

**SAMUEL ADEGBOYEGA UNIVERSITY**  
**COLLEGE OF MANAGEMENT SCIENCES**  
**DEPARTMENT OF BUSINESS ADMINISTRATION**  
**BUS 313: QUANTITATIVE ANALYSIS FOR BUSINESS DECISION**  
**DECISION MAKING**

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**Objective:**

At the end of this course, the students will be able to understand the nature, principles and characteristics of Organization; discuss the theories of organization; identify the various limitations of quantitative models in decision making; and explain the decision making process under certainty, uncertainty and Risk

**Introduction**

Managers are frequently faced with complex decisions that need to be made. These decisions often have great impact on the profitability of the organization as well as the decision maker's career. Therefore, it is essential that the decision maker be given the best information available to aid the process of decision making.

A range of quantitative techniques are available for helping the decision makers in this task. Quantitative Analysis can be view as a scientific approach to decision making with special emphasis on the quantification rather than qualification of decision variables.

Quantitative analysis can also be seen as a method of applying mathematics and models with the use of knowledge of product, industry and employee capabilities to make beneficial business decisions. Organizational management and team of key employees need more objective data and information to aid decision-making.

Knowing how to implement and analyze operating methods using quantitative data will help to take the speculation of business processes.

Qualitative Analysis is an examination of measurable and verifiable data such as earnings, revenue, wages, market share. It helps company to see how well they are doing compared to last year. And also to determine whether to take up a new project or not having considered the risk associated with the best decision

The models can help quantify the variables in the situation under consideration as well as the probabilities of the various outcomes. Quantitative analysis is only part of the equation, however. The decision maker must also use capable employees and their capability in interpreting the results of the analysis.

Before the decision take place there must be a system (organization) where such decision is implemented.

### **What is an organization?**

It is a system of harmonized activities of two or more individuals. When people come together and officially decide to combine their efforts for a common purpose/goal/objective, an organization is the result.

The following are common characteristics of Organization:

1. **Coordination of Effort:**

Coordination of effort involve Individual who join together and coordinate their mental and physical efforts to accomplish great and exciting things. Coordination of efforts multiplies individual contributions.

2. **Common Goal or Purpose:**

Common goal or purpose occur when people work toward achieving something of joint interest. Coordination of effort cannot take place unless

those who have joined together agree to struggle for something of mutual interest. A common goal or purpose gives organization members a collective ideas.

3. Division of Labour:

This is the process of dividing tasks into different stages either base on specialty or professionalism and assigning workers to the tasks. By systematically dividing complex tasks into specialized jobs, an organization can use its human resources efficiently. Division of labour allows each organization member to become more proficient and skillful by repeatedly doing the same specialized task

4. A Hierarchy of Authority:

Authority is defined as the right to direct the actions of others. Hierarchy of Authority occur when authority is formally assigned to individual coordinating a collective effort with a view of achieving an intended goal. Hierarchy of authority facilitate effective and efficient accomplishment of tasks. Without a clear hierarchy of authority, coordination of effort is difficult if not impossible to achieve.

## **DECISION MAKING UNDER CERTAINTY**

A condition of certainty exists when there is no doubt about a particular decision and its outcome can be predicted accurately. In a world filled with uncertainties, certainty is relative rather than absolute: - For example the decision to order more molding block for a construction of firm is based on the relative certainty that the current state of use will exhaust the material on a specific date. But even in this case, uncertainties about the possible misuse or theft of the materials will influence the level of assurance that the materials will be enough for the project. Since

nothing is truly certain, conditions of risk and uncertainty are the general rule for managers.

## **DECISION MAKING UNDER UNCERTAINTY**

Uncertainty is a reality of life. Life is filled with varying degrees of uncertainty. Managers are continually asked to make the best decisions they can despite uncertainties about both present and future circumstances. Three (3) different types of environmental uncertainties have been observed (Kreitzer, 1995), these include:

i. **State Uncertainty:**

This refers to an unpredictable environment e.g. change of weather from a fine weather to a rainy one.

ii. **Effect Uncertainty:** This refers to unpredictable impacts that environmental changes may have. If it rains, will the rain be heavy enough to disturb the activity or programme?

iii. **Response Uncertainty:** This refers to the unpredictable consequences of decisions taken. Managers are affected by their different perceptions of environmental factors. Their degree of uncertainty may vary from one type of uncertainty to another. A manager may, for example, be uncertain about the timing of a labour strike (state uncertainty) but certain that a strike would ruin quarterly profit (effect uncertainty).

## **STEPS IN DECISION PROCESS**

Decision making process include the following

1. Identify the problem
2. Specify objectives and criteria for choosing a solution
3. Develop alternatives
4. Analyze and compare alternatives
5. Select the best alternative
6. Implement the chosen alternative

7. Monitor the result to ensure that desired results are achieved

**Identify the problem:**

Incorrect identification of the problem will lead to directing efforts toward removing symptoms rather than the problem e.g. pain killer drug given to an athlete to mask the pain instead of treating the injury, increasing the volume of a car radio to drown the noise coming from the engine.

**Specify objectives and criteria for choosing a solution:**

The decision maker must identify criteria by which proposed solution will be judged. Common criteria often relate to costs, profits, return to investments, increased productivity, risk, company image, impact on demand etc.

**Develop alternatives:**

The ability to satisfactorily handle problems often depends on the degree of success one has in developing suitable alternatives. In the search for alternatives, there is always the danger that one or more potentially superior alternatives would be overlooked. The optimal alternative may turn out to be less than optimum.

**Analyze and compare alternatives:**

Analyzing and comparing alternatives is often enhanced by the use of mathematical or statistical techniques.

**Select the best alternative:**

Selection of the best alternative will depend on the objectives of the decision maker and the criteria that are being used to evaluate alternatives.

**Implement the chosen alternative:**

Implementing a solution simply means carrying out the actions indicated by/related to the chosen alternative. Examples include buying/acquiring the machine, refusing the loan application, beginning development of a new product, and authorizing the use of overtime.

### **Monitor the result to ensure that desired results are achieved:**

Effective decision making requires that the results of the decisions be monitored to make sure that the desired consequences/results have been achieved. If they have not, the decision maker may have to repeat the entire process, or perhaps a review of the situation may reveal an error in implementation, an error in calculation or a wrong assumption that will allow the situation to be remedied quickly.

### **DECISION THEORY**

Decision theory is a general approach to decision making when the outcome associated with the alternatives are often in doubt. Since the chief role of the operation manager is that of decision maker, it helps them with decision on process capacity, location and inventory because such decisions are about an uncertain future.

An operations manager is a senior-level employee who oversees the production of goods and/or delivery of services. His or her aim is to ensure that the organization is running/operating as smoothly and efficiently as possible, and that the goods and/or services produced satisfy/meet customer needs.

### **Steps:**

1. **List the feasible alternatives:**

A basic assumption is that the number of alternatives is finite. However the manager must narrow the number of choices to a reasonable number. One alternative that should always be considered is the "do nothing" alternative.

2. **List the events:**

List the events that have an impact on the outcome of the choice but aren't under the managers control e.g. the demand could be low or high.

3. **Calculate the payoff:**

Calculate the payoff for each alternative in each event. Typically the payoff is total profit or total cost.

4. **Estimate the likelihood of each event using past data, executive opinion, or other forecasting methods.**

5. **Select a decision rule**

To evaluate the alternatives such as choosing the alternative with lowest expected cost. The value chosen depends on the amount of information the manager has on the event probability and the managers' attitude towards risk.

### **DECISION MAKING UNDER CERTAINTY**

1. Decision making under certainty occurs when the manager knows which event will occur.
2. The decision rule here is to pick the alternative with the best payoff for the known event.
3. The best alternative is the highest payoff if the payoffs are expressed in terms of profit. If the payoffs are expressed in terms costs, the best alternative is the lowest payoff

#### **Assessment:**

1. A manager is deciding whether to make delivery of order placed by a potential customer from one of the available three factories (X, Y, Z) as shown below. Which factory is best suitable for the supply using the following strategies?

- a. Maximin      (b) Maximax      (c) Laplace      (d) Minimax Regret

<b>Factory</b>	<b>Low (₦)</b>	<b>Moderate (₦)</b>	<b>High (₦)</b>
<b>X</b>	(4)	2	16
<b>Y</b>	7	15	12
<b>Z</b>	10	8	10

**Solution:**

**a. Maximin**

Alternatives	Worst payoff	
<b>X</b>	<b>(N4)</b>	<b>The minimum possible demand for small factory</b>
<b>Y</b>	<b>7</b>	<b>The minimum possible demand for Medium factory</b>
<b>Z</b>	<b>8</b>	<b>The minimum possible demand for Large factory</b>

The best of these is N8m, hence choose the **Moderate (Z)**

**b. Maximax**

Alternatives	Worst payoff
<b>X</b>	<b>N16</b>
<b>Y</b>	<b>15</b>
<b>Z</b>	<b>10</b>

The best of these is N16m, hence choose the **High (X)**

**c. Laplace**

Step 1: Find the Row Totals.

Step 2: Find the Row Average:- divide each of those Row Totals by the number of states of nature (Low, Moderate, High i.e. 3).

Step 3: choose the best among the alternatives.

Alternatives	Low	Moderate	High	Row Total	Row Average
<b>Small facility</b>	(4)	N2	16	<b>14</b>	<b>4.66</b>
<b>Medium</b> "	7	15	12	<b>34</b>	<b>11.33</b>
<b>Large</b> "	10	8	10	<b>28</b>	<b>9.33</b>

The best Average or weighted payoff is N11.33, hence the **FACTORY Y** is selected

**d. Minimax Regret**

Step 1: subtract every payoff in each column from the largest **Row Totals**.

Step 2: choose the best of the **worst regret**.

Alternatives	Low	Moderate	High	Worst opportunity cost(highest)
<b>Small facility</b>	$16 - -4 = \mathbf{20}$	$15 - 2 = \mathbf{13}$	$10 - 16 = \mathbf{-6}$	<b>20</b>
<b>Medium</b> "	$16 - 7 = \mathbf{9}$	$15 - 15 = \mathbf{0}$	$10 - 12 = \mathbf{-2}$	<b>9</b>
<b>Large</b> "	$16 - 10 = \mathbf{6}$	$15 - 8 = \mathbf{7}$	$10 - 10 = \mathbf{0}$	<b>7</b>

The best of the worst regret is N7; hence the **FACTORY Y** should be chosen

**Reference material:**

Glyn Davis and Branko Pecar, (2013). Quantitative Methods for Decision Making. Oxford University Press, UK. March 2013.

McGraw-Hill C. (2010). Quantitative Analysis for Decision Making. Volumes 1 & 2, ISBN-10: 069779153X ISBN-13: 9780697791535.