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**Lectures on Discipline**

**Methods of Decision-Making**

**for the Students of the Speciality 073 «Management»**

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**CONTENTS**

|  |  |
| --- | --- |
| Topic 1. Decisions in management ……………………………………………. | 4 |
| Topic 2. Technology of decision-making process…………………………..… | 10 |
| Topic 3. Modeling of decision-making process ……………………………….. | 15 |
| Topic 4. Analysis of the internal and external environment and it’s impact on the implementation of alternatives ………………………………………..…... | 19 |
| Topic 5. Decision modeling under uncertainty………..………………………. | 25 |
| Topic 6. Control of decisions implementation……………………………….... | 32 |

**TOPIC 1. DECISIONS IN MANAGEMENT**

**Content**

**1. The concept of management decisions**

**2. Types of decisions**

**3. Managerial economics**

**1. The concept of management decisions**

Every action of a manager is generally an outcome of a decision.

Owing to this fact, P.P. Drucker in his book “Practice of Management,” observes “Whatever a manager does, he does through making decision.” True, the job of management involves the making of innumerable decisions. That is why many persons think that management is decision-making.

The word ‘decides’ means to come to a conclusion or resolution as to what one is expected to do at some later time. According to Manely H. Jones, “It is a solution selected after examining several alternatives chosen because the decider foresees that the course of action he selects will do more than the others to further his goals and will be accompanied by the fewest possible objectionable consequences”‘.

A decision is a choice made between alternative courses of action in a situation of uncertainty.

Decision is a choice whereby a person comes to a conclusion about given circumstances/ situation. It represents a course of behaviour or action about what one is expected to do or not to do. Decision- making may, therefore, be defined as a selection of one course of action from two or more alternative courses of action. Thus, it involves a choice-making activity and the choice determines our action or inaction.

Decision-making is an indispensable part of life. Innumerable decisions are taken by human beings in day-to-day life. In business undertakings, decisions are taken at every step. All managerial functions viz., planning, organizing, staffing, directing, coordinating and controlling are carried through decisions. Decision-making is thus the core of managerial activities in an organisation.

So decision-making is a very important part of an organisation. Herbert Simon, in fact, is the pioneer in the field of decision-making concept because he felt that if decision were not taken properly and timely that may spoil the objective of the business organisation and keeping this in mind it is essential that an organisation will resort to utmost caution as to the adoption of decision and at the same time will focus on the implementation of the decision. So both taking and implementing decision are important.

So we can say that decision-making denotes the formulation of general policy for the management of an organisation which may be business organisation or administrative organisation. The point to note is that the nature and implementation of decision-making may be different in both places but it remains that in every case the importance of decision-making remains intact. To sum up, the decision-making means the adoption and application of rational choice for the management of private, business or governmental organisation in an efficient manner.

Following elements can be derived from the above mentioned definitions:

1. Decision–making is a selection process and is concerned with selecting the best type of alternative.

2. The decision taken is aimed at achieving the organisational goals.

3. It is concerned with the detailed study of the available alternatives for finding the best possible alternative.

4. Decision making is a mental process. It is the outline of constant thoughtful consideration.

5. It leads to commitment. The commitment depends upon the nature of the decision whether short term or long term.

**Nature:**

If we go through the numerous stages of decision-making and the implementation of the decision we shall find that it has certain features, some of which are briefly stated:

1. In one of his writings Herbert Simon has said that decision or decision making “is a matter of compromise”. Why it is called so? There are number of alternatives, before a policy/decision maker and while making decision he is to select one or more alternatives which will be suitable for him or which will serve his purpose.

While pursuing this policy or technique the decision-maker is forced to make compromises and the main aim of compromise is to fulfill the objective of the organisation or management. The compromise becomes inevitable on another ground. The policy maker must see that the policy is not divorced from real situation and the real situation chiefly relates to the declared policy of the management or government organ.

2. There must be rationality in decision making process. We have just now pointed out that compromise and decision making both is linked with each other. The policy maker makes compromises on the ground that this policy/decision will be a realistic one. Similarly, while a decision is being made the decision maker must demonstrate utmost rationality.

He must consider all the aspects of policy such as elements entering into the policy making process, implication of implementation or feasibility of application etc. While the decision-maker considers actively all these aspects it will be found that he is rational. A decision should be both subjectively and objectively rational.

A decision would be “objectively” rational if it maximised the given values in a given situation, “subjectively” rational if it maximised attainment relative to the actual knowledge of the subject.

3. An important characteristic of decision-making is that it is never a product of a single man. It does not originate from a single brain; it is always the product of several men or brains who work together. In any organisation several officers work together and after considering all the aspects a decision is taken.

4. Decision-making does not relate to one issue or question but to a number of issues.

**Some of the categories of decision have been identified by Wasby:**

(a) Who made the decision?

(b) What was the decision?

(c) When was the decision made?

(d) How was the decision made?

(e) Where was the decision made?

(f) What were the characteristics of the decision situation?

(g) To what class or subclass of decisions does the decision belong?

(h) Why was the decision made?

Whenever a department or an organization takes any decision or decides to take a decision that automatically comes into any one of the above noted categories. The decisions are never taken in vacuum. The decisions are made to serve definite purposes/purpose. We have already noted that behind every decision there must be rationality of the decision maker and there is no place of idiosyncrasy.

5. It has been observed by many scholars that irrationality and rationality conception gives birth to a lot of confusion because the policy maker is chiefly motivated by real situation which sometimes gives no credence to rationality. In other words, conflict arises between rationality and reality or the general welfare of the organization. The policy maker firmly believes that if rationality is given priority that may jeopardies the prospect of welfare principle and in that situation the policy maker may be compelled to give his preference for the general welfare consideration. So the dichotomisation between rationality and irrationality may appear irrelevant.

However, this issue should not blur the conceptualization of rationality idea because in special circumstances the rationality principle may be neglected but this should never be the general principle. If rationality is not given due importance the decision-making process and the objective of public utility concerns will be adversely affected.

**2. Types of decisions**

1. **Programmed and non programmed decisions:** Programmed decisions are those which are normally repetitive in nature and are taken as a routine job and responsibilities. These types of decisions are made by middle level management in accordance with some policies, rules and procedures. They have short term impact. For example: granting a leave to an employee, purchasing office materials etc. Non-programmed decisions are non repetitively taken by top executives. They need to collect data and analyze them and forecast the strategic plans.

2. **Major and minor decisions:** among different decisions some decisions are considerably more important than others and are prioritized. They are called major decisions. For example, replacement of man by machine, diversification of product etc. Contrary to that, some of the remaining decisions are considerably less important than others and are not so prioritized. They are minor decisions. For example, store of raw materials etc.

3. **Routine and strategic decisions:** Routine decisions are those decisions which are considered as tactical decisions. They are taken frequently to achieve high degree of efficiency in the organizational activities. For example, parking facilities, lighting and canteen etc. Strategic decisions are those which are related to lowering the prices of products, changing the product etc. They take more fund and make certain influence for future of the enterprise.

4. **Organizational and personal decision:** Organizational decision is taken by top executives for official purpose. They affect the organizational activities directly. Authority is also delegated. Personal decisions are concerned to an employee. The executives whenever takes the decisions personally that is known as personal decisions

5. **Individual and group decisions:** When a single employee is involved in decision making it is called individual decision. They are taken by sole proprietor when the problem is of routine nature. On the other hand when the decision is of group taken in a large organization where important and strategic decisions are taken it is a group decision

6. **Policy and operating decisions:** Policy decisions are taken by top level management to change the rules, procedures, organizational structure etc. and they have a long term effect. Operational decisions are taken by low level management which have short term effect and which affect the day to day operation of the organization.

**3. Managerial economics**

**Managerial economics** is the "application of the economic concepts and economic analysis to the problems of formulating rational managerial decisions". It is sometimes referred to as [business economics](https://en.wikipedia.org/wiki/Business_economics) and is a branch of [economics](https://en.wikipedia.org/wiki/Economics) that applies [microeconomic](https://en.wikipedia.org/wiki/Microeconomic) analysis to decision methods of businesses or other management units. As such, it bridges economic theory and economics in practice. It draws heavily from quantitative techniques such as [regression analysis](https://en.wikipedia.org/wiki/Regression_analysis), [correlation](https://en.wikipedia.org/wiki/Correlation) and [calculus](https://en.wikipedia.org/wiki/Calculus). If there is a unifying theme that runs through most of managerial economics, it is the attempt to [optimize](https://en.wikipedia.org/wiki/Optimization_(mathematics)) business decisions given the firm's objectives and given constraints imposed by scarcity, for example through the use of [operations research](https://en.wikipedia.org/wiki/Operations_research), [mathematical programming](https://en.wikipedia.org/wiki/Mathematical_programming), [game theory](https://en.wikipedia.org/wiki/Game_theory) for strategic decisions, and other [computational methods](https://en.wikipedia.org/wiki/Computational_economics).

**Managerial decision areas** include:

* assessment of investible funds
* selecting business area
* choice of product
* determining optimum output
* sales promotion.

Almost any business decision can be analyzed with managerial economics techniques, but it is most commonly applied to:

* *Risk analysis* - various models are used to quantify [risk](https://en.wikipedia.org/wiki/Risk) and asymmetric [information](https://en.wikipedia.org/wiki/Information_economics) and to employ them in [decision rules](https://en.wikipedia.org/wiki/Decision_theory) to manage risk.
* *Production analysis* - microeconomic techniques are used to analyze [production efficiency](https://en.wikipedia.org/wiki/Production_theory_basics), [optimum factor allocation](https://en.wikipedia.org/w/index.php?title=Optimum_factor_allocation&action=edit&redlink=1), [costs](https://en.wikipedia.org/wiki/Cost), [economies of scale](https://en.wikipedia.org/wiki/Economies_of_scale) and to estimate the firm's cost function.
* *Pricing analysis* - microeconomic techniques are used to analyze various [pricing decisions](https://en.wikipedia.org/wiki/Pricing) including [transfer pricing](https://en.wikipedia.org/wiki/Transfer_pricing), [joint product pricing](https://en.wikipedia.org/wiki/Joint_product_pricing), [price discrimination](https://en.wikipedia.org/wiki/Price_discrimination), price elasticity estimations, and choosing the optimum pricing method.
* *Capital budgeting* - Investment theory is used to examine a firm's [capital purchasing decisions](https://en.wikipedia.org/wiki/Corporate_finance#The_investment_decision).

**Characteristics of Managerial Economics:**

• It studies the problems and principles of an individual business firm or an individual industry. It aids the management in forecasting and evaluating the trends of the market.

• It is concerned with varied corrective measures that a management undertakes under various circumstances. It deals with goal determination, goal development and achievement of these goals. Future planning, policy making, decision making and optimal utilization of available resources, come under the banner of managerial economics.

• Managerial economics is pragmatic. In pure microeconomic theory, analysis is performed, based on certain exceptions, which are far from reality. However, in managerial economics, managerial issues are resolved daily and difficult issues of economic theory are kept at bay.

• Managerial economics employs economic concepts and principles, which are known as the theory of Firm or 'Economics of the Firm'. Thus, its scope is narrower than that of pure economic theory.

• Managerial economics incorporates certain aspects of macroeconomic theory. These are essential to comprehending the circumstances and environments that envelop the working conditions of an individual firm or an industry. Knowledge of macroeconomic issues such as business cycles, taxation policies, industrial policy of the government, price and distribution policies, wage policies and antimonopoly policies and so on, is integral to the successful functioning of a business enterprise.

• Managerial economics aims at supporting the management in taking corrective decisions and charting plans and policies for future.

• Science is a system of rules and principles engendered for attaining given ends. Scientific methods have been credited as the optimal path to achieving one's goals. Managerial economics has been is also called a scientific art because it helps the management in the best and efficient utilization of scarce economic resources. It considers production costs, demand, price, profit, risk etc. It assists the management in singling out the most feasible alternative. Managerial economics facilitates good and result oriented decisions under conditions of uncertainty.

• Managerial economics is a normative and applied discipline. It suggests the application of economic principles with regard to policy formulation, decision-making and future planning. It not only describes the goals of an organization but also prescribes the means of achieving these goals.

**Scope of Managerial Economics:**

The scope of managerial economics includes following subjects:

- Theory of Demand

- Theory of Production

- Theory of Exchange or Price Theory

- Theory of Profit

- Theory of Capital and Investment

**Importance of Managerial Economics:**

Business and industrial enterprises aim at earning maximum proceeds. In order to achieve this objective, a managerial executive has to take recourse in decision making, which is the process of selecting a specified course of action from a number of alternatives. A sound decision requires fair knowledge of the aspects of economic theory and the tools of economic analysis, which are directly involved in the process of decision-making. Since managerial economics is concerned with such aspects and tools of analysis, it is pertinent to the decision making process.

Spencer and Siegelman have described the importance of managerial economics in a business and industrial enterprise as follows:

- Accommodating traditional theoretical concepts to the actual business behavior and conditions: Managerial economics amalgamates tools, techniques, models and theories of traditional economics with actual business practices and with the environment in which a firm has to operate. According to Edwin Mansfield, “Managerial Economics attempts to bridge the gap between purely analytical problems that intrigue many economic theories and the problems of policies that management must face”.

- Estimating economic relationships: Managerial economics estimates economic relationships between different business factors such as income, elasticity of demand, cost volume, profit analysis etc.

- Predicting relevant economic quantities: Managerial economics assists the management in predicting various economic quantities such as cost, profit, demand, capital, production, price etc. As a business manager has to function in an environment of uncertainty, it is imperative to anticipate the future working environment in terms of the said quantities.

- Understanding significant external forces: The management has to identify all the important factors that influence a firm. These factors can broadly be divided into two categories. Managerial economics plays an important role by assisting management in understanding these factors.

a) External factors: A firm cannot exercise any control over these factors. The plans, policies and programs of the firm should be formulated in the light of these factors. Significant external factors impinging on the decision making process of a firm are economic system of the country, business cycles, fluctuations in national income and national production, industrial policy of the government, trade and fiscal policy of the government, taxation policy, licensing policy, trends in foreign trade of the country, general industrial relation in the country and so on.

b) Internal factors: These factors fall under the control of a firm. These factors are associated with business operation. Knowledge of these factors aids the management in making sound business decisions.

- Basis of business policies: Managerial economics is the founding principle of business policies. Business policies are prepared based on studies and findings of managerial economics, which cautions the management against potential upheavals in national as well as international economy. Thus, managerial economics is helpful to the management in its decision-making process.

At universities, the subject is taught primarily to advanced undergraduates and graduate business schools. It is approached as an integration subject. That is, it integrates many concepts from a wide variety of prerequisite courses. In many countries it is possible to read for a degree in Business Economics which often covers managerial economics, [financial economics](https://en.wikipedia.org/wiki/Financial_economics), [game theory](https://en.wikipedia.org/wiki/Game_theory), business [forecasting](https://en.wikipedia.org/wiki/Forecasting) and [industrial economics](https://en.wikipedia.org/wiki/Industrial_economics).

**TOPIC 2. TECHNOLOGY OF DECISION-MAKING PROCESS**

**Content**

**1. Decision-Making Process**

**2. Decision Quality**

**3. Factors Influencing Decision-Making**

**1. Decision-Making Process**

Decision making is the process of making choices by identifying a decision, gathering information, and assessing alternative resolutions.

Using a step-by-step decision-making process can help you make more deliberate, thoughtful decisions by organizing relevant information and defining alternatives. This approach increases the chances that you will choose the most satisfying alternative possible (fig.1).

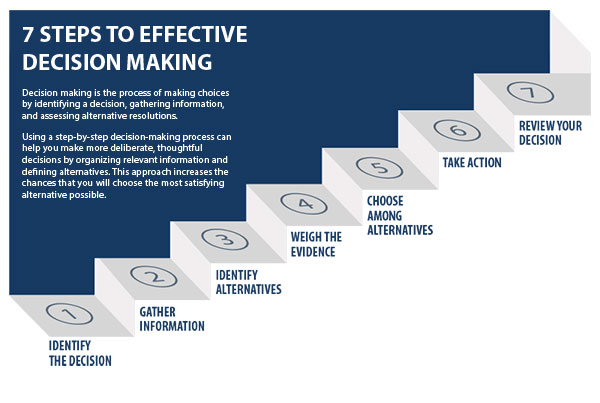


Fig 1 - Step-by-step decision-making process model

**Step 1: Identify the decision**

You realize that you need to make a decision. Try to clearly define the nature of the decision you must make. This first step is very important.

**Step 2: Gather relevant information**

Collect some pertinent information before you make your decision: what information is needed, the best sources of information, and how to get it. This step involves both internal and external “work.” Some information is internal: you’ll seek it through a process of self-assessment. Other information is external: you’ll find it online, in books, from other people, and from other sources.

**Step 3: Identify the alternatives**

As you collect information, you will probably identify several possible paths of action, or alternatives. You can also use your imagination and additional information to construct new alternatives. In this step, you will list all possible and desirable alternatives.

**Step 4: Weigh the evidence**

Draw on your information and emotions to imagine what it would be like if you carried out each of the alternatives to the end. Evaluate whether the need identified in Step 1 would be met or resolved through the use of each alternative. As you go through this difficult internal process, you’ll begin to favor certain alternatives: those that seem to have a higher potential for reaching your goal. Finally, place the alternatives in a priority order, based upon your own value system.

**Step 5: Choose among alternatives**

Once you have weighed all the evidence, you are ready to select the alternative that seems to be best one for you. You may even choose a combination of alternatives. Your choice in Step 5 may very likely be the same or similar to the alternative you placed at the top of your list at the end of Step 4.

**Step 6: Take action**

You’re now ready to take some positive action by beginning to implement the alternative you chose in Step 5.

**Step 7: Review your decision & its consequences**

In this final step, consider the results of your decision and evaluate whether or not it has resolved the need you identified in Step 1. If the decision has *not* met the identified need, you may want to repeat certain steps of the process to make a new decision. For example, you might want to gather more detailed or somewhat different information or explore additional alternatives.

**2. Decision Quality**

**Decision quality (DQ)** is the quality of a decision at the moment the decision is made, regardless of its outcome. Decision quality concepts permit the assurance of both effectiveness and efficiency in analyzing decision problems. In that sense, decision quality can be seen as an extension to [decision analysis](https://en.wikipedia.org/wiki/Decision_analysis). Decision quality also describes the process that leads to a high-quality decision. Properly implemented, the DQ process enables capturing maximum value in uncertain and complex scenarios.

**Decision and outcome**

Fundamental to all decision quality concepts is the distinction between the decision and its outcome. They are different because of the uncertainties when making a choice – a high quality decision can still result in a poor outcome, and vice versa. In the face of uncertainty, the decision maker only has control over the decision, but no control over the outcome of external circumstances. Consequently, the outcome of a decision does not allow an assessment about its quality. A decision has quality at the time it is made, which is not changed by hindsight. Concepts of decision quality focus on measuring and improving the quality of the decision at the time it is being made.

**Elements**

The confidence a decision maker has in its choice, and related to it the commitment a decision maker has to act upon that choice, depends on the quality of the decision at the time of making the decision. A high-quality decision is characterized by the following elements (fig. 2):

* A useful frame
* Feasible and diverse alternatives
* Meaningful and reliable information
* Clear values, preferences, and trade-offs
* Logically sound reasoning
* Commitment to action



**Fig. 2 - The six essentials of decision quality**

Quality in decision making requires quality in each of the elements listed above, and the overall quality of the decision is limited by the weakest element. Decision quality is achieved when for each element the cost to obtain additional information or insight to improve its quality exceeds the added value.

A variety of specific tools and processes exist to improve the quality of each element.

**Framing**

The first element to achieve decision quality is framing. Having the appropriate frame ensures the right decision problem is addressed. Quality in framing is achieved when the [decision makers](https://en.wikipedia.org/wiki/Decision_making) have alignment on purpose, perspective, and scope of the decision problem to be solved. It means the right people will work the right problem the right way.

**Alternatives**

A decision cannot be better than the best available option (alternative). A wide variety of approaches, tools, and methods exist to generate high quality alternatives, ranging from systematic search approaches to identify alternatives to approaches that aim to creatively synthesize alternatives. Quality in alternatives is achieved by applying a suitable alternatives generation process, where the process itself leads to a variety of feasible and diverse alternatives, which are hybrid solutions of originally considered alternatives that combine their best features, and where for each alternative an understanding of its implementation exists.

**Information**

The quality of a decision depends on the quality of the information to inform the decision. Quality in information is achieved when the information is meaningful and reliable, is based on appropriate data and judgment, reflects properly all [uncertainties](https://en.wikipedia.org/wiki/Uncertainty) [biases](https://en.wikipedia.org/wiki/Bias), intangibles, and [interdependencies](https://en.wikipedia.org/wiki/Interdependence), and the limits to the information are known. A wide variety of tools exist to improve the quality of the information used in the decision problem.

**Values and trade-offs**

Quality in this element requires the identification of the right decision criteria and the definition of [trade-off](https://en.wikipedia.org/wiki/Trade-off) rules among them. This necessitates at first the identification of all key [stakeholders](https://en.wikipedia.org/wiki/Stakeholder_(corporate)), and what each of them values. Quality in this element of decision quality is characterized by transparent value metrics, a clear line of sight of the primary metric, and explicit trade-off rules between key metrics.

**Sound reasoning**

This element is the domain of decision analysis, which aims to produce insight. Decision analysis provides the logic and analytic tools to find the best choice in a complex situation, and should serve as a guide to facilitate the conversation about the decision. A wide variety of tools, ranging from decisions trees, over hierarchies to complex network models is available to match the decision problem. Quality in this element is achieved when the value and uncertainty of each alternative is understood, and the best choice is clear.

**Commitment to action**

The quality of a decision also depends on the commitment to act upon the choice that is made. Quality in this element is achieved by involving all key decision makers and stakeholders in an effective and efficient decision making process. At the end of the process, quality is characterized by buy-in across all stakeholders and an organization that is ready to take action and commit resources.

**3. Factors Influencing Decision-Making**

There are several important factors that influence decision making. Significant factors include past experiences, a variety of cognitive biases, an escalation of commitment and sunk outcomes, individual differences, including age and socioeconomic status, and a belief in personal relevance. These things all impact the decision making process and the decisions made.

Past experiences can impact future decision making. Juliusson, Karlsson, and Garling indicated past decisions influence the decisions people make in the future. It stands to reason that when something positive results from a decision, people are more likely to decide in a similar way, given a similar situation. On the other hand, people tend to avoid repeating past mistakes. This is significant to the extent that future decisions made based on past experiences are not necessarily the best decisions. In financial decision making, highly successful people do not make investment decisions based on past sunk outcomes, rather by examining choices with no regard for past experiences; this approach conflicts with what one may expect.

In addition to past experiences, there are several cognitive biases that influence decision making. Cognitive biases are thinking patterns based on observations and generalizations that may lead to memory errors, inaccurate judgments, and faulty logic. Cognitive biases include, but are not limited to: belief bias, the over dependence on prior knowledge in arriving at decisions; hindsight bias, people tend to readily explain an event as inevitable, once it has happened; omission bias, generally, people have a propensity to omit information perceived as risky; and confirmation bias, in which people observe what they expect in observations.

In decision making, cognitive biases influence people by causing them to over rely or lend more credence to expected observations and previous knowledge, while dismissing information or observations that are perceived as uncertain, without looking at the bigger picture. While this influence may lead to poor decisions sometimes, the cognitive biases enable individuals to make efficient decisions with assistance of heuristics.

In addition to past experiences and cognitive biases, decision making may be influenced by an escalation of commitment and sunk outcomes, which are unrecoverable costs. Juliusson, Karlsson, and Garling concluded people make decisions based on an irrational escalation of commitment, that is, individuals invest larger amounts of time, money, and effort into a decision to which they feel committed; further, people will tend to continue to make risky decisions when they feel responsible for the sunk costs, time, money, and effort spent on a project. As a result, decision making may at times be influenced by ‘how far in the hole’ the individual feels he or she is.

Some individual differences may also influence decision making. Research has indicated that age, socioeconomic status (SES), and cognitive abilities influences decision making. Finucane et al. established a significant difference in decision making across age; that is, as cognitive functions decline as a result of age, decision making performance may decline as well. In addition, older people may be more overconfident regarding their ability to make decisions, which inhibits their ability to apply strategies. Finally, with respect to age, there is evidence to support the notion that older adults prefer fewer choices than younger adults.

Age is only one individual difference that influences decision making. People in lower SES groups may have less access to [education](http://www.inquiriesjournal.com/keyword/education) and resources, which may make them more susceptible to experiencing negative life events, often beyond their control; as a result, low SES individuals may make poorer decisions, based on past decisions.

Over and above past experiences, cognitive biases, and individual differences; another influence on decision making is the belief in personal relevance. When people believe what they decide matters, they are more likely to make a decision. Acevedo and Krueger examined individuals’ voting patterns, and concluded that people will vote more readily when they believe their opinion is indicative of the attitudes of the general population, as well as when they have a regard for their own importance in the outcomes. People vote when they believe their vote counts. Acevedo and Krueger pointed out this voting phenomenon is ironic; when more people vote, the individual votes countless, in electoral math.

**TOPIC 3. MODELING OF DECISION-MAKING PROCESS**

**Content**

**1. Modeling and its Role in Economy**

**2. Limitations of the Models**

**3. How Economists Build Empirical Models**

**4. Model Types of Decision-Making Process**

**1. Modeling and its Role in Economy**

During deep studying of the major problems that require solutions, we can use some scientific methods, such as systems analysis, operations research. Their basis is mathematical modeling. Mathematical modeling is an effective tool for learning the internal laws, phenomena and processes. Its essence is to select mathematical schemes that adequately describe the processes in reality. It allows you to explore the quantitative relationship and interdependence in modeled system and improves its further development and functioning.

Strict formalization of social and economic processes of the enterprise is almost impossible. Therefore, the model is a simplified representation of the real system, but if this simplification is done correctly, it gets us close reflection of the real situation and gets exact characteristics of the object. Despite this problem, mathematical modeling in socio-economic sphere sometimes serves as only possibility of quantitative analysis processes and phenomena because experiments are impossible or restricted.

Therefore, in economics, a model is defined as a theoretical construct that represents economic processes through a set of [variables](https://www.boundless.com/economics/definition/variable/) and a set of logical or [quantitative](https://www.boundless.com/economics/definition/quantitative/) relationships between the two. A model is simply a framework that is designed to show complex economic processes. Most models use mathematical techniques in order to investigate, theorize, and fit theories into economic situations.

Economists use models in order to study and portray situations. The focus of a model is to gain a better understanding of how things work, to observe patterns, and to predict the results of stimuli. Models are based on theory and follow the rules of [deductive](https://www.boundless.com/economics/definition/deductive/) logic.

Modeling is used for the following reasons:

• models are cheaper and require less time than experimenting with real systems;

• managers can estimate a large number of alternatives;

• models can apply a systematic approach to problem analysis;

• models require restrictions on the factors that have little impact on the problem.

Economic models have two functions: 1) to simplify and abstract from observed data, and 2) to serve as a means of selection of data based on a paradigm of econometric study. Economic processes are known to be enormously complex, so simplification to gain a clearer understanding is critical. Selecting the correct data is also very important because the nature of the model will determine what economic facts are studied and how they will be compiled.

Examples of the uses of economic models include: professional academic interest, forecasting economic activity, proposing economic policy, presenting reasoned arguments to politically justify economic policy, as well as economic planning and allocation.

The positive features of modeling are:

• use more perfect calculation compared with other methods;

• a high degree of decisions validity;

• shortening decision-making terms;

• the ability to perform the reverse operation. Its peculiarity is, when we have the model and initial data, we can calculate the result. But we can navigate to the desired result and determine which initial data needed for this. In management, this feature is extremely important. For example, based on revenue in the volume of N, we can set quantitative values other factors that directly and indirectly affect the achievement of results, which is scheduled.

**2. Limitations of the Models**

The main limitation of the use of models:

• models can be expensive and require considerable time for their development and testing;

• they cannot be used because of mathematical complexity;

• they reduce importance of factors that not be reflected mathematically;

• they often oversimplify reality.

Due to the complexity of economic models, there are obviously limitations that come into account. First, all of the data provided must be complete and accurate in order for the analysis to be successful. Also, once the data is entered, it must be analyzed correctly. In most cases, economic models use mathematical or quantitative analysis. Within this realm of observation, accuracy is very important. During the construction of a model, the information will be checked and updated as needed to ensure accuracy. Some economic models also use [qualitative](https://www.boundless.com/economics/definition/qualitative/) analysis. However, this kind of analysis is known for lacking precision. Furthermore, models are fundamentally only as good as their founding [assumptions](https://www.boundless.com/economics/definition/assumption/).

**3. How Economists Build Empirical Models**

Despite their diversity, empirical economic models have features in common. Each will allow for inputs, or exogenous variables, which do not need to be explained by the model. These include policy variables, such as government spending and tax rates, or nonpolicy variables, like the weather. Then there are the outputs, called dependent variables (for example, the inflation rate), which the model will seek to explain when some or all of the exogenous variables come into play.

Every empirical model will also have coefficients that determine how a dependent variable changes when an input changes (for example, the responsiveness of household consumption to a $100 decrease in income tax). Such coefficients are usually estimated (assigned numbers) based on historical data. Last, empirical model builders add a catchall variable to each behavioral equation to account for idiosyncrasies of economic behavior at the individual level. (In the example above, agents will not respond identically to a $100 tax rebate).

There are, however, fundamental differences among economists regarding how an empirical model’s equations should be derived. Some economists insist that the equations must assume maximizing behavior (for example, an agent chooses its future consumption to maximize its level of satisfaction subject to its budget), efficient markets, and forward-looking behavior. Agents’ expectations and how they react to policy changes play a vital role in the resulting equations. Consequently, users of the model should be able to track the effect of specific policy changes without having to worry about whether the change itself alters agents’ behavior.

Other economists favor a more nuanced approach. Their preferred equations reflect, in part, what their own experience has taught them about observed data. Economists that build models this way are, in essence, questioning the realism of the behavioral constructs in the more formally derived models. Incorporating experience, however, often means it’s impossible to untangle the effect of specific shocks or predict the impact of a policy change because the underlying equations do not explicitly account for changes in agent behavior. The gain, these same economists would argue, is that they do a better job of prediction (especially for the near term).

Therefore, the construction and use of a model will vary according to the specific situation. However, creating a model does have two basic steps: 1) generate the model, and 2) checking the model for accuracy - also known as diagnostics. The diagnostic step is important because a model is only useful if the data and analysis is accurate.

**4. Model Types of Decision-Making Process**

There are several models of decision-making:

1. The economic rationality model. This model comes from the classical economist models, in which the decision-maker is perfectly and completely rational in every way. In this, following conditions are assumed.

a. The decision will be completely rational in means ends sense.

b. There is a complete and consistent system of preferences that allows a choice among alternatives.

c. There is a complete awareness of all the possible alternatives.

d. Probability calculations are neither frightening nor mysterious.

e. There are no limits to the complexity of computations that can be performed to determine the best alternatives.

2. The social model: - At the opposite extreme from the economic rationality model is the social model drawn from psychology. Sigmund Freud viewed humans as bundles of feelings, emotions and instincts, with their behavior guided by their unconscious desires. These processes have even an impact in the international arena as they provide some basic rules of protocol.

3. Simon’s bounded rationality model: - To present a more realistic alternative to the economic rationality model, Herbert Simon proposed an alternative model. He felt that management decision-making behaviour could be described as follows

a. In choosing between alternatives, manager attempt to satisfy or looks for the one which is satisfactory or “good enough”. Examples of satisfying criteria would be adequate profit or share or the market and fair price.

b. They recognize that the world they perceive is drastically simplified model of the real world. They are content with the simplification because they believe the real world is mostly empty anyway.

c. Because they satisfy rather than maximise, they can make their choices without first determining all possible behaviour alternatives and without ascertaining that these are all the alternatives.

d. The managers treat the world as empty, they are able to make decision with simple rule of thumb. These techniques do not make impossible demands upon their capacity for thought.

4. The neuroscientific (neurocognitive) model: - In cognitive neuroscience decision-making refers to the cognitive process of evaluating a number of possibilities, and selecting the most appropriate thereof in order to further a specific goal, or task. This faculty is a fundamental component of executive functions, although recent studies show that a complex brain network is involved including motor areas.

Example model. Demand of cars in the shop for the last 7 periods is presented in the table. It should make using trend forecast for next year.

|  |  |  |  |
| --- | --- | --- | --- |
| Period | Demand | х2 | xy |
| 1 | 74 | 1 | 74 |
| 2 | 79 | 4 | 158 |
| 3 | 80 | 9 | 240 |
| 4 | 90 | 16 | 360 |
| 5 | 105 | 25 | 525 |
| 6 | 142 | 36 | 852 |
| 7 | 122 | 49 | 854 |
| ∑х=28 | ∑y=692 | ∑х2=140 | ∑ху=3063 |

The trend line is given by:

,

y - the calculated value of the expected variable;

a - intercept straight on the vertical axis;

b - the slope of the regression line;

x - independent variable (time).

The slope of the regression line:



- the average of x and y;

n - the number of data points or observation.

, , 

а = 98,86 - 10,54\*4 = 56,7; у = 56,7+10,54×8 = 141,02 (units)

Consequently, the demand for cars in the shop for next period will amount to 141 units.

**TOPIC 4. ANALYSIS OF THE INTERNAL AND EXTERNAL ENVIRONMENT AND IT’S IMPACT ON THE IMPLEMENTATION OF ALTERNATIVES**

**Content**

**1. Strategic and Tactical Decisions, their Characteristics and Relationship**

**2. The Impact of External Factors on Decision-Making Process**

**3. The Impact of Internal Factors on Decision-Making Process**

**1. Strategic and Tactical Decisions, their Characteristics and Relationship**

The decision that a manager has to take may range from setting of goals and targets for the entire business enterprise to specific decisions regarding day-to-day activities. Some of them may have only short-term implications, while others may have long-term implications on the enterprise. From these points of view, managerial decisions can be broadly classified into three categories, namely, strategic, tactical and operational decisions.

Strategic decisions are the decisions that are concerned with whole environment in which the firm operates, the entire resources and the people who form the company and the interface between the two. Strategic decisions are major choices of actions and influence whole or a major part of business enterprise. They contribute directly to the achievement of common goals of the enterprise. They have long-term implications on the business enterprise.

They may involve major departures from practices and procedures being followed earlier. Generally, strategic decision is unstructured and thus, a manager has to apply his business judgement, evaluation and intuition into the definition of the problem. These decisions are based on partial knowledge of the environmental factors which are uncertain and dynamic. Such decisions are taken at the higher level of management.

**Characteristics/Features of Strategic Decisions**

1. Strategic decisions have major resource propositions for an organization. These decisions may be concerned with possessing new resources, organizing others or reallocating others.
2. Strategic decisions deal with harmonizing organizational resource capabilities with the threats and opportunities.
3. Strategic decisions deal with the range of organizational activities. It is all about what they want the organization to be like and to be about.
4. Strategic decisions involve a change of major kind since an organization operates in ever-changing environment.
5. Strategic decisions are complex in nature.
6. Strategic decisions are at the top most level, are uncertain as they deal with the future, and involve a lot of risk.
7. Strategic decisions are different from administrative and operational decisions. Administrative decisions are routine decisions which help or rather facilitate strategic decisions or operational decisions. Operational decisions are technical decisions which help execution of strategic decisions. To reduce cost is a strategic decision which is achieved through operational decision of reducing the number of employees and how we carry out these reductions will be administrative decision.

Tactical decisions relate to the implementation of strategic decisions. They are directed towards developing divisional plans, structuring workflows, establishing distribution channels, acquisition of resources such as men, materials and money. These decisions are taken at the middle level of management.

Operational decisions relate to day-to-day operations of the enterprise. They have a short-term horizon as they are taken repetitively. These decisions are based on facts regarding the events and do not require much of business judgement. Operational decisions are taken at lower levels of management. As the information is needed for helping the manager to take rational, well informed decisions, information systems need to focus on the process of managerial decision making The differences between Strategic, Administrative and Operational decisions can be summarized as follows:

|  |  |  |
| --- | --- | --- |
| **Strategic Decisions** | **Tactical Decisions** | **Operational Decisions** |
| Strategic decisions are long-term decisions. | Administrative decisions are taken daily. | Operational decisions are not frequently taken. |
| These are considered where The future planning is concerned. | These are short-term based Decisions. | These are medium-period based decisions. |
| Strategic decisions are taken in Accordance with organizational mission and vision. | These are taken according to strategic and operational Decisions. | These are taken in accordance with strategic and administrative decision. |
| These are related to overall Counter planning of all Organization. | These are related to working of employees in an Organization. | These are related to production. |
| These deal with organizational Growth. | These are in welfare of employees working in an organization. | These are related to production and factory growth. |

Strategic decision making, or strategic planning, describes the process of creating a company's mission and objectives and deciding upon the courses of action a company should pursue to achieve those goals.

Strategic decision making is an ongoing process that involves creating strategies to achieve goals and altering strategies based on observed outcomes. For example, the managers of a pizza restaurant might have the objective of increasing sales and decide to implement a strategy of offering lower prices on certain products during off hours to attract more customers. After a month of pursuing the new strategy, managers can look at sales data for the month and evaluate whether the strategy resulted in increasing sales and then choose to keep the new price scheme or alter their strategy.

Business managers often use a variety of management tools and techniques to aid in making strategic planning decisions.

1) Market Research

Market research is the process of gathering information about a certain market, such as the preferences of potential customers, the presence of competitors and the current state of the market. Market research is an essential strategic planning tool because insight into the needs of customers can help managers create a mission, goals and strategies that better fulfill those needs.

2) Cost-Benefit Analysis

A cost-benefit analysis is a common type of strategic decision-making tool that consists of assessing the costs and potential benefits associated with different courses of action and choosing the course of action that results in the greatest net benefit. For example, if managers expect that a certain project would cost $100,000 and result in a $110,000 benefit while a second project would cost $90,000 and result in a $105,000 benefit, managers would pursue the second project, as it is expected to produce a net benefit that is $5,000 greater than the other project.

3) SWOT Analysis

A SWOT analysis is a strategic planning tool that consists of assessing the strengths and weaknesses of a business and the threats and opportunities a business faces. A SWOT analysis can help managers take advantage of company strengths and implement strategies to reduce weaknesses or turn them into strengths. Assessing external threats and opportunities can aid in the strategic decision-making process, as it allows managers to plan for things like the presence of new competitors or the impact of new government regulations.

4) Feasibility Study

A feasibility study or feasibility analysis is a business-planning tool that involves assessing whether a certain project or goal can actually be created or achieved and whether the project can make a profit. A feasibility analysis can help entrepreneurs in the beginning planning stages of launching a company decide whether to pursue a certain opportunity or not. For example, if an inventor creates a new type of television display technology that is expensive to produce and does not provide significant benefits over existing technologies, a feasibility study might reveal that products that use the technology would be too expensive to attract customers, making a business based on selling the product unfeasible.

**2. The Impact of External Factors on Decision-Making Process**

Environmental issues are the external factors that affect the organization. The types of external factors that can have an effect on decision making include:

1) The market in which the organization operates

2) The economy

3) Government legislation

4) Customers' reaction to the organization’s products and services

For example, B&B online™ decided to create a new team, B&B for Busy Bodies™ because they believed that a corporate market existed for the bed and breakfast industry.

Markets (customers): Demographic and socio-cultural considerations, such as who the customers are and what they believe, are critical to capturing market share. Understanding the needs and preferences of the markets is essential to providing something that will have a demand.

Competition: Knowing who else is competing and how they are strategically poised is also key to success. Consider the size, market share, branding strategy, quality, and strategy of all competitors to ensure a given organization can feasibly enter the market.

Technology: Technological trajectories are also highly relevant to success. Does the manufacturing process of the product have new technologies which are more efficient? Has a disruptive technology filled the need that was currently being filled?

Supplier markets: Suppliers have great power as they control the necessary inputs to an organization's operational process. For example, smartphones require rare earth materials; if these materials are increasingly scarce, the price points will rise.

Labor markets: Acquiring key talent and satisfying employees (relative to the competition) is critical to success. This requires an understanding of unions and labor laws in regions of operation.

The economy: Economic recessions and booms can change spending habits drastically, though not always as one might expect. While most industries suffer during recession, some industries thrive. It is important to know which economic factors are opportunities and which are threats.

The regulatory environment: Environmental regulations, import/export tariffs, corporate taxes, and other regulatory concerns can poise high costs on an organization. Integrating this into a strategy ensures feasibility.

**3. The Impact of Internal Factors on Decision-Making Process**

A number of internal factors (organizational issues) can impact on the decision making process. These issues include:

1) Policies and procedures

2) Organizational hierarchy

3) Organizational politics

**Policies and Procedures.** Many organizations have formalized policies and procedures which have been developed to resolve common problems and to guide managers when making decisions. For example, many organizations have documented disciplinary procedures which guide managers through a process of resolving issues with staff members.

**Organizational Hierarchy.** Organizational hierarchy refers to the management structure of the organization. Most organizations have different levels of management which carry with them different degrees of authority. The degree of authority directly impacts on the nature of the decisions an individual can make. For example, a Customer Contact Centre Team Leader cannot make decisions about the overall goals of the organization. However, the Team Leader can make decisions about how their team contributes to the achievement of the organization’s goals.

**Organizational Politics.** Organizational politics refers to behaviour displayed by individuals and groups which is designed to influence others. Individuals and teams will often use politics to:

- Advance their careers

- Advance their interests and ideas

- Increase their rewards

Organizations are made up of individuals with different beliefs, values and interests. These differences are often the driving forces behind organizational politics. For example, two teams believe they require an extra team member. Unfortunately the organization can only afford one new employee. The two teams may well use politics in an attempt to influence their manager to allocate the new employee to their team.

**Topic 5. DECISION MODELING under uncertainty**

**Content**

**1. Decision making under risk and uncertainty**

**2. Decision tree approach**

**3. Evaluating decision under risk and uncertainty**

**1. Decision making under risk and uncertainty**

*Decision making* is a process of identifying problems and opportunities and choosing the best option among alternative courses of action for resolving them successfully. Usually, there are three different conditions under which decisions are made:

*1. Certainty*: Complete and accurate knowledge of outcome of each alternative. There is only one outcome for each alternative.

*2. Risk*: Multiple possible outcomes of each alternative can be identified and a probability of occurrence can be attached to each.

*3. Uncertainty*: Multiple outcomes for each alternative can be identified but there is no knowledge of the probability to be attached to each.

Let’s take a look at these conditions in details:

*- Conditions under certainty* are which a decision maker has full and needed information to make a decision. The manager knows exactly what the outcome will be, as he/she has enough clarity about the situation and knows the resources, time available for decision-making, the nature of the problem itself, possible alternatives to resolve the problem, and undoubtedly clarify or certain with the result of alternatives. In most situations, the solutions are already available from the past experience and are appropriate for the problem at hand. The decision for restock food supply, *for example*, when the goods in stock fall below a determined level, is a decision making under circumstance of certainty.

*Other example*: if the optimization criterion is least cost and you are considering two different brands of a product, which appear to be equal in value to you, one costing 20% less than the other, then, all other things being equal, you will choose the less expensive brand.

- *Conditions under risk* provide probabilities regarding expected results for decision making alternatives, it is due to the nature of the future conditions that are not always know in advance and the managers face this condition more often in reality compared to conditions under certainty. Although some good information may be available, it is not enough to answer all questions about the outcomes. The manager could define the nature of the problem, possible alternatives, and the probability or each alternative leading to the desired results, but could not guarantee how each alternative may work. Decision has clear-cut goals, but future outcomes associated with each alternative are subject to chance. Testing a nuclear leakage in Japan in 2011 is a risky decision by Japanese Government, as the government didn’t know how wide the range of effecting area and the nuclear substance itself is a life threatening factor.

*Other example*: if you are faced with a choice between two actions one offering a 1% probability of a gain of $10000 and the other a 50% probability of a gain of $400, you as a rational decision maker will choose the second alternative because it has the higher expected value of $200 (400\*0,5) as against $100 (10000\*0,01) from the first alternative.

- *Conditions under uncertainty* provide no or incomplete information, many unknowns and possibilities to predict expected results for decision making alternatives. Uncertainty is a situation where the current state of knowledge is such that the order or nature of things is unknown, the consequences, extent, or magnitude of circumstances, conditions, or events is unpredictable, and credible probabilities to possible outcomes cannot be assigned. The manager cannot even assign subjective probabilities to the likely outcomes of alternatives. The manager can not predict with confidence what the outcomes of his actions will be. Managers may have to come up with creative approaches and alternatives to solve the problem. *Decision making under uncertainty* means that the alternatives are evaluated for different scenarios. *For example*, one could assess the benefit of a public transportation system for the four scenarios: 1) high demand and strong economy; 2) low demand and strong economy; 3) high demand and weak economy; 4) low demand and weak economy.

Uncertainty also can be classified as:

*Complete uncertainty* means that a manager don’t have enough data to quantify the chance of occurrence of the different states and resulting scenarios.

*Informed uncertainty* refers to situations where the managers do have enough data to quantify the chance of occurrence of the different states and resulting scenarios.

**2. Decision tree approach**

*Decision tree* is a very specific type of probability tree that enables a manager to make a decision about some kind of process. There are three broad areas usually displayed in a tree:

*- Decision*: displayed as a square node (box) with two or more arcs (called “decision branches”) pointing to the options. A box is used to show a choice that the manager has to make.

*- Event sequence*: displayed as a circle node with two or more arcs pointing out the events. Probabilities may be displayed with the circle nodes, which are sometimes called “chance nodes”. A circle is used to show that a probability outcome will occur.

*- Consequences*: the costs or utilities associated with different pathways of the decision tree. The end point is called a “Terminal” and is represented by a triangle or bar on a computer. Lines connect outcomes to their choice or probability outcome.

The main *advantages of decision tree* are the following:

*-* Easy to understand: Decision tree output is very easy to understand even for people from non-analytical background. It does not require any statistical knowledge to read and interpret them.

- Useful in data exploration: Decision tree is one of the fastest ways to identify most significant variables and relation between two or more variables. With the help of decision trees, we can create new variables / features that have better power to predict target variable.

- Less data cleaning required: It requires less data cleaning compared to some other modeling techniques.

- Data type is not a constraint: It can handle both numerical and categorical variables.

- Decision tree can be used with other decision techniques.

- Risks are not ignored because decision trees consider negative outcomes as well.

- The probability of each outcome occurring is an advantage and makes calculations easier.

- Decision trees take into consideration the costs of the decision as well.

The main *disadvantages of decision tree* are the following:

- the external business environment is not taken into consideration when drawing decision trees;

- the diagram only helps in calculation but not reduction of risks in decision making;

- the estimated probabilities might not always be meaningful since forecasting errors may occur;

- decision trees are numerical/quantitative in nature and ignore qualitative data.

*Decision Trees Example*: suppose an organization is using a legacy software. Some influential stakeholders believe that by upgrading this software your organization can save millions, while others feel that staying with the legacy software is the safest option, even though it is not meeting the current company needs. The stakeholders supporting the upgrade of the software are further split into two factions: those that support buying the new software and those that support building the new software. By exploring all possibilities and consequences, a manager can quantify the decisions and convince stakeholders. This is known as Decision Tree Analysis.

In this scenario, you can either:

**- Build the new softwar**e: To build the new software, the associated cost is $500 000.

**- Buy the new software:** To buy the new software, the associated cost is $750 000.

**- Stay with the legacy software:** If the company decides to stay with the legacy software, the associated cost is mainly maintenance and will amount to $100 000.

Looking at the options listed above, you can start building the decision trees as shown in the diagram (*figure 2*). By looking at this information, the lobby for staying with the legacy software would have the strongest case. But, let’s see how it pans out.

The Buy the New Software and Build the New Software options will lead to either a successful deployment or an unsuccessful one. If the deployment is successful then the impact is $2 million. However, if the deployment is unsuccessful, then the impact is zero. The Stay with the Legacy Software option will lead to only one impact, which is $0,8 million, because the legacy software is not currently meeting the needs of the company. Nor, will it meet the needs should there be growth. In this example, we have assumed that the company will have growth.

In this example, Decision Trees analysis will be used to make the project risk management decision. The next step is to compute the Expected Monetary Value for each path in the Decision Trees. Let's see how this helps in this Decision Trees example.

The diagram depicts the decision tree. Now, the manager can calculate the Expected Monetary Value for each decision.

The Expected Monetary Value associated with each risk is calculated by multiplying the probability of the success with the impact. By doing this, we get the following:

**- Build the new software:** $ 2 000 000 \* 0,4 = $ 800 000

**- Buy the new software:** $ 2 000 000 \* 0,35 = $ 700 000

**- Staying with the legacy software:** $ 800 000 \* 0,45 = $ 360 000

Now, subtract the setup costs from each Expected Monetary Value:

**- Build the new software:** $ 800 000 – $ 500 000 = $ 300 000

**- Buy the new software:** $ 700 000 – $ 600 000 = $ 100 000

**- Staying with the legacy software:** $ 360 000 – $ 200 000 = $ 160 000

Decision

Build Buy

Stay

Successful

Deployment

**Impact: $2 million**

Unsuccessful

Deployment

**Impact: $0**

Successful

Deployment

**Impact: $2 million**

Unsuccessful

Deployment

**Impact: $0**

Growth in business

**Impact: $0,8 million**

40%

35%

45%

Stay with legacy software

**Cost:**

**$200 000**

Buy the new software

**Cost:**

**$600 000**

Build the new software

**Cost:**

**$500 000**

*Figure 1* – Decision tree

*Conclusion*: looking at the Expected Monetary Values computed in this Decision Trees example, you can see that building the new software is actually the most cost efficient option, even though it requires significant initial setup cost. The Expected Monetary Values from building the new software exceeds the initial setup cost by $300 000.

**3. Evaluating decision under risk and uncertainty**

When managers implement decision and make choices under risk or uncertainty, they must somehow incorporate this risk into their decision-making process.

*Evaluating decision under risk and uncertainty* covers the set of methods and techniques designed to detect and measure risk during decision making process.

*Conditions of risk* occur when a manager must make a decision for which the outcome is not known with certainty. Under conditions of risk, the manager can make a list of all possible outcomes and assign probabilities to the various outcomes.

*Uncertainty* exists when a decision maker cannot list all possible outcomes and/or cannot assign probabilities to the various outcomes. To measure the risk associated with a decision, the manager can examine several characteristics of the probability distribution of outcomes for the decision.

*Outcomes* are the changes, benefits or other effects (*for example*, increased revenue or profit, decreased costs and expenses, increased productivity) that happen as a result of managerial decisions.

The various rules for making and implementing decisions under risk require information about several different characteristics of the probability distribution of outcomes:

*1) Expected value of outcome* is defined as a value found by multiplying the value of the outcome by the probability for each value. The following formula is used to compute the expected value of outcome.

*Expected value of outcome = ∑ Outcome value \* Probability* (1)

*2) Variance* is used to measure the risk level during decision implementation and calculated by the formula:

*Variance =∑* (*Outcome value - Expected value of outcome*)***2*** *\* Probability* (2)

A small variance indicates that the risk level during decision implementation is low and acceptable, while a high variance indicates that the risk level during decision implementation is high.

*3) Standard deviation* is the square root of the variance:

 (3)

A small standard deviation indicates that the risk level during change implementation is low and acceptable, while a high standard deviation indicates that the risk level during change implementation is high.

*4) Coefficient of variation* is defined by dividing the standard deviation by the expected value of outcome:

*Coefficient of variation = (Standard Deviation / Expected value of outcome)\*100%* (4)

The lower the coefficient of variation, the risk is low and acceptable. On the other hand, the higher the coefficient of variation, the risk is high and unacceptable.

The risk level ranges from 0 to 100%:

0-10% – low risk level;

10-25% – moderate risk level;

25% and ˃ – high risk level.

*For example*: An automobile company explores the possibility to produce the crossovers, mid-size cars, full-size cars and luxury cars. Make the decision and determine the riskiness of each cars production.

*Table 1* – Input data

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Cars | *Revenue, thousand dollars per unit* | | | |
| Crossovers | 8,2 | 8,5 | 9,4 | 9,5 |
| Mid-size cars | 15 | 15,5 | 16 | 14 |
| Full-size cars | 25 | 28 | 29 | 30 |
| Luxury cars | 45 | 50 | 35 | 40 |
| *Probability,* *р* | *0,3* | *0,2* | *0,25* | *0,25* |

*Solution*: The expected values of revenue for each kind of cars are calculated below:

*Expected revenue \_ Crossovers*  *= 8,2\*0,3+8,5\*0,2+9,4\*0,25+9,5\*0,25=$ 8,89 thousand*

*Expected revenue \_ Mid-size cars* *=15\*0,3+15,5\*0,2+16\*0,25+14\*0,25=$ 15,1 thousand*

*Expected revenue \_ Full-size cars* *=25\*0,3+28\*0,2+29\*0,25+30\*0,25=$ 27,9 thousand*

*Expected revenue \_ Luxury cars =45\*0,3+50\*0,2+35\*0,25+40\*0,25=$ 42,3 thousand*

*Conclusion* is that production of luxury cars brings to the automobile company the highest expected revenue.

The riskiness of each kind of cars is determined by using following indicators:

- The variance of each kind of cars:

*Variance \_ Crossovers =* (*8,2–8,89*)*2\*0,3* +(*8,5–8,89*)*2\*0,2+*(9*,4–8,89*)*2\*0,25+*(*9,5–8,89*)*2\*0,25=0,33*

*Variance \_ Mid-size cars =* (*15–15,1)2\*0,3+(15,5–15,1)2\*0,2+(16–15,1)2\*0,25+(14–15,1*)*2\*0,25=0,54*

*Variance \_ Full-size cars =* (*25–27,9)2\*0,3+(28–27,9)2\*0,2+(29–27,9)2\*0,25+(30–27,9*)*2\*0,25=3,93*

*Variance \_ Luxury cars =* (*45–42,3)2\*0,3+(50–42,3)2\*0,2+(35–42,3)2\*0,25+(40–42,3*)*2\*0,25=28,69*

*Conclusion* is that production of crossovers is characterized by the lowest risk level, despite on the fact that production of luxury cars brings the highest expected revenue.

- The standard deviation of each kind of cars:









- The coefficient of variation of each kind of cars:

*Coefficient of variation\_ Crossovers = (0,576 / 8,89)\*100%=* 6,5%

*Coefficient of variation\_ Mid-size cars = (0,735 / 15,1)\*100%=* 4,9%

*Coefficient of variation\_ Full-size cars = (1,982 / 27,9)\*100%=* 7,1%

*Coefficient of variation\_ Luxury cars = (5,356 / 42,3)\*100%=* 12,7%

*Conclusion* is that production of mid-size car is characterized by the lowest risk level (4,9%), although production of crossovers and full-size cars is characterized by low risk level (6,5%) as well. The decision of luxury car production is characterized by moderate risk level. The automobile company has to produce the second kind of cars (i.e. mid-size cars), because its riskiness is lowest.

**TOPIC 6. CONTROL OF DECISIONS IMPLEMENTATION**

**Content**

**1. Effective Control Systems**

**2. Control Techniques**

**3. The Control Process**

**4. Types of Control**

**1. Effective Control Systems**

Control is intended to ensure and make possible the performance of planned activities and to achieve the predetermined goals and results. Effective control systems share several common characteristics. These characteristics are as follows:

* A focus on critical points. For example, controls are applied where failure cannot be tolerated or where costs cannot exceed a certain amount. The critical points include all the areas of an organization's operations that directly affect the success of its key operations.
* Integration into established processes. Controls must function harmoniously within these processes and should not bottleneck operations.
* Acceptance by employees. Employee involvement in the design of controls can increase acceptance.
* Availability of information when needed. Deadlines, time needed to complete the project, costs associated with the project, and priority needs are apparent in these criteria. Costs are frequently attributed to time shortcomings or failures.
* Economic feasibility. Effective control systems answer questions such as, “How much does it cost?” “What will it save?” or “What are the returns on the investment?” In short, comparison of the costs to the benefits ensures that the benefits of controls outweigh the costs.
* Accuracy. Effective control systems provide factual information that's useful, reliable, valid, and consistent.
* Comprehensibility. Controls must be simple and easy to understand.

**2. Control Techniques**

Control techniques provide managers with the type and amount of information they need to measure and monitor performance. The information from various controls must be tailored to a specific management level, department, unit, or operation.

To ensure complete and consistent information, organizations often use standardized documents such as financial, status, and project reports. Each area within an organization, however, uses its own specific control techniques, described in the following sections.

After the organization has strategies in place to reach its goals, funds are set aside for the necessary resources and labor. As money is spent, statements are updated to reflect how much was spent, how it was spent, and what it obtained. Managers use these financial statements, such as an income statement or balance sheet, to monitor the progress of programs and plans. **Financial statements** provide management with information to monitor financial resources and activities. The **income statement** shows the results of the organization's operations over a period of time, such as revenues, expenses, and profit or loss. The **balance sheet** shows what the organization is worth (assets) at a single point in time, and the extent to which those assets were financed through debt (liabilities) or owner's investment (equity).

**Financial audits**, or formal investigations, are regularly conducted to ensure that financial management practices follow generally accepted procedures, policies, laws, and ethical guidelines. Audits may be conducted internally or externally. **Financial ratio analysis** examines the relationship between specific figures on the financial statements and helps explain the significance of those figures:

* Liquidity ratios measure an organization's ability to generate cash.
* Profitability ratios measure an organization's ability to generate profits.
* Debt ratios measure an organization's ability to pay its debts.
* Activity ratios measure an organization's efficiency in operations and use of assets.

In addition, financial responsibility centers require managers to account for a unit's progress toward financial goals within the scope of their influences. A manager's goals and responsibilities may focus on unit profits, costs, revenues, or investments.

**Budget controls**

A budget depicts how much an organization expects to spend (expenses) and earn (revenues) over a time period. Amounts are categorized according to the type of business activity or account, such as telephone costs or sales of catalogs. Budgets not only help managers plan their finances, but also help them keep track of their overall spending.

A budget, in reality, is both a planning tool and a control mechanism. Budget development processes vary among organizations according to who does the budgeting and how the financial resources are allocated. Some budget development methods are as follows:

* Top‐down budgeting. Managers prepare the budget and send it to subordinates.
* Bottom‐up budgeting. Figures come from the lower levels and are adjusted and coordinated as they move up the hierarchy.
* Zero‐based budgeting. Managers develop each new budget by justifying the projected allocation against its contribution to departmental or organizational goals.
* Flexible budgeting. Any budget exercise can incorporate flexible budgets, which set “meet or beat” standards that can be compared to expenditures.

**Marketing controls**

Marketing controls help monitor progress toward goals for customer satisfaction with products and services, prices, and delivery. The following are examples of controls used to evaluate an organization's marketing functions:

* Market research gathers data to assess customer needs – information critical to an organization's success. Ongoing market research reflects how well an organization is meeting customers' expectations and helps anticipate customer needs. It also helps identify competitors.
* Test marketing is small‐scale product marketing to assess customer acceptance. Using surveys and focus groups, test marketing goes beyond identifying general requirements and looks at what (or who) actually influences buying decisions.
* Marketing statistics measure performance by compiling data and analyzing results. In most cases, competency with a computer spreadsheet program is all a manager needs. Managers look at marketing ratios, which measure profitability, activity, and market shares, as well as sales quotas, which measure progress toward sales goals and assist with inventory controls.

Unfortunately, scheduling a regular evaluation of an organization's marketing program is easier to recommend than to execute. Usually, only a crisis, such as increased competition or a sales drop, forces a company to take a closer look at its marketing program. However, more regular evaluations help minimize the number of marketing problems.

**Human resource controls**

Human resource controls help managers regulate the quality of newly hired personnel, as well as monitor current employees' developments and daily performances.

On a daily basis, managers can go a long way in helping to control workers' behaviors in organizations. They can help direct workers' performances toward goals by making sure that goals are clearly set and understood. Managers can also institute policies and procedures to help guide workers' actions. Finally, they can consider past experiences when developing future strategies, objectives, policies, and procedures.

Common control types include performance appraisals, disciplinary programs, observations, and training and development assessments. Because the quality of a firm's personnel, to a large degree, determines the firm's overall effectiveness, controlling this area is very crucial.

**Computers and information controls**

Almost all organizations have confidential and sensitive information that they don't want to become general knowledge. Controlling access to computer databases is the key to this area.

Increasingly, computers are being used to collect and store information for control purposes. Many organizations privately monitor each employee's computer usage to measure employee performance, among other things. Some people question the appropriateness of computer monitoring. Managers must carefully weigh the benefits against the costs – both human and financial – before investing in and implementing computerized control techniques.

Although computers and information systems provide enormous benefits, such as improved productivity and information management, organizations should remember the following limitations of the use of information technology:

* Performance limitations. Although management information systems have the potential to increase overall performance, replacing long‐time organizational employees with information systems technology may result in the loss of expert knowledge that these individuals hold. Additionally, computerized information systems are expensive and difficult to develop. After the system has been purchased, coordinating it – possibly with existing equipment – may be more difficult than expected. Consequently, a company may cut corners or install the system carelessly to the detriment of the system's performance and utility. And like other sophisticated electronic equipment, information systems do not work all the time, resulting in costly downtime.
* Behavioral limitations. Information technology allows managers to access more information than ever before. But too much information can overwhelm employees, cause stress, and even slow decision making. Thus, managing the quality and amount of information available to avoid information overload is important.
* Health risks. Potentially serious health‐related issues associated with the use of computers and other information technology have been raised in recent years. An example is carpal tunnel syndrome, a painful disorder in the hands and wrists caused by repetitive movements (such as those made on a keyboard).

Regardless of the control processes used, an effective system determines whether employees and various parts of an organization are on target in achieving organizational objectives.

**3. The Control Process**

The control process involves carefully collecting information about a system, process, person, or group of people in order to make necessary decisions about each. Managers set up control systems that consist of four key steps:

1. Establish standards to measure performance. Within an organization's overall strategic plan, managers define goals for organizational departments in specific, operational terms that include standards of performance to compare with organizational activities.
2. Measure actual performance. Most organizations prepare formal reports of performance measurements that managers review regularly. These measurements should be related to the standards set in the first step of the control process. For example, if sales growth is a target, the organization should have a means of gathering and reporting sales data.
3. Compare performance with the standards. This step compares actual activities to performance standards. When managers read computer reports or walk through their plants, they identify whether actual performance meets, exceeds, or falls short of standards. Typically, performance reports simplify such comparison by placing the performance standards for the reporting period alongside the actual performance for the same period and by computing the variance – that is, the difference between each actual amount and the associated standard.
4. Take corrective actions. When performance deviates from standards, managers must determine what changes, if any, are necessary and how to apply them. In the productivity and quality‐centered environment, workers and managers are often empowered to evaluate their own work. After the evaluator determines the cause or causes of deviation, he or she can take the fourth step—corrective action. The most effective course may be prescribed by policies or may be best left up to employees' judgment and initiative.

These steps must be repeated periodically until the organizational goal is achieved.

**4. Types of Control**

Control can focus on events before, during, or after a process. For example, a local automobile dealer can focus on activities before, during, or after sales of new cars. Careful inspection of new cars and cautious selection of sales employees are ways to ensure high quality or profitable sales even before those sales take place. Monitoring how salespeople act with customers is a control during the sales task. Counting the number of new cars sold during the month and telephoning buyers about their satisfaction with sales transactions are controls after sales have occurred. These types of controls are formally called feedforward, concurrent, and feedback, respectively.

**Feedforward controls**, sometimes called preliminary or preventive controls, attempt to identify and prevent deviations in the standards before they occur. Feedforward controls focus on human, material, and financial resources within the organization. These controls are evident in the selection and hiring of new employees. For example, organizations attempt to improve the likelihood that employees will perform up to standards by identifying the necessary job skills and by using tests and other screening devices to hire people with those skills.

**Concurrent controls** monitor ongoing employee activity to ensure consistency with quality standards. These controls rely on performance standards, rules, and regulations for guiding employee tasks and behaviors. Their purpose is to ensure that work activities produce the desired results. As an example, many manufacturing operations include devices that measure whether the items being produced meet quality standards. Employees monitor the measurements; if they see that standards are not being met in some area, they make a correction themselves or let a manager know that a problem is occurring.

**Feedback controls** involve reviewing information to determine whether performance meets established standards. For example, suppose that an organization establishes a goal of increasing its profit by 12 percent next year. To ensure that this goal is reached, the organization must monitor its profit on a monthly basis. After three months, if profit has increased by 3 percent, management might assume that plans are going according to schedule.