Management Control Systems

Block

4

MANAGEMENT CONTROL: FUNCTIONAL PERSPECTIVES – II

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BLOCK 4: MANAGEMENT CONTROL: FUNCTIONAL PERSPECTIVES – II

The fourth block of the course on Management Control Systems deals with the part two of the functional perspectives of management control. The block contains five units. The first unit discusses the management control of service operations. The second focuses on the management control of projects. The third and the fourth units discuss the management control of research and development, and human resource management, respectively. The fifth unit discusses the control and governance of information systems.

Unit 14, Controls of Service Operations, explains the characteristics of services. It discusses the generic techniques for control of services. The unit also discusses the classification of service organizations. The unit ends by discussing the control of different categories of service organizations.

Unit 15, Management Control of Projects, explains the significance of project control in the successful execution of projects, and the use of project overview statement as the basis for control. The unit discusses how to use project plan as the primary control mechanism, and the importance of organizing for project control. It also discusses how to control the execution of a project, and the concepts associated with overall change control. The unit ends with a discussion on the process of project auditing, and how to conserve and utilize resources in projects.

Unit 16, Management Control of Research and Development, discusses the different dilemmas faced by organizations in controlling research and development. It discusses the impact of culture on R&D and innovation. It also discusses the different methods used for measuring and controlling R&D. The unit ends with a discussion on the different methods used in management control of new product development.

Unit 17, Control of Human Resource Management, talks about the concept of human resource planning. The unit discusses how to control the functions of the HR department. It then discusses the various techniques for assessing the effectiveness of HRM, and the concept of workforce scorecard. It ends with a discussion on the use of human resource information systems for control.

Unit 18, Control and Governance of Information Systems, discusses the need for and objectives of control of information systems, and the concept of information technology governance and frameworks developed by two agencies. It discusses the different categories of management controls for information systems and the activities within them. It also discusses the different types of application controls used for information systems. The unit ends with a discussion on the importance of information systems audit, and the concepts of business continuity and disaster recovery.

Unit 19, Implementation of Management Control Systems, discusses the operationalization of a management control system. It discusses the various organizational roles and responsibilities involved in implementation of control systems. It also discusses the challenges involved in implementing these controls. The unit ends with a discussion on the impact of the organizational life cycle on the evolution of an organization's control requirements.

Unit 14

Control of Service Organizations

Structure

"Customer Service is the new marketing, it's what differentiates one business from another."

- Jay Baer, an entrepreneur, business strategist, and an inductee into word-of-mouth marketing hall of fame

14.1   Introduction

In this unit, we learn about the characteristics of services and discuss the generic management techniques used for control of services in different categories of service organizations.

In the last unit of the previous block, we discussed the management control of production and operations. In this unit, we shall discuss the management control of service operations.

In many countries, the services sector has overtaken the agriculture and manufacturing sectors in terms of contribution to the gross domestic product. The growing importance of services for the growth of the economy has, in turn, increased the need for proper management and control of service organizations.

We shall first explain the characteristics of services. We shall then move on to discuss the generic techniques for control of services. We shall also discuss the classification of service organizations. Finally, we shall discuss the control of different categories of service organizations.

14.2 Objectives

After studying this unit, you should be able to:

- Explain the characteristics of services.

- Discuss the different generic techniques used in controlling services.

- Recognize the different ways in which service organizations are classified.

- Identify the control mechanisms used in controlling different categories of service organizations.

14.3 Characteristics of Services

Kotler and Bloom in 1984, defined service as, "any activity or benefit that one party can offer to another that is essentially intangible and does not result in the ownership of anything. Its production may or may not be tied to a physical product."

One reason, for the poor quality of service levels across different service industries, is that managers often tend to solve service marketing problems with tools and techniques that are essentially meant for tangible products. It happens because of inadequate understanding about the nature of services. As our knowledge of the characteristics of services grows, so does our ability to deal with them from both an economic and marketing perspective. Services have a number of distinctive characteristics that make them unique and distinct from physical products.

Service organizations differ from manufacturing organizations with regard to certain attributes, such as:

14.3.1 Intangibility

Unlike products, services cannot be counted, measured, or felt. It is difficult to explain about a specific feature in the service that will be rendered to the customer. As services are intangible, the perceptions of customers regarding the service may differ at any given point in time. Each customer will have a different experience from the same service. Due to this intangibility factor, evaluating the quality of service poses a major problem for service organizations.

14.3.2 Heterogeneity

Heterogeneity of services means different people rate the characteristics of services differently. It is easy to assess the quality of a product as it is tangible and also because there are specific characteristics associated with each product. But in the case of services, there are different characteristics and different people may rate these characteristics differently. As the services provided involve human interactions (between the service personnel and customer), it is not possible to ensure that all customers receive or perceive the same level of quality every time. Heterogeneity has an effect on three areas - service encounter, productivity, and

service quality. Management control of service organizations has to grapple with all these implications of heterogeneity of services.

14.3.3 Inseparability

Irrespective of whether a service is provided by a person or by a machine, the production and consumption of the service cannot be separated from the source that provides it. Services involve the customer in the production process and they generally first get sold, then produced, and then consumed. Thus, inseparability is an integral attribute of services and it has a major bearing on service delivery. The production of the service requires the customer to communicate with the producer to get the desired output.

14.3.4 Perishability

Services cannot be stored. They are consumed as soon as they are produced. This describes the perishability characteristic of services. The perishable nature of services makes it important for organizations to keep a constant track of the demand for a particular service. Service organizations have to focus on managing demand and production of their services so that there is a balance between the peak periods and lean periods.

Example: People Drive Success: RISE with SAP Inspires and Empowers Employees

Service was defined as, "any activity or benefit that one party can offer to another that is essentially intangible and does not result in the ownership of anything". RISE with SAP was a novel approach adapted by SAP in the form of a service to the customer and helping them to transform an entire organization into an intelligent enterprise. Under this scheme via SAP Learning Hub Licenses, SAP Professionals have gained access to training content, networked with various other learning forums, learn to know about new training systems and obtain regular updates   Whereas with content such as demo videos, tutorials, guided demonstrations and user manuals, the end customers learnt about software usage and got their questions answered within no time.

For example, RISE with SAP has empowered global companies such as Pfeiffer and the NBA. SAP experts used to spend considerable amount of time to train the project members and time spent was more than the technical implementation of SAP S/4HANA and the move the SAP Platform to the cloud. Another advantage was that Customer's employees acquired the latest SAP knowledge first-hand and practiced directly on training systems that facilitated knowledge transfer rapidly.

Source: Thomas Jenewein, February 28, 2022 https://news.sap.com/2022/02/people-drive-success-rise-with-sap-training/ Accessed on 14-06-2022

Activity 14.1

Harsh and Utkarsh went to a physician to get a regular health check-up done. The doctor spent a long time with them checking every minute detail and also enquiring about their family medical history. On coming out of the doctor's clinic, Harsh seemed content with the visit proceedings but Utkarsh was upset because of the time he had spent on the visit. Which of the attributes of service does the given situation describe? Describe the other attributes of services which distinguish them from products.

Answer:

14.4 Generic Techniques for Control of Services

Service organizations differ from manufacturing organizations in many respects. Due to these differences, the planning and control processes used in service organizations are also quite distinct from those used in manufacturing organizations. Service organizations use some generic techniques to manage and control their operations.

14.4.1 Service Blueprinting

A service blueprint is a map or a diagrammatic representation of the service delivery process, the associated tangible evidence, and the employees involved in the service delivery process. Service blueprinting is the process of designing the service blueprint.

Service blueprinting involves the following steps:

- Identification of all activities in the service to be blueprinted

- Identification of activities which may create problems in the delivery process

- Estimation of time for service delivery taking into consideration the profitability, quality of service, and reputation of the organization

The benefits of blueprinting are:

- It reduces the likelihood of a service being provided in an adhoc fashion.

- It encourages a controlled service delivery process so that variations in the quality of a service are reduced.

- It provides a precise picture of the process to be followed leaving minimal chances of misinterpretation.

- It helps the marketing department in identifying the need for redesigning existing services and also developing new services.

- The blueprint helps the human resource department in identifying needs for recruitment, training, and development, and for redefining the performance standards.

- In mapping the time that may be spent on each activity, it helps employees in better time management.

- In mapping service features, it is able to highlight those features which are considered important by the customer and to eliminate those perceived to be unnecessary.

Example: UrbanClap Business Model - How it Works

UrbanClap (Now Urban Company) has been recognized as one of the fastest-growing start-ups in India UrbanClap has helped to connect service providers with service seekers. The Management has turned many individuals or small groups into Micro Entrepreneurs who worked closely with Individuals. UrbanClap did by creating market access, extending credit, covered individuals for accident insurance, training on tools and devices, managing inventory, managing payment, staff retention strategies, etc. Under the brand name of UrbanClap, they drive their partner's entire business through standardizing the end-user experience, pricing and distributing the service. A service blueprint was a map or a diagrammatic representation of the service delivery process, the associated tangible evidence and the employees involved in the service delivery process. UrbanClap has provided both an online website and mobile app in order to provide an easy access to its home services. The company built an Online platform that was easy to understand and more collaborative. Every user was able to use it easily and avail services sitting at Home.

Source: Anurag Jain, June 29, 2022 https://oyelabs.com/urbanclap-business-model/ Accessed on 04.08.2022

14.4.2 Capacity Management

Capacity management deals with managing the demand and supply of services to the customers. It is an important aspect in managing service organizations as it helps in maintaining the quality of service given to the customer, tackling the level of demand uncertainty, and adapting the capacity to the fast changing demands of the market. Capacity management and service quality determine how effective the service will be. The interaction between capacity management, service quality, and productivity is the basis on which service operations are planned and controlled.

Capacity management strategies

Organizations use different strategies for capacity management. They are:

- *Customer development:* Service organizations try to gain the loyalty of the customers through loyalty programs or by allowing customers to try out the services before purchasing them.

- *Bundling:* Two or more services are marketed together and the customer is given a discount.

- *Differentiation:* In this technique, some of the capacity is kept idle at normal times in order to be able to handle exceptional situations.

Queueing theory is a mathematical model widely used in capacity management. This enables mathematical analysis of several related processes, including arriving at the (back of the) queue, waiting in the queue (essentially a storage process), and being served by the server(s) at the front of the queue.

Activity 14.2

Sudha needs to go to a beauty parlor for a hair-cut. She makes her enquiries regarding the rates that are charged at the Curls & Cures (C&C) parlor. She is told that if she spends ₹ 500/- for the varied services at the parlor, she will be eligible for a free pedicure. What strategy is C&C using to manage demand and supply of services to customers? Describe the other capacity management strategies that the parlor could have used.

Answer:

14.4.3 Yield Management

Sheryl E. Kimes (Kimes) defines yield management as "a method which can help a firm sell the right inventory unit to the right type of customer, at the right time, and for the right price." Yield management is also known as revenue management.

Certain situations in which yield management is used are:

- When the capacity that the organization possesses cannot be modified
- When the demand can be classified into groups
- When the service cannot be stored
- When the products are sold and delivered at different times
- When there is a high amount of uncertainty in demand
- When the costs involved in modifying the capacity are higher than production or sales costs, etc.

Control through yield management

Some models used in yield management, according to Kimes, are:

- Mathematical programming models

- Economics based models

- Threshold curve

- Expert systems

The commonly used models are economics based models and threshold curve. Taking the example of the airline industry, economics based model and threshold curve can be described as follows:

Economics based models: A typical scenario in the airline industry is selling the flight tickets at premium or at concession rates. Generally, the demand for concession rate tickets comes much before the demand for premium rate tickets. This trend makes it necessary for organizations to decide on a ceiling on the number of seats that can be sold at a concession rate. Setting a high ceiling may result in the loss of premium customers and a low ceiling may result in idle inventory. To resolve this issue, airline industry players make use of a marginal revenue model, which is based on economics.

Threshold curve: The threshold curve is constructed using past data available on seat bookings. A trend of bookings made in the past is collected and threshold curves are constructed keeping in mind the historical aggregate demand patterns. Once these curves have been constructed, the present booking trends are plotted against the forecast.

14.4.4 Service Quality Management

Unlike manufacturing organizations, where quality is defined by the product having a certain set of standard specifications, quality in service organizations primarily depends upon how a customer perceives what he/ she gets and whether it meets his / her expectations.

The three main components of service quality, also known as the three Ps of service quality, are:

- *Physical facilities and processes:* Include place of operation, the ambience, types of services offered, and the process.

- *People's actions:* Include punctuality, way of interaction, and problem resolving capability.

- *Professional opinion:* Includes integrity, knowledge, and experience of the professional in the field.

Determinants of service quality

Parasuraman, Valarie A. Zeithaml, and Leonard L. Berry have given a classification of certain factors that customers rely on to judge the service quality. Table 14.1 summarizes these service quality determinants.

Table 14.1: Service Quality Determinants

Determinant	Description
Reliability	Dependability, consistency, and accuracy
Responsiveness	Promptness of service delivery
Competence	Employees have the skills and knowledge, required for service delivery
Access	Easy to contact - Convenience in terms of both timing and location
Credibility	Trustworthiness, believability, honesty
Courtesy	Demeanor of the service provider - politeness, respect, friendliness
Communication	Demonstrated ability to explain the attributes of the service (features and cost) effectively to the customer and also to listen to the customer attentively
Security	Freedom from danger, risk or doubt; includes physical security, financial security, and data confidentiality
Understanding/ Knowing the customer	Understanding the needs of the customer, providing individualized attention, and also recognizing the regular customer
Tangibles	Physical facilities, tools, ambience, physical representations of the service, and appearance of the service providing personnel

Source: ICFAI Research Center

Six Sigma Requisite in Service Industry

The major factors, on which service quality depends, are the service delivery process and the people who deliver the service.

Some of the factors related to quality issues of service delivery process are given below.

- To control and improve service quality, it is necessary that the top management of service organizations designs the service quality standards keeping in mind the expectations of customers from that service.

- Once the service standards are set, it is the responsibility of the management to train the employees and equip them with the necessary knowledge, skills, and behavioral traits.

- The management of the organization should ensure that the employees understand what is expected of them, and are aware of the objectives, strategies, values, vision, and quality standards of the organization.

- The service organization should ensure that there is adequate publicity about the service and that the right message and information are communicated to customers.

- The organization should ensure that it delivers, what all it has promised. It is very important for the organization to keep track of whether the customers feel that the service, that they receive, is as per their expectations. This is achieved by asking the customers to give suggestions and / or feedback regarding the service.

Evaluating service quality

Two important ways in which service quality can be evaluated are:

- *By conducting a service quality audit:* J.M. Juran defines service quality audit as "an independent evaluation of service quality to determine its fitness for use and conformance to specification".

- *By collecting customer feedback:* A customer feedback system is used to gather information regarding customer satisfaction levels. These systems help the organization understand whether the customers are satisfied or dissatisfied in their transactions with the organization and also the satisfaction levels regarding each service that they have experienced.

Six Sigma for service quality

Six Sigma helps in increasing the effectiveness and efficiency of the services by minimizing the defects, errors, and flaws in their processes. The Six Sigma strategy helps organizations to attain the desired levels of service performance (on an average) and to reduce the variability in the process.

In the services setting, Six Sigma aims at understanding how defects arise and at developing improvements in the processes to minimize these defects. This ultimately results in increased customer satisfaction. Through Six Sigma, the organization can benefit both on the human resource and the operational fronts.

On the human resource front it leads to:

- Achievement of better cross-functional teamwork

- Improvement in job satisfaction and in the morale of employees due to greater understanding of problem-solving methods.

On the operational front it leads to:

- Improvement in the quality of decisions as the decisions are based on facts rather than assumptions.

- Faster service delivery due to minimization of steps which do not add value to the process.

- Minimization of costs incurred due to late delivery, complaints, etc.

- Enhanced consistency of results due to reduced process variability.

Issues in implementing Six Sigma

When organizations implement Six Sigma, one of the most important issues is the non-availability of accurate and complete data. Generally, the data has to be acquired from the customers and hence the organization does not have enough control on the quality of data. Higher levels of human interactions and influence of human characteristics like friendliness being valued by customers also make it difficult to measure customer satisfaction.

14.4.5 Service Recovery

A mismatch between the customers' perception of the service they receive and their expectations leads to service failure. Service recovery refers to actions taken by a service provider to rectify a situation of service failure. Some issues and challenges that service organizations face during service delivery are:

- Absence of a service person when a machine needs to be repaired

- Delay in the service delivery

- Faulty administration of service

The service recovery process is one of the most significant processes in a service industry as it is during this process that customers are more focused on the way the organization treats them. The person who handles the service recovery process plays an important role in improving customer satisfaction.

Services can be evaluated in two ways: one, depending on the results obtained and the other, based on the method of service delivery. If service is evaluated at the primary phase of purchase, the focus is on the results, while if it is evaluated at the time of service recovery, the customer generally focuses on the way in which the service is delivered.

Service failure and customer switching

Customer switching (defection) occurs when an existing customer defects and becomes the customer of a competitor. Customer switching results in market share erosion and reduced profits. The absence of effective and timely service recovery is one of the important reasons for customer switching. As the cost of acquiring new customers is much higher than the cost of retaining existing

customers, service organizations search for various alternatives to reduce the rate of customer switching. Keaveney identified eight different reasons relating to service failure on the part of service organizations that cause customers to switch to other service providers. Five of these reasons can be addressed by service recovery. They are:

- Core service failures
- Service encounter failures
- Price failures
- Inconvenience
- Employee response to service failures.

The other three reasons are: attraction by competitors, ethical problems, and involuntary switching; these reasons cannot be addressed by service recovery.

Check Your Progress - 1

1. As a generic technique to manage and control service operations, what is a service blueprint?

   a. The management of the demand and supply of services to the customers.

   b. A method, which can help an organization, sell the right service unit to the right type of customer, at the right time, and for the right price.

   c. A mathematical model, which is widely used in capacity management.

   d. A map or a diagrammatic representation of the service delivery process, the associated tangible evidence, and the employees involved in the service delivery process.

   e. A charter that governs the services of an organization

2. Identify the method which can help a service organization to sell the right inventory unit to the right type of customer, at the right time, and for the right price.

   a. Capacity management

   b. Differentiation

   c. Bundling

   d. Yield management

   e. Service blueprint

3. What are the three main components, which are referred to as the 3Ps of service quality?

   i. Physical facilities and processes

   ii. People's actions

   iii. Professional opinion

       iv. Promotional activities

       v. Revenue management

       a. i, ii, iii but not iv

       b. ii, iii, iv but not i

       c. i, ii, iv but not iii

       d. i, iii, iv but not ii

       e. i, iii, v but not iv

4. In service quality management, what is the aim of Six Sigma?

    a. Understanding how defects arise and at developing improvements in the processes to minimize these defects.

    b. Managing the demand and supply of services to the customers.

    c. Diagrammatically representing the different levels of interactions between the customer and the service provider.

    d. Helping organizations sell the right inventory unit to the right type of customer, at the right time, and for the right price.

    e. A method which can help an organization sell the right service unit to the right type of customer, at the right time, and for the right price.

5. Keaveney identified eight reasons relating to service failure on the part of service organizations that cause customers to switch to other service providers. Five of these reasons can be addressed by service recovery. Pick out the option, which is not one of these reasons.

    a. Core service failures

    b. Attraction by competitors

    c. Inconvenience

    d. Employee response to service failures

    e. Price failures

14.5 Classification of Service Organizations

Classification of services helps in formulating guidelines for executing appropriate service strategy towards profitability of an organization. The classification helps in

- Better understanding of the customer needs.

- Cross fertilization of concepts and strategies. Because the classification helps in applying the learning from one service industry to other service industry.

- Defining the strategic service guidelines.

Some earlier classifications of service organizations were based on dimensions that are generally used in a manufacturing organization. Some other classifications did not consider the systems involved in service organizations nor did they consider the fact that customers are an integral part of service operations.

14.5.1 Dimensions of Classifying Service Organizations

Studies on the classification of service organizations brought out six specific dimensions along which such classifications could be based. Table 14.2 lists the dimensions that can be used to differentiate between the various types of service organizations.

Table 14.2: Six Dimensions for Classification of Service Organizations

Dimension	Description
Equipment focus / people focus	In equipment focus, the tool or machine used for delivering the service is important; in people focus, the organization's representatives who deliver the service are more important than the tool or machine.
Product focus / process focus	Product focus deals with what the customer purchases; process focus deals with how the purchase is affected.
Level of customization	This has an impact on the process of service delivery, and deals with the extent to which the service caters to individual customer's need or whether the service is standardized. A service could be highly standardized or may have the provision for a high degree of customization to meet the specific needs of individual customers.
Back office focus/ front office focus	The major part of value addition in the service may happen either in the front office or in the back office.
Duration of customer contact	Closely related to the inseparability aspect of service delivery, this is the amount of time a customer spends in a service system. In case of low contact services, the time spent by the customer within the organization is limited and hence the process of service delivery is not as influenced by the customer as in high contact services.
Level of discretion	This empowers the service providing personnel to make changes to the service (depending on the customer's request) without having to consult with higher authorities.

Source: ICFAI Research Center

14.5.2 Categories of Service Organizations

In 2004, Roger W. Schmenner devised a framework to classify services based on the degree of variation and the relative throughput time. He proposed a two-by-two matrix with the degree of variation on the X-axis and relative throughput time on the Y-axis.

- *Degree of variation*: It describes the variations, which are possible in the services offered due to the differences in the interaction with the customer and the extent to which the service may be customized for the customer.

- *Throughput time*: It is the interval of time between availability for use and completion of the service encounter; relative throughput time is throughput time measured for a service transaction as compared to others in the industry.

Depending on whether the services rank high or low on the degree of variation and relative throughput time, they are classified as follows:

- *Service factories*: Low degree of variation and low relative throughput time

- *Mass services*: Low degree of variation but high relative throughput time

- *Service shops*: High degree of variation and low relative throughput time

- *Professional services*: High degree of variation and high relative throughput time

Table 14.3 shows Schmenner's service classification matrix.

Table 14.3: Schmenner's Service Classification Matrix

		Degree of Variation*	
		Low	High
Relative throughput time**	Low	Service Factory E.g., Fast Food Restaurants Low Cost Airlines	Service Shop E.g., Traditional Restaurants, Hospitals
	High	Mass Services E.g., Retail Banking, Schools	Professional Services E.g., Gourmet Restaurant, Consulting Firms

* Degree of variation - Customization for and interaction with the customers.

** Relative throughput time - Throughput time measured for a service transaction as compared to others in the industry.

Source: ICFAI Research Center

Activity 14.3

Mandarin is a premier Chinese food restaurant, which serves customized recipes and also has Chef's choice recipes available on the menu. Customers have to wait long for their orders to be served, during which they can enjoy the authentic ambience created by light effects and music. Expressway is a self-service fast food joint having a defined number of items on the menu. There are a number of delivery counters, resulting in less waiting time. Categorize the two food outlets based on Schmenner's framework and justify your answer.

Answer:

14.6 Control of Different Categories of Service Organizations

The dimension 'degree of variation' has its implications for managing service quality. On the other hand, the throughput time dimension is associated with the productivity aspect of the services. In service organizations, operational control generally deals with the productivity and service quality aspects of the services being offered. To simultaneously increase both productivity and service quality, managers may try to reduce both the relative throughput time and the degree of variation. In other words, they attempt to shift their organization towards the service factory category from any of the below stated three categories.

14.6.1 Professional Service Organizations

Professional services are characterized by high degree of variations and high relative throughput time, where employees are usually highly skilled or educated, and are empowered to take decisions independently. The organizations are heavily dependent on the employees for the business and treat human resources (human capital) as the most important class of assets.

Professional services involve higher interaction between the service provider and the customer, wherein the customer influences the way in which the service will be delivered, that is, the service provider interacts with the customer to decide on the specifications of the service that have to be provided. A long-term association is created in the service system and this makes it difficult to automate processes in the organization.

The high dependency of professional service organizations on the service providing personnel makes it important for them to focus on human resource management. It becomes necessary for the organization to be careful and choosy

about the people they hire; that is, there is a greater emphasis on personnel control than on behavioral control. Professional service organizations need to give their employees the authority to use their discretion in handling customers.

Example: Swiggy Launches Instant Pick Up and Drop Service 'Swiggy Go'

Swiggy, a food delivery platform, connected food lovers to over 1,30,000 hotels and, restaurants across more than 325 cities. Swiggy launched a new mobile app - Swiggy Go - which was an instant pick up and drop service to send small sized packets or packages anywhere across the city. Swiggy Go was used to pick up and drop off laundry, get forgotten keys, send lunch boxes from home to office or even deliver documents or parcels to clients. Similar to Swiggy Stores — which promised to deliver to users' doorsteps, household items like groceries, flowers and medicines among other things within an hour — Swiggy Go will be part of the main app. Swiggy's vision was to elevate the quality of life of urban consumers by offering unparalleled convenience. After enabling this with food delivery for five years and stores across the city with Swiggy Stores, Swiggy Go opened the Swiggy delivery superpower to all consumers in the city.

Source: https://newslivetv.com/swiggy-launches-pick-up-and-drop-service-swiggy-go/, 2022, Accessed on 15.06.2022

14.6.2 Mass Services and Service Shops

Mass services are characterized by a low degree of variation and high relative throughput time. The focus of the mass services should mainly be on achieving lower throughput time and in turn achieving higher productivity. Throughput time can be reduced by identifying and eliminating the sources of 'waste' such as lack of accurate data, inconvenient locations of the facilities delivering the services, waiting, unnecessary steps in the process, and defects in the product/service. Such an elimination of wastes can also result in higher service quality in terms of reliability, accessibility, responsiveness, etc.

According to Schmenner, tangibles, responsiveness, competence, access, and reliability are the service quality determinants which are important in the case of mass services. In managing mass services, a difficulty faced is that of customers perceiving lower responsiveness due to lower degree of variations. This issue can be handled by training the workforce in the required skills. Proper monitoring of customer feedback should be carried out to increase customer retention and customer loyalty.

Service shops are characterized by a high degree of variation and lower relative throughput time. The issue in controlling the service shops generally focuses on reducing the variations through standardizing the services and trying to spread the overhead costs over a greater number of service units without compromising on the throughput time.

14.6.3 Service Factories

Service factories are characterized by a low degree of variation and low relative throughput time. Managing services which have low interactions and low customization, that is, a low degree of variation, will call for development of standard operating procedures with very little improvisation from the employees in handling the customers. It is therefore necessary for the service factory to have employees who are well-versed (competent) in the standard operating procedures. In a service factory, the service quality determinants that are usually to be considered are tangibles, responsiveness, recovery, and competence.

Check Your Progress - 2

6. Match the given dimensions for classification of service organizations with their respective descriptions.

   Dimensions

   i. Product focus

   ii. Process focus

   iii. People focus

   iv. Level of discretion

   Description

   p. Deals with what the customer purchases

   q. Empowers the service providing personnel to make changes to the service on a customer's request, without having to consult higher authorities.

   r. Considers the organization's representatives who deliver the service as more important than the tool or machine.

   s. Deals with how the purchase is effected (brought about)

   a. i/q, ii/r, iii/p, iv/s

   b. i/r, ii/q, iii/s, iv/p

   c. i/p, ii/s, iii/r, iv/q

   d. i/r, ii/p, iii/q, iv/s

   e. i/s, ii/p, iii/q, iv/r

7. In order to classify service organizations, Schmenner devised a framework consisting of a two-by-two matrix. What are they?

   a. Degree of variation; level of education

   b. Relative throughput time; need for technology

   c. Degree of variation; relative throughput time

   d. Need for technology; level of education

   e. Level of education; need for technology

8. As per Schmenner's matrix for classifying services, what are service factories?

   a. High degree of variation and low relative throughput time

   b. Low degree of variation and low relative throughput time

   c. High degree of variation and high relative throughput time

   d. Low degree of variation and high relative throughput time

   e. Nominal degree of variation and nominal relative throughput time

9. In service organizations, operational control generally deals with the productivity and service quality aspects of the service being offered. What the managers are expected to try when they want to simultaneously increase both productivity and service quality?

   a. Reduce both the relative throughput time and the degree of variation

   b. Increase degree of variation while reducing relative throughput time

   c. Reduce degree of variation while increasing relative throughput time

   d. Increase both relative throughput time and the degree of variation

   e. Moderate both the relative throughput time and the degree of variation

10. Service factories are service organizations that are characterized by a low degree of variation and low relative throughput time. In managing such services, what should be the focus?

    a. Developing standard operating procedures with very little improvisation from the employees in handling the customers.

    b. Reducing waste so as to achieve lower throughput time and higher productivity.

    c. Hiring people who are highly skilled and have decision making capabilities.

    d. Trying to spread the overhead costs over a greater number of service units without compromising on the throughput time.

    e. Empowers the service providing personnel to make changes to the service on a customer's request, without having to consult higher authorities.

14.7 Summary

- Service organizations differ from manufacturing organizations with regard to: intangibility, heterogeneity, inseparability, and perishability.

- A service blueprint is a map or a diagrammatic representation of the service delivery process, the associated tangible evidence, and the employees involved in the service delivery process. Service blueprinting is the process of designing the service blueprint.

- Capacity management deals with managing the demand and supply of services to the customers. It is an important aspect in managing service organizations as other factors like service quality and productivity are closely associated with it.

- Yield management, also known as revenue management, is a method which can help an organization sell the right inventory unit to the right type of customer, at the right time, and for the right price.

- Quality in service organizations primarily depends upon how a customer perceives what he / she gets and whether it meets his / her expectations. The three main components of service quality are physical facilities and processes, people's actions, and professional opinion, which form the three Ps of service quality.

- Service recovery is a set of activities that an organization undertakes to rectify issues faced during delivery of the service.

- There are six dimensions that can be used to understand the differences between various types of service organizations - equipment focus / people focus; product focus/ process focus; level of customization; back office focus / front office focus; duration of customer contact; and level of discretion.

- Services are broadly classified into four categories - service factory, service shop, mass services, and professional services - based on the degree of variation and the relative throughput time.

- The dimension 'degree of variation' has its implications for managing service quality, while the 'throughput time' dimension is associated with the productivity aspect of the services. To simultaneously increase both productivity and service quality, managers may try to reduce both the relative throughput time and the degree of variation.

14.8 Glossary

Bundling (in service capacity management): In the bundling strategy, two or more services are marketed together and the customer is given a discount.

Core Service Failures: Core service failures include all mistakes and technical problems encountered while rendering the core service. They may range from simple billing errors to big mistakes in terms of reduced service quality or failure to live up to the promises made while selling the service.

Customer Development: Customer development is a capacity management method in which service organizations try to gain the loyalty of the customers through loyalty programs.

Customer Feedback: A customer feedback system is used to gather information regarding customer satisfaction levels. These systems help the organization understand whether the customers are satisfied or dissatisfied in their transactions

with the organization and also the satisfaction levels regarding each service that they have experienced.

Differentiation (in service capacity management): In the 'differentiation' strategy, some of the capacity is kept idle at normal times in order to be able to handle exceptional situations.

Dimensions for Classifying Service Organizations: There are six different dimensions that can be used to understand the differences between types of service organizations – equipment / people focus; product / process focus; level of customization; back office/ front office focus; duration of customer focus; and level of discretion.

Mass Services: Mass services are characterized by a low degree of variation and high relative throughput time. The focus of the mass services should mainly be on reducing the waste so as to achieve lower throughput time and in turn achieving higher productivity; thus moving the organization toward the service factory quadrant.

Professional Service Organizations: In professional service organizations, both the degree of variations and the relative throughput time are high. Professional services involve higher interaction between the service provider and the customer wherein the customer influences the way in which the service will be delivered.

Service Blueprint: A service blueprint is a map or a diagrammatic representation of different levels of interactions between the customer and the service provider. It is a detailed representation of the service delivery process, the associated physical evidence, and the employees involved in the service delivery process. The process of designing this service blueprint is called as service blueprinting.

Service Encounter Failures: Service encounter failures arise if the employees are hostile toward the customers and do not give due consideration to the customers' opinions. They also crop up due to technical snags in non-personal service encounters like the Internet, ATMs, Interactive Voice Response System (IVRS), etc.

Service Encounters: Service encounters are the personal interactions between the customers and employees of the organization.

Service Factories: Service factories are service organizations that are characterized by a low degree of variations and low relative throughput time. They are expected to be more productive than other categories of service organizations in the same industry.

Service Failure: Service failure occurs when there is a mismatch between the customers' perception of the service they receive and their expectation.

Service Quality Audit: Service quality audit can be defined as an independent evaluation of service quality to determine its fitness for use and conformance to specification. The information that is obtained through conducting the service

quality audit helps in establishing the correctness of the internal standards and the internal compliance.

Service Recovery: Service recovery refers to actions taken by a service provider to rectify a situation of service failure.

Services: Services are intangible (cannot be counted, measured, or stored), heterogeneous (have different characteristics and different people may rate these characteristics differently), inseparable (their production and consumption cannot be separated from the source that provides it), and perishable (cannot be stored and need to be utilized as soon as they are produced).

Throughput Time: Throughput time is the interval of time between availability for use and completion of the service encounter; relative throughput time is throughput time measured for a service transaction as compared to others in the industry.

14.9   Self-Assessment Test

1. Service organizations differ from manufacturing organizations with regard to certain attributes. Describe these attributes.

2. Briefly explain the generic control techniques used in service organizations.

3. What are the reasons relating to service failure that cause customers to switch / defect to other service providers? Which of these reasons can be addressed by service recovery?

4. What are the different dimensions used to classify services?

5. Describe the service classification matrix proposed by Roger W. Schmenner.

6. Describe how controls used in professional services are different from those in mass services.

14.10   Suggested Reading/Reference Material

1. Stephen P Robbins, David A. De Cenzo and Mary Coulter (2022). *Fundamentals of Management: Essential Concepts and Applications,* Fifteenth Edition| Pearson Paperback, 30 June 2022.

2. Subhash Chandra Das (2019). Management Control Systems – Principles and Practices, PHI Learning Pvt. Limited, Paperback – 15 July 2019.

3. Pravin Durai (2019). Principles of Management: Text and Cases, First edition, Pearson India Education Services Pvt. Ltd.; Second edition (31 August 2019).

4. Merchant, Kenneth A (2017). "Management Control System: Text and Cases", Pearson Education Asia.

5. Saravanavel, P (2022). Management Control Systems – Principles and Practices. First edition, Himalaya Publishing House.

14.11   Answers to Check Your Progress Questions

1. **(d)   A map or a diagrammatic representation of the service delivery process, the associated tangible evidence, and the employees involved in the service delivery process**

   A service blueprint is a map or a diagrammatic representation of different levels of interactions between the customer and the service provider. It gives a detailed representation of the service delivery process, the associated physical evidence, and the employees involved in the service delivery process.

2. **(d)   Yield management**

   Yield management is also known as revenue management. E. Kimes defined the same. Yield management is a method, which can help an organization, sell the right inventory unit to the right type of customer, at the right time, and for the right price.

3. **(a)   i, ii, iii but not iv**

   Unlike in manufacturing organizations, where quality is defined by the product having a certain set of standard specifications, quality in service organizations primarily depends upon how a customer perceives what he/she gets and whether it meets his/her expectations. Defining exactly what the customer wants from a specific service is complex, considering the characteristics of services - intangibility, heterogeneity, inseparability, and perishability. The three main components of service quality are physical facilities and processes, people's actions, and professional opinion. They form the three Ps of service quality.

4. **(a)   Understanding how defects arise and at developing improvements in the processes to minimize these defects**

   In the services setting, Six Sigma aims at understanding how defects arise and at developing improvements in the processes to minimize these defects. This ultimately results in increased customer satisfaction.

5. **(b)   Attraction by competitors**

   Five of the reasons identified by Keaveney can be addressed by service recovery. They are: 1) core service failures, 2) service encounter failures, 3) price failures, 4) inconvenience, and 5) employee response to service failures. The other three reasons are: 6) attraction by competitors, 7) ethical problems, and 8) involuntary switching.

6. **(c)   i/p, ii/s, iii/r, iv/q**

   Product focus deals with what the customer purchases. Process focus deals with how the purchase is effected (brought about). People focus considers the organization's representatives, who deliver the service as

more important than the tool or machine. Level of discretion empowers the service providing personnel to make changes to the service (depending on the customer's request) without having to consult with higher authorities.

7. **(c) Degree of variation; relative throughput time**

In 2004, Schmenner devised a framework to classify services based on the degree of variation and the relative throughput time. Schmenner proposed a two-by-two matrix with the degree of variation on the X-axis and relative throughput time on the Y-axis. Degree of variation refers to the customization for and interaction with customers. Throughput time is the interval of time between availability for use and completion of the service encounter; relative throughput time is throughput time measured for a service transaction as compared to others in the industry.

8. **(b) Low degree of variation and low relative throughput time**

Service factories are services with low degree of variation and low relative throughput time, e.g., fast food restaurants - McDonald's and KFC.

9. **(a) Reduce both the relative throughput time and the degree of variation**

To simultaneously increase both productivity and service quality, managers may try to reduce both the relative throughput time and the degree of variation. In other words, they attempt to shift their organization toward the service factory category from any of the other three categories.

10. **(a) Developing standard operating procedures with very little improvisation from the employees in handling the customers**

In managing and controlling service factories, the focus is on development of standard operating procedures with very little improvisation from the employees in handling the customers. The issue in controlling the service shops generally focuses on reducing the variations through standardizing the services and trying to spread the overhead costs over a greater number of service units without compromising on the throughput time. Reducing waste so as to achieve lower throughput time and higher productivity is an issue for controlling mass services. Hiring people, who are highly skilled and have decision making capabilities, is used for controlling professional services.

Unit 15

Management Control of Projects

Structure

"In poorly run projects, problems can go undetected until the project fails. It's like the drip … drip … drip of a leaky underground pipe. Money is being lost, but you don't see it until there is an explosion."

- Joy Gumz, Director of Project Auditors, LLC

15.1   Introduction

In this unit, we understand the significance of project control in the successful execution of projects, and the use of project overview statement and, project plan as the basis for control and the need for project auditing. Finally, we shall discuss how to conserve and utilize resources in projects.

In the previous unit, we discussed the management control of service operations. In this unit, we shall discuss the management control of projects.

A project can be defined as "a temporary endeavor undertaken, to create a unique product or service" or "a unique set of coordinated activities, with definite starting and finishing points, undertaken by an individual or organization to meet specific

objectives within defined schedule, cost, and performance parameters". Project planning and execution are the basic business activities for project-based organizations. Manufacturing or service organizations take up projects to fulfill specific needs.

Project-based organizations and other organizations can succeed in their businesses if they can identify viable projects and execute them successfully.

This unit will first explain the significance of project control in the successful execution of projects, and the use of project overview statement as the basis for control. We shall then move on to discuss how to use project plan as the primary control mechanism, and the importance of organizing for project control. We shall also discuss how to control the execution of a project, and the concepts associated with overall change control. Finally, we shall discuss the process of project auditing, and discuss how to conserve and utilize resources in projects.

15.2 Objectives

After studying this unit, you should be able to:

- Define the significance of project control in the successful execution of projects.

- Evaluate the use of project overview statement as the basis for control.

- Explain how to use project plan as the primary control mechanism.

- Discuss the importance of organizing for project control.

- Recall how to control the execution of a project.

- Describe the concepts associated with overall change control. Discuss the process of project auditing.

- Describe how to conserve and utilize resources in projects.

15.3 Introduction to Project Control

Project management must focus on ways to manage the resources required for successfully completing projects and fulfilling the project sponsor's objectives. Resources requirement can vary from project to project. Managing resources involve managing people, money, time, quality, etc. Following factors have an impact on a project's success:

- Clear definition of project goals

- A priori agreement on success factors by the project stakeholders, before the project commences

- Support and involvement of the top management / project sponsor to ensure project success

- Comprehensive project planning

- Ongoing collaboration between the project sponsor and the project manager, including involvement of the project sponsor in key discussions and decisions during the planning and execution of the project

- Technical/managerial competence, troubleshooting capabilities, and flexibility of the project personnel

- Project control systems, including (but not limited to) progress review, information systems, communication, and coordination mechanisms.

Project managers exercise control over the project team and others who are involved in various project functions. The purposes of project control are - to plan and organize the project in order to achieve the effectiveness and efficiency objectives; to execute the project so that its performance is close to the plan; to suitably revise the project plan (when required); and to conserve and ensure proper utilization of resources (physical assets, finances, or human resources).

Project control systems are required to have a check on the progress of the project in terms of time, cost, and quality of output. The cybernetic process in project control involves planning of control, assessing performance, and taking corrective actions; and plays a vital role in the overall project life cycle. Planning of control involves deciding on how, when, and what to monitor and control. Assessment involves evaluation of actual performance and comparison with planned performance. The task of taking corrective actions focuses on analyzing the reasons for the difference between actual and planned performance and applying corrective measures. Successful completion of a project depends on the ways in which problems are identified and immediately controlled or corrected. The control activity is required to keep a check on time, cost, and quality of output. It should not be viewed as a coercive tool, but should be thought of more as an activity that guides the project team toward goal-directed behavior.

Example: Unlocking the Value of the Observational Method

One of the project control methods adapted by Mott MacDonald, a construction company, was an observational method. Under the observational method (OM) both design and monitoring data were linked together , thus facilitating the project team to exercise controls on the construction works and also implement risk mitigation measures to safeguard the works or achieve cost savings. Controlling projects was a necessity so that meaningful and timely information can be obtained to satisfy the needs of the project's stakeholders. This control process included measuring resources consumed, measuring status and accomplishments, comparing measurements to projections and standards and providing effective diagnosis and replanning.

Source: GE Editorial, May 24, 2022, https://www.geplus.co.uk/opinion/unlocking-the-value-of-the-observational-method-24-05-2022/ Accessed on 15.06.2022

15.4 Project Overview Statement as the Basis for Control

Effective project control requires an accurate description of what is expected from the project's execution. The output requirements are recorded as the product scope that includes details about the features and quality standards required in the product or service that is to be delivered. The project overview statement (also known as the project scope statement, statement of work, initial project definition, or document of understanding) is a precise description of what the project goal is and how it will be achieved.

Example: Inter-Linking of River Projects

Ministry of Irrigation (now Ministry of Jal Shakti) has prepared a National Perspective Plan (NPP) in August 1980 for transferring water from water surplus basins to water-deficit basins and for water resources development through inter basin transfer of water. National Water Development Agency (NWDA) has identified 30 links (16 under Peninsular Component and 14 under Himalayan Component) and prepared Project Feasibility Reports (PFRs). In line with NPP which acts as a project basis, the Central Government has been actively pursuing the inter-linking of rivers (ILR) program in a consultative manner and accordingly providing funds to projects as required in annual budgets. Finance Minister during her 2022-23 Budget Speech has said that the implementation of Ken-Betwa rivers linking at an estimated cost of ₹44,605 crore would be taken up during this fiscal year and the draft detailed project reports (DPR) of Damanganga-Pinjal, Godavari-Krishna Krishna-Pennar, Par-Tapi-Narmada, and Pennar-Cauvery were being examined. No funds were allocated for inter-linking of river (ILR) projects such as Godavari-Cauvery link project, since they did not reach the stage of execution.. However, an amount of ₹1,400 crore was set aside for the project of interlinking of rivers in the union budget 2022-23.

Sources: i) Ministry of Jalshakti, 18th March, 2021,
https://pib.gov.in/PressReleseDetail.aspx?PRID=1705795 Accessed on 05.08.2022

ii) Livemint, 01st February, 2022, https://www.livemint.com/budget/five-river-linking-projects-finalised-fm-sitharaman-in-her-budget-2022-speech-11643694796500.html Accessed on 05.08.2022

The project scope must be decided based on the requirements of the project sponsor, the users, and the relevant stakeholders. It should provide details about the activities to be carried out and the resources required for project completion. The scope should be clearly laid out for each phase if a project has multiple phases. Project overview statements comprise - the problem or opportunity (the reason for taking up the project); the broad project goal, the specific objectives, and criteria for assessing successful project completion; the anticipated risks and hindrances that may have a significant impact on the project's progress and completion; and the assumptions involved.

Project control requires that the concerned project stakeholders should agree on the project scope. After the agreement, the project overview statement provides the basis for effective project control during the later stages of project execution, and guides the project manager's decision-making during project execution. However, it may not provide the level of details required by the project team members. The project team can develop a detailed project definition statement (Project Charter) that can be used as a standard reference by all the project team members. This statement will be aligned to the project overview statement so that it guides the project team members in the right direction during the project execution.

15.5   Project Plan as the Primary Control Mechanism

A project management plan for any organization is a formal document prepared as a guide to control and execute a project. It is the most vital document that needs to be carefully designed before executing a project. It is considered as a primary control mechanism because it involves schedule development, resource planning, cost estimation of each resource, and cost budgeting of activities. It is a key for successful execution of a project.

Example: Gati Shakti National Master Plan

Gati Shakti National Master Plan was meant for creating a Multimodal Connectivity, essentially through a digital platform. It was launched by GOI to bring together 16 departments, including railways and highways, and prepare an integrated planning of infrastructure connectivity for their departmental projects. Each department has been allowed to obtain project data about work on infrastructure projects being undertaken by other departments on an activated centralized digital platform. This has helped almost all departments in the efficient planning and implementation of projects. Moreover, It eliminated project management problems caused by a lack of coordination and reduced project delays between the different ministries. It was envisaged that use of a centralized portal for Mega Projects like ₹ 100 lakh crore Gati Shakti would reduce logistics costs by 8 per cent, from earlier 14 per cent The plan aimed to transform India into a world-class infrastructure hub by providing integrated and seamless connectivity for the movement of people, goods, and services.

Source: Jessica, June 14, 2022, https://www.inventiva.co.in/trends/gati-shakti-national-master-plan/ Accessed on 15.06.2022

The project plan preparation starts with the project scope definition. For a given scope, the activities to be carried out are identified along with their interdependencies in terms of sequence, the effort required to finish each activity is estimated, and the project schedule is developed. The schedule guides the

project manager to focus attention on the critical path along which any delay in activity completion will result in a delay in project completion. After the schedule is finalized, the project plan development involves resource planning, cost estimation of each resource, and cost budgeting of activities. At this stage, the project manager can evaluate options of reducing the total project duration by incurring higher costs. This trade-off between effectiveness and efficiency would depend on the organization's priorities and the needs of the project stakeholders.

Preparation of the overall project plan also involves establishing the quality standards and identifying ways of ensuring quality assurance; planning for staff acquisition; identifying roles, responsibilities, and reporting relationships among the project team members; determining communication needs of different stakeholders and ways of addressing them; risk identification and evaluation; etc. The project plan has to be approved (signed) by the project sponsor, after which it becomes the main reference for control in the project execution.

Project milestones, defined in the project plan, mark the end of major phases. They serve as 'go' or 'no go' control points for executive decision making. At each milestone, the intermediate project outcome is communicated to the project sponsor, based on which it is decided whether or not to continue the project. Periodic review and assessment of progress is conducted. Frequency of review varies within and between various project phases, depending on parameters like distribution of total effort among the various phases and risks associated with each phase.

15.6   Organizing for Project Control

"Project controls are the data gathering, management and analytical processes used to predict, understand and constructively influence the time and cost outcomes of a project or program; through the communication of information in formats that assist effective management and decision making." For successful implementation of project controls, a well-designed organization structure is must.

The matrix organization structure combines the advantages of the pure functional and product organization structures, and is usually adopted by project-driven organizations. The project teams are formed within the traditional line and staff organization, and the project uses various resources grouped together temporarily to achieve an objective. Different project teams may work under one department, or one project team may work under different departments. Whatever may be the case, the project members are answerable to the project manager and the departmental managers. This may lead to conflict between the project and functional managers as they must share the same set of workers for their individual responsibilities. Each manager should try to prioritize his/her jobs and

responsibilities to minimize such conflicts. Figure 15.1 depicts the reporting relationships in an organization dealing with construction projects.

Figure 15.1: Typical Matrix Organization Structure
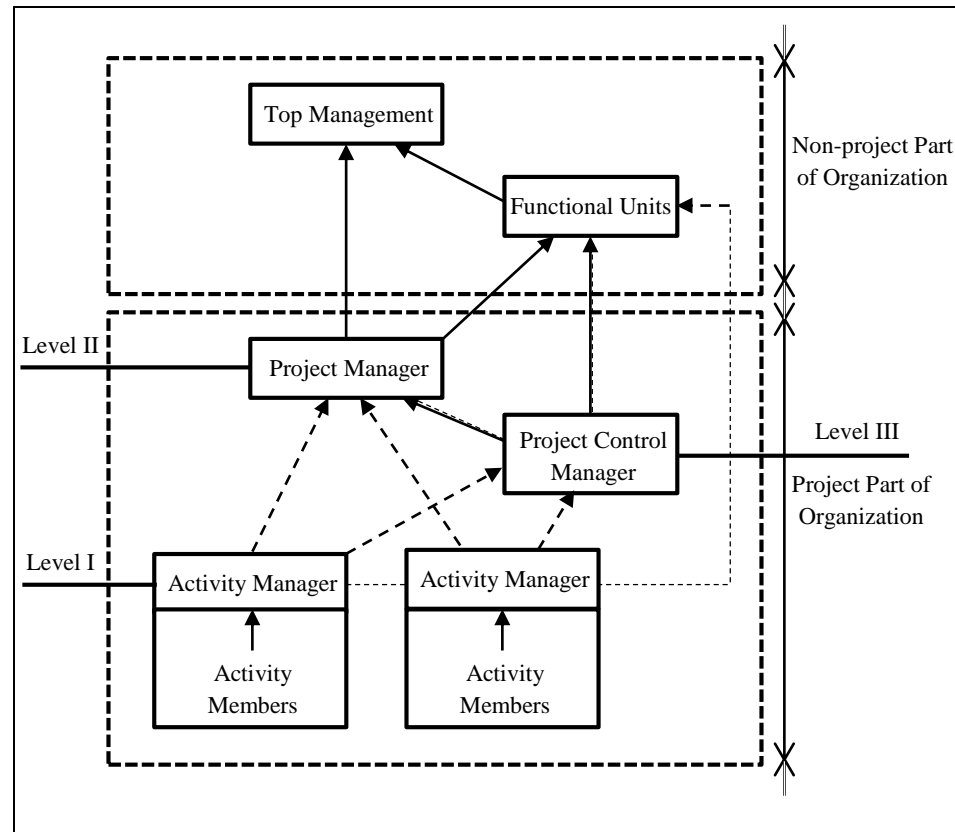
Source: ICFAI Research Center

Types of Matrix Organization

Based on the relative power of the functional and project managers, the matrix organization can be classified into a weak matrix, a strong matrix, and a balanced matrix.

The Weak Matrix: In this type of structure, the functional manager (or the line manager) is more powerful than the project manager. The organization might be designed in such a way that the performance of the workers is measured only based on their contribution to the department/functions and not to the project.

In such a situation, the workers will be more loyal to their responsibilities toward the function and working for the project may seem to them to be an extra burden. In such a situation, though the project manager is responsible for planning and monitoring his/her project, he/she will not have any authority over the staff. A conflict of interests may arise between the project manager and the functional manager because if the workers concentrate more on function, the progress of the

project is hampered and if the worker concentrates more on the project, department/functional activities are affected. Besides, the workers will not be interested in the latter because their performance depends solely on functional performance. Hence, the project manager is in a weak position in a weak matrix organization

The Strong Matrix: In the strong matrix organization, the project managers have the responsibility of the workers and not the functional managers. However, the project managers are not in charge of the human resource administration. This helps them to control the workforce better, because in this case, evaluating the performance of the workforce depends on the inputs of the project manager. As a result, the workers will be more committed to the project. The project manager formulates plans regarding workforce requirements and the functional manager tries to make resources available. In this system, though the project and the functional manager work in coordination, the overall control of project related activities lies with the project manager.

The Balanced Matrix: In the two cases just discussed, we find that one party is more powerful than the other, which means there are chances that either project performance will suffer (in case of a weak matrix) or functional performance will suffer (in case of a strong matrix). Therefore, the organization cannot perform optimally. To avoid this problem, the management should try to strike a balance between the function and the project. This can be achieved in many ways. The management can make performance evaluation dependent on both project and function, or formulate rules to delegate responsibilities to managers according to the situation. However, the goal should always be to achieve a win-win situation between the project managers and the functional managers.

15.6.1 Roles of Members in Project Control

Each project member should achieve the project objectives by adhering to the project plan. The control-related roles and the responsibilities of each project member should be clearly differentiated with the help of a Linear Responsibility Chart (LRC). The LRC for project control can be structured in three steps.

i.   The units are stated in the upper right-hand side of the chart and so arranged that the project units are separate from the non-project (functional) units. This arrangement does not depict any line relationship within the project.

ii.   Control tasks of the project control process are depicted on the left-hand side of the chart. They are grouped according to the project stages to enhance clarity.

iii. Symbols are used to show the relationship between units and control tasks. This can be done through 'Relationship: Category-Task' (RCT).

Figure 15.2 depicts the unit-task relationship of different project phases of the construction project just mentioned.

Figure 15.2: Sample Linear Responsibility Chart (LRC)

Unit Task Relationship Symbol ■ PT/RCT □ ATP/RCT ● GS/RCT ○ HBC/RCT ▲ HBI/RCT	Top Management	Project Manager	Project Control Manager	Activity Manager	Activity Members		Functional Units
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1. Study Project History	●	■	■	■			
2. Develop Design	▲	○	□	■	■		▲
3. Approval of Design	▲	○	▲	■			▲

Source: ICFAI Research Center

Five types of RCTs are used to define roles in project control.

1. *Perform Task/RCT (PT/RCT)* means the unit performs the control task.

2. *Approves Task Performance/RCT (ATP/RCT)* means the unit is supervising the unit performing the control task and has to approve that particular task.

3. *General Supervision/RCT (GS/RCT)* means the unit is supervising a unit performing ATP/RCT. Its role is to formulate the policy framework for the functioning of ATP/RCT and PT/RCT.

4. *Has to Be Consulted/RCT (HBC/RCT)*, where the HBC/RCT unit must be consulted by another unit which is performing some control task for inputs

5. *Has to Be Informed/RCT (HBI/RCT)*, where the HBI/RCT unit must be informed about certain things by another unit performing some control task.

Example: Project Controls in Offshore Software Outsourcing helps Lower Development Costs

Goldman Sachs, an Investment Bank, adapted a cost-effective business model that included Offshore Software Outsourcing to reduce IT Costs. Under Software Outsourcing, Goldman Sachs transferred the control of a certain business processes or parts of project management to Infosys. a Software Services Company who had competencies.

Contd….

> A matrix organization structure was followed as a combination of projectized organization structure and the functional organization structure for an effective and efficient project control. Offshore software outsourcing helped Goldman Sachs to lower development or maintenance costs, which in turn translated to lower operational expenses.

Source: https://www.tpptechnology.com/blog/what-is-software-outsourcing-and-how-to-do-it-effectively/. Copyright 2020. Last accessed on 4/11/2022

15.7 Control of Project Execution

Management project execution and control is to develop the product or service that the project was commissioned to deliver. Typically, this is the longest phase of the project management lifecycle, where most resources are applied. It needs constant supervision and appropriate revision at appropriate times.

In the project execution stage, the project managers should review the project's progress in a timely and phased manner, and take corrective action, if required. Various factors are involved in the monitoring and controlling of projects. These factors can be tracked using some tools and methods like project review, cost monitoring and control, schedule control, earned value analysis, progress measurement, productivity measurement, and progress reporting.

15.7.1 Project Review

Project reviews conducted at various stages of project implementation enables the project manager to solve problems before they get out of control, or to enhance the way in which the project is being handled.

Reviews are conducted to find out if the project can achieve the business goals; whether the organizational rules are understood properly and implemented; and whether the project is being managed effectively and the team members are sure of completing it by following the guidelines.

Types of project reviews

A project manager must conduct various reviews throughout the project life to ensure that it is progressing toward achieving the planned objectives. The way these reviews are conducted decides the success of current and future projects. In general, a project manager conducts three types of reviews - status reviews, design reviews, and process reviews, which are described in Table 15.1.

Table 15.1: Types of Reviews and their Features

Review Type	Features
Status review	Usually conducted at two levels - cursory review and comprehensive review. A weekly cursory and a monthly comprehensive review are usually conducted for projects of one-year duration.

Contd….

	The project manager should ensure that team members give status reports that are substantiated by meaningful details about cost, performance, time, and scope.
	A reporting system should be designed that can detect deviations that are greater than the permissible variance limits.
Design review	Conducted to check whether the design of the product/service being produced is of the desired performance quality.
Process review	Conducted to determine whether the processes are going on as planned and whether any improvements are possible.
	Objectives - to preserve the project processes' performances that are going on well, and to improve the processes that are below standard.
	Used for suggesting improvements (even if there is nothing wrong).

Source: ICFAI Research Center

Project status review meetings

Meetings help in effectively and essentially conducting project reviews in an organization. These are aimed at reviewing the project status and have a specific agenda. Meetings are useful for making decisions; for discussing aspects of the project; for planning and scheduling work; for discussing project scope changes and their impact on various project stakeholders; for deciding the suitable decisions to be taken; for resolving conflicts among the stakeholders, and as coordination mechanisms for solving project-related problems.

Example: Zendesk Confirms Completion of Strategic Review

Zendesk Inc., has conducted strategic review with the help of Qatalyst Partners, Goldman Sachs & Co and its legal advisors at Wachtell, Lipton, Rosen & Katz, During strategic review, the top executives were engaged in management meetings and it was proposed to conduct a due diligence on potential sale of the company with all existing strategic partners and financial sponsors, regarding a potential sale of the Company. Only one financial sponsor and none of the strategic parties expressed their interest in the process. Citing adverse market conditions and financing difficulties, no proposals on securing additional finances were received at the end of the process, Finally, the Board has taken an unanimous decision that the Company's existing strategic plan as an independent, public company could only be the choice in the best interest of the Company and its stockholders.

Contd….

Over the period, Zendesk taken initiatives to improve customer experience by enabling their customer help desk software products to go online. As on date Zendesk remained as the champion of great service everywhere for everyone and was able to handle billions of customer interactions, serving more than 1,00,000 brands with millions of customers over multiple platforms such as telephony, chat, email, messaging, social media, communities, review sites and help centres across the world.

Source: Businesswire, June 09, 2022
https://www.businesswire.com/news/home/20220609005601/en/Zendesk-Confirms-Completion-of-Strategic-Review Accessed on 16/06/2022

15.7.2 Cost Monitoring and Control Tools

Regardless of the project type, cost control is a critical issue - the project team should take maximum care to ensure accuracy of the planned budget to avoid execution problems. The team is answerable to the top management or the client if the actual cost goes beyond budgeted cost.

Cost monitoring

Activities should be monitored regularly so that problems can be addressed at an early stage. A cost summary table should be maintained to keep records of the costs incurred.

The table integrates all project-related costs like engineering and construction costs and can be used as a ready reference for financial status of a project. Details of the original budget, current budget, expenditures incurred till date, and forecasts of expenditures for various cost categories are entered in the table.

The labor rates and usage of production equipment and bulk materials should also be tracked. In certain projects, it becomes very essential to track the equipment costs as it forms an important part of the project's budget. A table of equipment should be maintained with the original estimates, current forecasts, and final purchase order costs to analyze the trends of cost of equipment and to make provisions for future purchases, if any. Tracking reports help in buying materials for future activities when the costs are relatively low. The procurement activities should be thoroughly tracked, and the information obtained should be revised regularly in the cost summary table.

Cost control

Budgeting plays a vital role in project control. The budget should be planned as accurately as possible keeping in mind unforeseen events that may occur due to external factors. Contingency plans (as part of the budgeting process) along with cash flow management help in cost control.

Contingency planning: Some amount is set aside in the budget to cover unplanned events. Contingency, however, is not meant to cover activities that involve project scope changes. Preparing a contingency rundown chart (plotting balance in the contingency fund against project period) may ensure that the contingency usage pattern does not deviate significantly from the plan.

If the actual contingency rundown curve is above the planned contingency rundown curve, it is a good sign for the project as it means that the actual balance in the contingency fund is more than the planned balance. If the actual contingency usage curve is going below the planned contingency usage curve, the project is using contingencies at a faster rate than planned and may exhaust all contingencies before the project is completed. Therefore, the curve alerts the management to discrepancies in project execution.

*Cash flow management***:** The cash flow should be managed during the project. The project team should try to complete the project considering budget constraints. It should always have information about the amount of cash that has been used up and the balance left out for the period or particular activity. A cash flow tracking chart helps compare the actual expenditure with the original planned cash flow (Y axis) over the project duration (X axis), and shows forecasted cash flow, thus estimating the project's final cost. Corrective actions can be taken if there is a considerable difference between actual and planned cash flow.

15.7.3 Schedule Control Tools

The project completion time should be estimated in the project planning phase using the Critical Path Method (CPM). A comprehensive project schedule should be developed that contains the details of all the resources (like equipment, bulk materials, and manpower) required for each of the activities. In case of outsourced projects, the client and the contractor should agree on a baseline schedule before project approval.

After this, the project schedule should be continuously monitored by tracking critical activities, milestones, and manpower utilization.

Let us understand the issues related to critical path and milestone tracking.

Critical path and milestone tracking

After commencing the project execution phase, the efforts toward the critical path activities should be tracked. Care should be taken that the objectives of the project and the critical activities are achieved. A milestone tracking chart helps in tracking milestones, i.e., activity completion. It uses a graphical format for showing the actual milestone dates or dates of completion of activities (Y axis) and the planned dates (X axis). It shows the project's status and the project's adherence (or non-adherence) to the planned schedule.

Manpower utilization

Another important is resourse utilization in any project. The project team has a choice to increase or decrease the manpower. Let us see how it is done.

As the project progresses, actual manpower utilization can be tracked against planned utilization. If the project's progress is slower than planned despite manpower utilization as per plan, it has to be decided by the project management team whether the project duration will be extended, or the project will be completed within the stipulated time by using more manpower.

15.7.4 Earned Value Analysis

Earned Value (EV) analysis method is used for both cost and schedule control, and for evaluating the project's progress and financials. "Earned value" represents the value earned from a project as and when the activities are completed. EV is a common and consistent unit to measure the project's or an activity's progress and cost performance. Time and money are the common units associated with EV. Time is mostly used in labor-intensive industries. In such cases, the project's financial control is taken up by an accounting system as other costs (apart from project's direct costs) are also involved like subcontractor cost and overhead cost. Money is mostly used in non- labor-intensive projects as it is useful where one needs to consider variables like salary rates, hikes, and overhead adjustments.

Usefulness of EV

EV forms a consistent basis for schedule and cost analysis by using a uniform unit of measurement (time or money), thereby simplifying the analysis of complex situations. The uniform unit used by EV also helps to compare the progress and performance of different activities in a project. EV helps in enhancing cost performance analysis by measuring the amount of work done in a unit that is comparable to cost, that is, the unit of measuring physical progress of the project is the same as the unit for measuring cost.

Implementation of EV

The steps in the implementation of EV are:

1. Establishing a Work Breakdown Structure (WBS) to divide the project into manageable components. It should be established at multiple levels in a hierarchical order. One component at a level can be broken down into smaller components, which in turn, form the next lower level. All the components must cumulatively add up to the total project. Each component should be monitored and controlled by an individual employee.

2. Identifying and allocating costs of each project activity based on direct cost and time consumed by that activity. The activities must be then scheduled, i.e., the resources allocation has to be planned over the time period.

This resource allocation is in the form of an S curve, also called as the Budgeted Cost of Work Scheduled (BCWS) curve.

3. Preparing a project schedule to confirm that the plan is acceptable so that the total resource allocation does not exceed the total available resources. Developing the schedule also helps study the cash flow of the project and to check if the budget of the project supports the schedule.

4. Monitoring and reporting each activity's progress. The activities are to be reported as started, completed, or part completed. In the case of unfinished activities, the percentage of completion should also be reported. The actual costs of the activities should also be identified and updated in the schedule.

5. Calculating EV by multiplying the percentage completion of an activity with the budgeted cost. In other words, EV is the Budgeted Cost of Work Performed (BCWP).

6. Calculating the performance metrics as follows:

- Schedule Variance (SV) = EV - BCWS = BCWP - BCWS

- Cost Variance (CV) = EV - Actual Cost of Work Performed (ACWP) = BCWP - ACWP

- Schedule Performance Index (SPI) = $\dfrac{AV}{BCWS} = \dfrac{BCWP}{BCWS}$

- Cost Performance Index (CPI) = $\dfrac{AV}{ACWP} = \dfrac{BCWP}{ACWP}$

Illustration 1

Given below are the details pertaining to a project at KL Constructions.

Particulars	₹ Million
Budgeted Cost of Work Performed	14
Budgeted Cost of Work Scheduled	12
Actual Cost of Work Performed	15

Based on the given details, calculate the following metrics.

Schedule variance

Cost variance

Schedule performance index

Cost performance index Solution

Given that,

Budgeted Cost of Work Performed (BCWP) = ₹ 14 million

Budgeted Cost of Work Scheduled (BCWS) = ₹ 12 million

Actual Cost of Work Performed (ACWP) = ₹ 15 million

Schedule Variance (SV) = EV - BCWS = BCWP - BCWS

$$= ₹ 14 \text{ million} - ₹ 12 \text{ million} = ₹ 2 \text{ million}$$

Cost Variance (CV) = EV - ACWP = BCWP - ACWP

$$= ₹ 14 \text{ million} - ₹ 15 \text{ million} = ₹ 1 \text{ million} (-)$$

$$\text{Schedule Performance Index (SPI)} = \frac{EV}{BCWS} = \frac{BCWP}{BCWS}$$

$$= \frac{₹ 14 \text{ million}}{₹ 12 \text{ million}} = 1.167$$

$$\text{Cost Performance Index (CPI)} = \frac{EV}{ACWP} = \frac{BCWP}{ACWP} = \frac{₹ 14 \text{ million}}{₹ 15 \text{ million}} = 0.93$$

Particulars	₹ Million
Budgeted Cost of Work Performed	9
Budgeted Cost of Work Scheduled Actual	7
Cost of Work Performed	11

Activity 15.1

Based on the data given, calculate the schedule variance, cost variance, schedule performance index, and cost performance index.

Answer:

15.7.5 Progress Measurement

Progress measurement calculates the percentage of project completed. The basis on which progress measurement is done can be finalized once the detailed schedule of the project is developed.

The measurement criteria for assessing this percentage must be clearly defined. Progress measurement, which should be done on a regular basis, should always reflect tangible work and not time expended. The validity of the progress report can be cross-checked with the help of quantity surveying and quantity sampling.

Progress measurement can be represented through a graph that plots the actual cumulative percent complete with the planned cumulative percent complete (Y axis) against time (X axis). This curve can also be developed by allocation of work hours to activities against time.

15.7.6 Productivity Measurement

Productivity is the ratio of outputs produced to resources consumed, that need not remain constant throughout the project duration. In the middle phase of the project, the productivity is high as by then, the learning phase is over. It drops in the end phase of the project due to fine-tuning activities undertaken in the final stages.

Planned productivity for various project phases can be determined based on the planned work and planned resource utilization. During project execution, actual productivity is measured based on the actual progress and actual resource utilization. A comparative trend analysis of actual productivity versus planned productivity helps the project manager to take corrective actions, when required.

Productivity measurement provides inputs for revising cost estimates and schedules.

15.7.7 Periodic Reporting

Periodic reporting is an important function of project control. Vital issues should be reported to the top management at the earliest without waiting for the end of the pre- defined period. The reports help the top management in better decision making if they are easily comprehensible and are prepared timely and accurately. Different tools lead to the generation of three different types of reports - trouble reports, progress reports, and financial reports. Refer to Table 15.2 for their descriptions.

Table 15.2: Types of Reports

Reports	Description
Trouble reports	• Emphasis is on the problems that have occurred are anticipated. Critical problems are identified and highlighted.
	• These reports should essentially be sent to the appropriate manager in time so that corrective actions can be taken at the earliest.
	• Information is usually transmitted face-to-face or through the telephone.
	• If the report contains important information, the oral communication is followed by a written document to provide a record.
	• Immediate action is taken based on the seriousness of the problem.

Contd….

Progress reports	• They compare the actual schedule and costs with the planned schedule and costs for the work done. • These reports also contain similar comparisons for overhead activities that are not directly related to the work. • Variances associated with costs, schedule delays, and similar factors are identified and measured quantitatively. • Emphasis is on the amount of work already done and the amount of work to be carried out.
Financial reports	• Accurate reports of project costs must be prepared in case of a cost-reimbursement contract since it is the basis for later payments. • These reports are not necessary if the project is a fixed-price contract. • Maintenance of these reports provides a clear picture of the ways in which financial resources are utilized.

Source: ICFAI Research Center

The reports are based on actual time compared to the scheduled time or actual cost compared to the budgeted cost. While interpreting the former, the top management raises the question whether more than estimated time was spent. But the analysis of the latter is somewhat different. If the proposed quality is maintained, the actual costs are compared with the budgeted cost. If the actual costs are less than the budgeted costs, quality might have suffered. So, the top management must study all the reports individually.

15.7.8 Information Technology for Project Control

Technological progress has made project control easier. The Project Management Information System (PMIS) is used to collect, analyze, and share project-related information. It is a useful tool for sequencing, scheduling, and tracking activities, especially in complex projects. The analysis output from the PMIS aids progress review and facilitates decision making. PMIS can be used to update the project plan on a regular basis with minimal effort and to communicate the revised plans to various stakeholders. Software tools like Microsoft Project not only save time and money spent on control but also help in improving connectivity among various project locations, leading to better collaboration, coordination, and communication.

Activity 15.2

Krushi India Private Limited is a software development company which started as a small firm of four people. With innovative solutions and good service, the company has grown remarkably in a few years. It handles several software development projects including a good number of international projects. However, the company was facing problems in scheduling its projects in the absence of a formal information system in place. The project manager understood that the company, in its present state, could ideally handle not more than five projects at a time. Neglecting this fact while taking in more and more number of projects would result in failure to deliver and in turn loss of clients. A project management information system was installed at the behest of the project manager. In what ways do you think will the company benefit from the use of this system in managing its projects?

Answer:

Check Your Progress - 1

1. Five types of RCTs are used to define roles in project control. What is the role of a PT/RCT unit?

    a. It performs the control task.

    b. It supervises the unit performing the control task.

    c. It supervises a unit that is responsible for approving the control task.

    d. It is informed about certain things by another unit performing some control task.

    e. It audits the control task.

2. Project reviews conducted at various stages of project implementation play a major role in the success of a project. These reviews are conducted to find out:

    i. If the project can accomplish the business goals

    ii. Whether the rules of the organization have been understood properly and implemented

    iii. If the budget of the project supports the schedule by checking the cash flow of the project

    iv. Whether the project is being managed effectively and the team members are sure of completing it by following the guidelines.

    a.   Only i and ii

    b.   Only i, ii, and iv

    c.   Only ii and iii

    d.   Only ii, iii, and iv

    e.   Only iii and iv

3. Identify what includes the details pertaining to the original budget, the current budget, expenditures incurred till date, and forecasts of expenditures for the various cost categories.

    a.   Cost summary table

    b.   Linear responsibility chart

    c.   Milestone tracking chart

    d.   Cash flow tracking chart

    e.   Service blueprint

4. What is applicable to estimate the time taken for the project completion during the project planning phase?

    a.   Critical path method

    b.   Cash flow tracking hart

    c.   Milestone tracking chart

    d.   Contingency planning

    e.   Cost summary table

5. Identify the activity in the final stage of a project that leads to a fall in productivity, after being high in the middle phase of the duration of project.

    a.   Learning

    b.   Fine-tuning

    c.   Damage control

    d.   Developmental

    e.   Project audit

15.8   Overall Change Control

Many a time, the course of action in a project changes from that originally planned due to various reasons like external factors or if there is a change in the instructions from the top management. Keeping track of all, these changes is essential to control the project cost. A formal process must be in place to identify, quantify, and verify changes to the work that have to be performed. Change control systems, configuration management, and scope creep are three key concepts associated with overall change control.

The change control system includes tracking systems and approval procedures necessary to authorize the changes. It is desirable for a project to have an independent Change Control Board (CCB) that approves or rejects change requests. Configuration management is a documenting procedure that is used to ensure that the project output (product or service) description is accurate and complete. It documents all physical and functional project characteristics of the outputs and records any change in these characteristics. While implementing the project, many changes can occur in the project scope due to many different reasons related to the external environment, user requirements, etc. This is referred to as scope creep. It is caused by absence of a detailed scope definition and repeated attempts by the project team and the client to improve the product/service. It is important to design an effective control mechanism to handle scope creep.

15.8.1 Scope Change Control

Scope change control aims at controlling the changes in the project scope that occur at various project life cycle stages by identifying the scope changes and managing the factors that cause scope changes to see that the changes are advantageous to the project.

Project managers use information collected from documents such as work breakdown structure, performance reports, and change requests. Work Breakdown Structure (WBS) is a deliverable-oriented grouping of project elements that organizes and defines the total project scope. Performance reports organize and summarize the information gathered and provide information on scope performances. Change requests may be external (like government regulations) or internal (like errors in defining the scope) to the project, oral or written, legally mandated or optional.

A scope change control system defines the procedures by which the project scope can be changed such as paper work, tracking systems, and levels of approval necessary for authorizing the changes. Performance techniques like variance analysis, trend analysis, and earned value analysis help in assessing the magnitude of the variations that occur. The scope changes made to the already approved plans (technical plans, financial plans, etc.) are updated, and then all project stakeholders are informed of the changes. The causes of variances and the corrective actions taken are documented for future reference.

Exhibit 15.3 provides an illustrative to the above.

Exhibit 15.3: Sample Scope Change Request Form

Scope Change Number: An arbitrary numbering scheme, usually 1, 2, 3.... Also, some coding scheme for categorizing the scope change request.

Requested By: Who requested the scope change?

Contd….

Date Reported: When was the change requested?

Status: Usually Pending, On Hold, In Progress, Complete, Not Approved.

Assigned To: Who is assigned to investigate the scope change?

Date Resolved: When was the request resolved?

Scope Change Description: Describe the change in sufficient detail so that others can understand the scope change request.

Business Benefit: Why is the request being made? What is the benefit from a business perspective?

Implications of Not Making the Change: Describe the consequences if the change is not made.

Impact Analysis to the Project: Describe how the change would be incorporated into the project, as well as the impact on the project in terms of cost, effort, and duration.

Alternatives: If there are any alternatives, note them here, along with their impact on cost, effort, and duration.

Final Resolution: Briefly describe how the scope change was resolved.

Approval from Sponsor for Final Resolution: Signifies that the Project Sponsor agrees to the resolution, including any budget, effort, and/or duration implications.

15.8.2 Schedule Change Control

The project manager has to consider the project schedule, performance reports, and change requests while controlling the schedule. The schedule change control system describes the procedures by which project schedules can be modified using methods like redrawing the project network diagrams and understanding the proposed changes. Performance measurement systems assess the effective project activity completion in the normal duration, and calculate the magnitude of variation that may occur for each project activity.

Example: India Achieves 10% Ethanol Blending Ahead of Schedule

India's National Policy on Biofuels has envisaged that they should achieve an indicative target of 20% ethanol blending in petrol by 2030. The Government of India has promoted the Ethanol Blended Petrol (EBP) programme to enhance energy security, to reduce import dependency on fuel, to save foreign exchange, to minimize environmental issues and thus giving a boost to agriculture. However, India has achieved the target of 10% ethanol blending in petrol five months ahead of schedule.

Contd....

> The three clear benefits obtained from this goal: (1) a reduction of 27 lakh tonnes of carbon emission; (2) foreign exchange savings worth ₹41,000 crore and; thirdly, (3) earned ₹40,600 crore in the last eight years due to increased use of ethanol. Based on the achieved performance and various other interventions taken by the government since 2014, the existing 20% target was advanced by four years to 2025-26 from 2030. For cost control to be effective, both the scheduling and the estimating systems must be somewhat disciplined in order to prevent arbitrary and inadvertent budget or schedule changes.

Source: Livemint, Swati Luthra, 05th June, 2022, https://www.livemint.com/news/india/india-achieves-10-ethanol-blending-ahead-of-schedule-11654448003843.html Accessed on 16.06.2022

15.8.3 Cost Change Control

Cost change control describes the procedures that bring about changes in the cost baseline, and includes the paper work, the tracking systems, and the approval levels necessary for authorizing changes.

15.8.4 Change Control System

A formal change control system that can minimize the risk associated with a change is usually a part of the configuration management system that integrates and coordinates changes across the project development life cycle. Following are the tasks of the system:

- Examine the changes that are requested by the project stakeholders, and determine the impact of these on the project's cost, schedule, and performance.

- Explore alternate changes that could yield the same or a better output.

- Accept or reject the proposed changes, communicate the changes to the parties involved, and incorporate the changes properly as per the plan.

- Develop monthly reports detailing all the changes and their impact on the project.

Following guidelines are useful in designing an effective change control system.

- All project agreements should include a detailed report on how requests for a change in the plan, budget, schedule, or output of a project should be introduced and processed.

- A "change order" should be prepared which should include a description of the changes that are agreed upon, along with corresponding changes in the plan, budget, schedule, and output.

- An approval letter must be obtained, both from the client's agent and senior management's representative, on the changes to be implemented. The project manager should be consulted before finalizing the change order. But, his/her approval is not mandatory.

- Once the "change order" is approved, a master plan of the project should be made reflecting the changes and then the change order becomes a part of the master plan.

An effective change management process contains two documents - a requisition for change in a project and a project impact statement.

Requisition for change in a project: Every change requested by the client should be documented in the form of a simple memo or in the format prescribed by the project team. This will help the team evaluate the impact of the change on the project and to determine whether the change can be incorporated.

Project impact statement: This is prepared after a requisition for change is made. It identifies various alternative actions along with the pros and cons of each. The client then chooses the best alternative. Following are the possible responses to a requisition for a change - accommodating the change within the allocated resources and time schedule of the project; accommodating the change with an extension in the delivery schedule of the project; accommodating the change with additional resources and/or extension in delivery schedule; or implementing the change in a phased manner by way of prioritizing the output needed.

15.9 Project Auditing

The objective of a project audit is to ensure whether the project is meeting its project management standards. This is done through investigations and evaluations. For a project manager, it is like a judgment day. This is because huge amounts of work, time and money are at stake.

Project auditing can be defined as the process of detailed inspection by the management of a project, its methodology, techniques, procedures, documents, properties, budgets, expenses, and level of completion. A project audit is a key step in the process of closing a project. It can be carried over for the whole project or for a part of it.

The project auditor's basic responsibility is to convey facts and while doing so must acknowledge the presence of the various kinds of biases of the people in the project. He/she should be aware of the limitations and should seek external help when certain audit aspects of the project are beyond his/her area of expertise. The gathered information should be kept confidential till the official release of the audit report. He/she should not allow any political or technical pressures to influence the audit report.

15.9.1 Depth of the Project Audit

Time and money are two practical constraints that limit the scope of an auditor's project evaluation. They limit the depth of the investigation and affect the amount of detail presented in the audit report. Costs (professional and clerical costs)

are incurred as part of the audit process; for gathering, storing, and preserving the data to be audited; due to the distraction caused by the auditing process to the people working on the project; and due to the drop in morale of the individuals working on the project.

An audit report, though presented in a constructive and positive style, can demoralize team members and negatively affect the project. The depth of the audit varies with the situation and the project needs. A project audit generally may be carried out at the following three levels - general audit, detailed audit, and technical audit. Refer to Table 15.3 for the various levels and their respective descriptions.

Table 15.3: Project Audit Levels

Levels	Description
General audit	• Brief review of the project, carried out within a limited period and with only a few resources. • Usually touches on all the six dimensions of the auditing report, that is, the present status of the project, the future status, the status of the crucial tasks, assessing the risk, information relating to other projects, and the project limitations.
Detailed audit	• Conducted as a follow-up to the general audit, and when an unacceptable level of risk has been discovered by the general audit. • Depth depends on the seriousness of the issues and their impact on the project objectives. More serious the issue, greater will be the audit depth.
Technical audit	• Conducted when a detailed audit fails to evaluate the project's technical aspects satisfactorily because of the auditor's lack of technical knowledge. • The project auditor then employs a technically qualified individual to conduct the audit based on certain guidelines. • If such individuals are not employees of the organization, they should be asked to sign a non-disclosure document to ensure Confidentiality. • It is generally conducted in a detailed manner.

Source: ICFAI Research Center

Example: Finance at Accenture - Innovating Internal Audit

Accenture has more than five lac employees working for clients in 120 countries. Accenture's internal audit function has complex challenges in supporting their Organisation due to finite resources and larger scope of their audit function. Accenture's audit was conducted throughout the year and audit findings were compiled on an audit-by-audit basis. Accenture's internal audit team has developed bots as a proof of concept to automate the testing of Sarbanes-Oxley information technology general controls (ITGCs).

The bots were found to reduce testing time by more than 80 percent. Thus, optimized processes and adapting to new technology innovations have significantly changed the way internal audits were conducted at Accenture. Analysts were empowered with data analytics and trained team members to do full population testing instead of traditional manual sample. Further, the use of Robotic Process Automation has helped Accenture to automate repetitive testing and operational activities. By performing audits and health checks, project managers could prevent a project from becoming distressed, provided that the cause of the problem was detected early enough and options exist for corrective action.

Source: Zameer Shaikh, 2022, https://www.accenture.com/gr-en/case-studies/about/innovating-internal-audit Accessed on 15.06.2022

15.9.2 Timing of the Project Audit

The timing of an audit is project specific. The first audit is conducted early in the project life cycle, as early problem detection would ease the rectification process. Early audits focus on solving key technical problems. As the project progresses, adherence to schedule and budget is given more importance. Auditing at the end of the project life cycle is a value addition to the organization than to the project. During this stage, management concerns like disposing of equipment and reallocating personnel become key issues. Post project evaluation could be necessary for the following reasons: it is specified by the client in the agreement and is required legally; it constitutes a major part of the project report and is also the key information source for giving feedback to the parent organization; and it accounts for all the project assets and expenses as a part of project closure.

15.9.3 Project Audit Report

The top management and the project team's seriousness in considering the audit report vary depending on the credibility of the information given in the report. Data should be checked and calculated carefully to ensure its accuracy.

Activity 15.3

Virtu Cons Pvt. Ltd. joined hands with the state government of Andhra Pradesh to build a 25-storied building complex that would become the trade center for the twin cities of Hyderabad and Secunderabad. Shreyas, an experienced and able project manager, was entrusted with the construction project. At an interim stage of the project, he decided to get a project audit done. The project auditor conducted the first two levels of audit. She reported that sufficient technical details were not available from these audits. So, Shreyas decided to conduct the next level of audit. Explain how these levels of audit are different from each other.

The auditor should explore ways in which he/she can enhance the effectiveness, efficiency, and value of the auditing process. The audit report format depends on the nature of the project under evaluation and the purpose of evaluation. Though some project managers prefer complex and custom-made audit report formats, the structure of the audit report should always be simple and straightforward as it makes it easy for the project manager and the top management to understand and comprehend. The management should prepare a distribution list if the audit report is to be distributed within the organization. Restricted distribution may attract every individual, thinking it as a confidential report, which might in turn lead to interpersonal and intergroup conflicts.

Focus of the report should be on deviations of actuals from the plans, along with explanations and comments. Such a structure would aid the management to identify project-related problems easily. The audit report should not include negative comments about the people involved in the project. The content in the report should be limited to the project-related information and issues. The report should be written in a professional style without any scope for emotional overtones.

Following are the various information items to be included in a typical audit report.

Introduction: This section should present the project's framework. It should include a clear representation of the project objectives. An appendix should be added to the report providing additional information on the project objectives in case of highly complex objectives.

Present project status: The project's current status has to be reported when auditing the project. This section should include the following performance measures.

- *Cost***:** The actual costs are compared with the planned costs in this section. The report should mention the timeframe during which the comparison is made. It concentrates on computing the project's direct costs. A cost data sheet should be given as a supplementary table to highlight the project's total costs along with the overheads.

- *Schedule***:** This section reports project performance in terms of the milestones accomplished. The auditor must clearly report the completed tasks, pending tasks, and the percentage of work completed.

- *Progress***:** This section compares the completed tasks with the resources utilized. The report should have adequate information to help the project manager to zero in on the activities that are the sources of the problem, and estimate the time and expenditure required to complete the remaining project.

- *Quality:* The significance of quality as an evaluation factor depends on the nature of the project. Quality refers to all the features and characteristics of a product or service which bear on its ability to satisfy a stated or implied need.

These needs, in terms of projects, are pre-specified characteristics. If detailed quality specifications are attached to a project, this part of the project status report should contain a detailed review of the quality control procedures, along with the latest results of the quality tests conducted.

Future project status: This includes the project evaluator's conclusions, the project's progress, and makes suggestions about the pending tasks. Audit report does not rewrite the existing project proposals, but provides guidance to future projects.

Critical management issues: This section should address all the important issues that should be continuously monitored by the top management; should explain the link between the critical issues and the project objectives; and should briefly describe the time, cost, and performance trade-off. This helps the management to make decisions in future projects.

Risk analysis: This section describes all the major risks involved in the project; discusses the impact of these risks on the project's time, cost, and performance. The report can recommend an alternative course of action for minimizing risks.

Limitations and assumptions: This section can be included in the introduction or can be placed toward the end of the report. While the audit report's accuracy and timeliness depends on the project auditor, the top management is responsible for the interpretation and actions taken based on the information given in

the report. Therefore, it is important to state the limitations of the audit report's validity.

15.10   Conservation and Utilization of Resources

Control aims at regulating the results through alteration of activities and the proper utilization of organizational assets. The project manager should simultaneously act as a conservationist and should guide the organization's physical assets, its financial resources, and its human resources. The process of conserving these three different kinds of assets is different and so must be done carefully.

15.10.1 Conservation of Physical Assets

Physical asset control deals with asset maintenance, asset replacement, and quality of maintenance. Asset maintenance can be either preventive or corrective. If the project uses considerable amounts of physical equipment, the project manager may have a problem setting up maintenance schedules to keep the equipment in operating condition. Physical inventory (equipment or material) should be controlled. It must be received, inspected (or certified), or possibly stored carefully before use. All the records of incoming shipments should be validated carefully so that payment to suppliers can be authorized.

15.10.2 Conservation of Financial Resources

It is difficult to track the expenses incurred on larger and more complex projects, and also difficult for the project sponsor to work out the project's correct financial health before it becomes too late to fix problems economically. Financial control tools like current asset controls, project budgets, project accounting, and capital investment controls are used to conserve and regulate financial resources. These controls are exercised through a series of analyses and audits. Project audits help in assessing the project's exact financial health, the project's output, the suitability of the technical approach, the accurateness of the project plan, and the practices being followed in the project.

15.10.3 Conservation and Development of Human Resources

The manpower requirement of a project depends on the project's nature. Proper planning should be done regarding manpower requirements for each stage of the project at the inception of any project.

Human resource control requires controlling and developing members. Projects provide an effective platform for gathering people, and they have to be utilized carefully. Measures like employee appraisals; personnel performance indices; and screening methods for appointment, promotion, and retention are taken up to ensure proper quality of manpower for a project.

Example: Automation in the Pulp and Paper Industry

ITC's Bhadrachalam Paperboards has undertaken a study for selecting appropriate solutions to efficiently and productively reduce environmental pollution and water, energy and raw material consumption. Post study the management has decided to go for process automation enabled by AI/ML communication and self-monitoring as it would give required results. Further Real-time monitoring and communication between machines would reduce the need for human intervention. Data-driven decision-making and actions would result in overall improvement in system performance and end-product quality. The greatest challenge in Automation was combining the workforce and technology in an efficient and ergonomic way. Automation has empowered frontline workers with relevant skills, and use of mobile computers and wearable scanners helped to gather data on a real-time basis.. Automation has connected workers, machines, , data and workflows and thus created a more natural and comfortable working environment.

Source: Haber May 3, 2022 https://www.haberwater.com/post/automation-in-the-pulp-and-paper-industry Accessed on 16.11.2022

Check Your Progress - 2

6. The course of action in a project very often changes from that originally planned. Which of the following are the three key concepts associated with overall change control?
    i. Change control systems
    ii. Configuration management
    iii. Earned value analysis
    iv. Scope creep
    v. Cost summary table
    a. i, ii, and iii
    b. i, iii, and iv
    c. i, ii, and iv
    d. ii, iii, and iv
    e. ii, iv and v

7. In designing an effective change control system, what describes every alteration in the project should be prepared against which an approval letter has to be obtained?
    a. Work Breakdown Structure
    b. Statement of work
    c. Contingency run down curve
    d. Change order
    e. Critical path method

8. Identify a brief review of the project that carried out within a limited time period and with only a few resources.

    a. Project audit

    b. General audit

    c. Technical audit

    d. Follow-up audit

    e. Cost audit

9. Which of the following are the information items provided by a typical project audit report?

    i. Present project status

    ii. EV Analysis

    iii. Quality

    iv. Risk analysis

    v. Critical management issues

    a. Only i and iv

    b. Only ii, iii, and iv

    c. Only i, iii, iv, and v

    d. Only ii and v

    e. i, ii, iii, iv, and v

10. Though a formal audit report can be presented in various formats, there are certain aspects that have to be contained in the report. Identify the aspect(s) which should not form a part of the audit report.

    i. Present status of the project

    ii. Future status of the project

    iii. Status of crucial tasks on which the success of a project depends

    iv. Any negative comments about the people involved in the project

    v. Chances of the project failing or running into losses

    vi. The limitations, assumptions, or constraints that have an impact on the audit data

    a. Only iv

    b. Only iii and v

    c. Only iv and vi

    d. Only ii, iv, and v

    e. Only v

15.11   Summary

- The main purposes of project control are -- to plan and organize the project in order to achieve the objectives of effectiveness and efficiency; to execute the project so that its performance is as close as possible to the planned schedule, budget, and specifications; and to suitably revise the project plan, when required.

- The project overview statement describes what the goal of the project is and how it will be achieved. The approved project overview statement provides the basis for effective project control, and guides the project manager's decision-making for planning, organizing, and executing the project.

- Project plan development includes schedule development, resource planning, cost estimation of each resource, and cost budgeting of activities.

- Preparation of the overall project plan also involves: establishing the quality standards and identifying the ways of ensuring quality assurance; planning for staff acquisition; identifying the roles, responsibilities, and reporting relationships among the project team members; determining the communication needs of different stakeholders and ways of addressing them; risk identification and evaluation; etc.

- Project-driven organizations usually adopt the matrix organization structure that combines the advantages of the pure functional organization structure and the product organization structure.

- In the project execution stage, the project manager should review the project's progress in a timely and phased manner in order to take corrective actions, if required.

- Project execution can be controlled using methods and tools like project review, cost monitoring and control, schedule control, Earned Value analysis, progress measurement, productivity measurement, and progress reporting.

- The project's course can deviate from the plan due to external or internal factors. These changes should be kept in view to control the project's cost. Change control systems, configuration management, and scope creep are three key concepts associated with overall change control.

- Overall change control also includes scope change control, schedule change control, and cost change control. A formal change control system can minimize the risks associated with change.

- Project audit involves detailed inspection of the management of a project, its methodology, techniques, procedures, documents, properties, budgets, expenses, and level of completion. Some of the important considerations in project auditing are the depth of the project audit, timing of the project audit, and the content and format of the project audit report.

- The project manager should at the same time, become a conservationist; and should conserve and properly utilize the organization's physical assets, its financial resources, and its human resources.

15.12   Glossary

Change Requests: Change requests occur in different ways. They may be external (like government regulations) or internal (like errors in defining the scope) to the project, oral or written, legally mandated or optional.

Configuration Management: Configuration management is a documenting procedure that is used to ensure that the description of the project output (product or service) is accurate and complete. It documents all physical and functional characteristics of the project outputs and records any change in these characteristics.

Discounted Cash Flow: Discounted cash flow is an approach to evaluate the value of a project using the time value of money. The Net Present Value (NPV) method and the Internal Rate of Return (IRR) method are two popular techniques used in this approach.

Earned Value Analysis (EV): EV is a method for evaluating the progress and financial analysis of a project. The term "earned value" represents the value earned from a project as and when the activities are completed. The EV is a common and consistent unit to measure the progress and cost performance of a project or any activity.

Process Reviews: Process reviews are conducted to determine whether the processes are going on as planned and whether any improvements are possible. The two objectives of process reviews are: to preserve the performance of project processes that are going on well and to improve the processes that are below standard.

Progress Measurement: Progress measurement calculates the percentage of project completed. Progress measurement should always reflect tangible work and not time expended.

Project Auditing: Project auditing can be defined as the process of detailed inspection by the management of a project, its methodology, its techniques, its procedures, its documents, its properties, its budgets, its expenses, and its level of completion.

Project Impact Statement: A project impact statement is prepared after a requisition for a change is made. This statement identifies various alternative actions along with the pros and cons of each. The client then chooses the best alternative.

Project Management Information System (PMIS): The PMIS is used to collect, analyze, and share project-related information. It is an invaluable tool for sequencing, scheduling, and tracking activities, especially in complex projects.

Project Overview Statement (POS): A POS is a precise description of what the goal of the project is and how it will be achieved. It is also known as the 'project scope statement', 'statement of work', 'initial project definition', or 'document of understanding'.

Project: A project is a temporary endeavor undertaken, to create a unique product or service. It is defined as a unique set of coordinated activities, with definite starting and finishing points, undertaken by an individual or organization to meet specific objectives within defined schedule, cost, and performance parameters.

Schedule Change Control System: A schedule change control system describes the procedures by which project schedules can be modified. The methods include redrawing the project network diagrams and understanding the proposed changes.

Scope Change Control: The scope change control is the process of controlling the changes in the project scope that occur at various stages of the project life cycle. It involves identifying the changes in the scope and managing the factors that cause scope changes to see that the changes are advantageous to the project.

Scope Creep: Scope creep refers to the changes that can occur in the project scope during the course of implementing the project due to many different reasons related to the external environment.

Status Reviews: Status review is the most common and frequently conducted review in organizations taking up projects. A status review is usually conducted at two levels- cursory review and comprehensive review. A weekly cursory and a monthly comprehensive review are usually conducted for projects of one-year duration.

Types of Autonomy: Autonomy is of two types: operational and strategic. Operational autonomy brings in a sense of fulfillment when the project is completed and promotes the feeling of ownership in the employees. Strategic autonomy links individual aspirations to the organizational objectives.

Work Breakdown Structure (WBS): The WBS is a deliverable-oriented grouping of project elements that organizes and defines the total scope of the project.

15.13 Self-Assessment Test

1. Project management must focus on the ways to manage the resources required for successfully completing projects and fulfilling the project sponsor's objectives. State the various factors that have a major impact on the success of a project.

2. The project overview statement is a precise description of what the project goal is and how it will be achieved. Explain. In what way does the project overview statement act as the basis for controlling a project?

3. In the project execution stage, the project managers should review the project's progress in a timely and phased manner, and take corrective action, if required. What are the various tools and methods that aid in monitoring and controlling projects during this stage?

4. A project's course of action changes from the original plan due to various reasons. What are these reasons? How can these changes be tracked to control the project cost?

5. A project audit is a key step in the process of closing a project. Explain. What do you understand by the depth and timing of the project audit? Explain the various components of a project audit report.

6. Explain the following:

   a. Ways in which a project plan acts as the primary control mechanism

   b. The role of project members in controlling a project

   c. Role of the project manager as a conservationist.

15.14 Suggested Reading/Reference Material

1. Stephen P Robbins, David A. De Cenzo and Mary Coulter (2022). *Fundamentals of Management: Essential Concepts and Applications,* Fifteenth Edition| Pearson Paperback, 30 June 2022.

2. Subhash Chandra Das (2019). Management Control Systems – Principles and Practices, PHI Learning Pvt. Limited, Paperback – 15 July 2019.

3. Pravin Durai (2019). Principles of Management: Text and Cases, First edition, Pearson India Education Services Pvt. Ltd.; Second edition (31 August 2019).

4. Merchant, Kenneth A (2017). "Management Control System: Text and Cases", Pearson Education Asia.

5. Saravanavel, P (2022). Management Control Systems – Principles and Practices. First edition, Himalaya Publishing House.

15.15 Answers to Check Your Progress Questions

1. **(a) It performs the control task**

   Perform Task/RCT or PT/RCT-this simply means the unit performs the control task.

2. **(b) Only i, ii, and iv**

   Project reviews give the project manager and the organization a chance to resolve problems before they get out of hand, or to improve the way in which the projects are being handled. The project manager conducts reviews to find out: if the project can accomplish the business goals; whether the rules of the organization have been understood properly and

implemented; and whether the project is being managed effectively and the team members are sure of completing it by following the guidelines. Developing a project schedule helps study the cash flow of the project and to check if the budget of the project supports the schedule.

3. **(a) Cost summary table**

    The project management team should maintain a cost summary table to keep records of the costs incurred. The cost summary table integrates all the costs pertaining to the project like the engineering costs, construction costs, etc. Details of the original budget, the current budget, expenditures incurred till date, and forecasts of expenditures for the various cost categories are entered in the cost summary table. This table can be referred to for finding out the financial status of the project.

4. **(a) Critical path method**

    The time taken for project completion is estimated during the planning phase using the Critical Path Method (CPM). Cash flow tracking chart helps to understand how much cash has already been used and how much is left for a particular period and particular activity. A milestone tracking chart helps the project management team track milestones, that is, completion of activities. Contingency planning is also one of the techniques used for cash control and it involves setting some amount aside in the budget to meet unplanned events.

5. **(b) Fine-tuning**

    The productivity of the project does not remain constant throughout the duration of the project. It is low in the initial stages of the project due to the time taken by the employees to streamline the activities and high in the middle phase of the project as they get proficient in the activities of the project by then. The productivity falls in the final stages of the project duration as a result of the fine-tuning activities undertaken in this phase.

6. **(c) i, ii, and iv**

    The three concepts associated with overall change control are: change control systems, configuration management, and scope creep. The change control system includes tracking systems and approval procedures necessary to authorize the changes. Configuration management is a documenting procedure that is used to ensure that the description of the project output (product or service) is accurate and complete. In the course of implementing the project, many changes can occur in the project scope due to many different reasons related to the external environment, user requirements, etc. This is referred to as scope creep.

7. **(d) Change order**

    A change order that describes every change in the project should be prepared. This must include a description of the changes that have been agreed upon, along with corresponding changes in the plan, budget, schedule, and output. An approval letter must be obtained, both from the client's agent and senior management's representative, on the changes to be implemented. The project manager should ideally be consulted before the change order is finalized.

8. **(b) General audit**

    The general audit is usually a brief review of the project, carried out within a limited period and with only a few resources. It touches on all the six dimensions of the auditing report - the present status of the project, the future status, the status of the crucial tasks, assessing the risk, information relating to other projects, and the limitations of the project.

9. **(c) Only i, iii, iv, and v**

    The typical information items that an audit report provides are: introduction, present project status, quality, future project status, critical management issues, risk analysis, and limitations and assumptions.

10. **(a) Only iv**

    The aspects that have to be contained in an audit report include the present status of the project, its future status, the status of crucial tasks on which the success of the project depends, the chances of the project failing or running into losses, the lessons that can be learnt from the project audit that can be used in the future to improve the management of other projects of the organization; and the limitations, assumptions, or constraints that have an impact on the audit data. The audit report should not make negative comments about the people involved in the project.

Unit 16

Management Control of Research and Development

Structure

"Research is something that everyone can do, and everyone ought to do. It is simply collecting information and thinking systematically about it."

- Raewyn Connell, Australian sociologist and Professor Emeritus

16.1   Introduction

Research and Development (R&D) is a key factor that contributes to the success of any organization in the sectors of biotechnology, defence, pharmaceuticals, manufacture of mobile phone devices, etc. In this unit, we shall learn the management control of research and development projects in an organization.

In the previous unit, we discussed the management control of projects. In this unit, we shall discuss the management control of Research and Development (R&D).

Edwin Mansfield in his article, "*How Economists See R&D"* wrote, "Management is the art of dealing intelligently with uncertainty. Within that, the aspect (though little) that comes within the purview of management is either more uncertain, or more important to a company's future, than the many activities known collectively as R&D." Research and Development (R&D) is a key factor that contributes to the success of any business organization. Specifically, organizations which

operate in sectors like biotechnology, defence, pharmaceuticals, manufacture of mobile phone devices, etc., depend heavily on the success of their R&D operations.

This unit will first explain the different dilemmas faced by organizations in controlling research and development. We shall then move on to discuss the impact of culture on R&D and innovation. We shall also discuss the different methods used for measuring and controlling R&D. Finally, we shall discuss the different methods used in management control of new product development.

16.2   Objectives

After studying this unit, you should be able to:

- Explain the different dilemmas faced by organizations in controlling research and development

- Discuss the impact of culture on R&D and innovation

- Identify the different methods used for measuring and controlling R&D

- Recognize the different methods used in management control of new product development

16.3   Dilemmas in Controlling Research and Development

Planning and monitoring the R&D function involves the following dilemmas:

- Designing the projects in such a way that the objectives of both the organization and the customers are met

- Planning and monitoring the R&D activities and making the people in the R&D function responsible for the activities they undertake

- Viewing R&D as strategic infrastructure and not merely as a collection of projects and activities.

16.3.1 Linking R&D Activities to Organizational and Customer Needs

The availability of suitable technical expertise, clarity on what the organization and customers want, and the availability of adequate financial and material resources are some factors to be considered for R&D activities to be successful. Often, there are discrepancies between what the marketing function expects and what the R&D function can deliver. In such cases, there are chances of the organization's technological expertise being either under-utilized or over-utilized. Also, the R&D managers may adopt a mechanical approach toward the project and this can result in delays. Both these situations may lead to a misalignment between the objectives of the organization and that of the R&D function. Some of the likely problems that could arise in such situations and a few solutions to avoid such problems are given here.

Collection of relevant data from the marketing function

Marketing activity compiles lot of data . R&D must ensure the relavant data is picked up and used to meet the organizational and customerneeds. The following are some of the points to be followed:

- To link R&D with customer needs

- Accurate data needs to be collected from the marketing function which explicitly defines the customers' needs

- The data needs to be passed on to the R&D function so that the R&D personnel can analyze the technical aspects required to meet the customers' needs.

Integrating R&D with other organizational functions

Key people from core functions such as marketing, manufacturing, finance, and even the senior management must be involved in the selection of the research and development activities. But organizations face some problems while integrating different organizational functions. The problems faced by organizations and the possible solutions are described in Table 16.1.

Table 16.1: Problems in Integrating R&D and Other Organizational Functions

Problem	Solution
Differing time frame concerns between manufacturing, marketing, and other functional managers (short-term) and R&D managers (long-term).	Creating open communication between the R&D manager and the managers of other functions regarding strategies.
Discrepancy in the way the developer of the technology and the user of the technology look at the technology.	R&D managers can try to apply the technology in a way that the user expects it to be used.
Lack of available expertise to integrate R&D with other functions.	Hiring the right people; imparting necessary training to executives.
Disagreement on control.	There should be proper negotiation to avoid this situation.
Disinterest among R&D personnel and the functional managers to create the link across departments.	Change in attitude or change of personnel assigned to key positions.

Source: ICFAI Research Center

Ensuring commercial viability

To ensure commercial viability, managers can follow certain tenets. Some of them are:

- All managers should jointly decide on when the R&D project must begin.

- When preparing the technology plan, the R&D managers should also consider factors that will make the product commercially viable.

- During the planning stage, the R&D managers should also include the available technology and expected customer needs mentioned by the other functional departments.

- The availability of resources is a key factor that has to be kept in mind while planning and deciding on the priorities.

Example: Bharat Biotech to get CEPI Funding for Development of 'Variant-Proof' COVID Vaccine

Coalition for Epidemic Preparedness Innovations (CEPI), has provided $19.3 million funds to Bharat Biotech the maker of COVID-19 vaccine 'Covaxin', for development of a 'variant-proof' SARS-CoV-2 vaccine. Bharat Biotech was famous for its world-class research capabilities. Bharat Biotech developed several breakthrough vaccines and bio-therapeutics including the world's first typhoid conjugate vaccine and recombinant Hepatitis B vaccine. As a research-led company, Bharat Biotech believed in practising the highest standards of integrity. It brought scientific rigour to all stages of product development from discovery and development to clinical trials and manufacturing. With complete adherence to IPR, Bharat Biotech worked collaboratively with academic and research institutions to undertake fundamental research that helped it address unmet conditions and improve public health.

Source: https://www.businesstoday.in/coronavirus/story/bharat-biotech-to-get-cepi-funding-for-development-of-variant-proof-covid-vaccine-333035-2022-05-10; Accessed on 19/06/2022

16.3.2 R&D Project Planning and Control

An R&D project, like any other project, is characterized by time and budgetary constraints as well as the need to meet the technical objectives of the R&D function. R&D project planning and control help organizations in effectively utilizing their R&D resources to achieve their business objectives. R&D managers and employees may resist R&D planning and management if they are more concerned about science and technology than about managing the R&D function. Resistance also comes from people who think that planning and managing R&D would reduce creativity and who feel that luck plays a big role in outstanding products or services being brought out. Some people also feel that only the development aspect in research and development should be planned and monitored.

R&D project plan constituents

The project plan and implementation follow the guidelines given below.

- Technical objectives of the R&D function.

- Issues that the R&D function will have to face during the research and development phase.

- Evaluation methods to be used to verify the results obtained.

- Intermediate technical targets that have to be achieved in order to attain the final technical objectives.

- Time frame within which those targets have to be achieved. Budgets required to achieve these targets.

- People who will be responsible for the completion of the project. Each person's role should be decided in such a way that they know when and what part of the project they have to undertake.

R&D project control

To ensure effective control of R&D projects, managers should:

- Set intermediate targets that need to be attained in order to achieve the final technical objectives.

- Monitor and assess intermediate targets keeping in mind factors like the relevance and quality of the information that is collected in the process of reaching the intermediate target.

- Continuously monitor the time frames and budgets allocated to the project Use certain R&D assessment systems.

16.3.3 Viewing R&D as Strategic Infrastructure

R&D capabilities and outputs should be viewed as strategic infrastructure and not as just a function or a collection of projects. It provides a competitive advantage due to the emphasis on the value of knowledge, competencies, and brand names. Every organization has a distinct set of competencies, intangible assets, etc., which decide the efficiency and effectiveness of the activities performed by each department. The success of the organization depends on the quality and quantity of the resources it possesses. It is, therefore necessary to evaluate the value of this strategic infrastructure and this evaluation poses a managerial dilemma.

16.4   Impact of Culture on R&D and Innovation

R&D outcomes are highly dependent on the capabilities of the people involved and their attitudes and ability to work together in teams. The R&D function being an integral part of any organizational set-up is influenced by the prevalent organizational culture. Organizational culture determines the nature of decision-making, communication, and conflict resolution. The culture of the country in

which the organization operates also has an influence on the organizational culture.

Example: Diversity in Tech: How Companies are closing the Gap?

Salesforce company want to achieve gender equality and diversity by allowing a sense of pride to employees. All employees were allowed to express themselves as part of a tolerant and inclusive company. The company had three R&D sites in Israel-Tel Aviv, Petah Tikva and Nazareth, with people employed from all domains and all parts of the world.

Salesforce created equality groups of employees with similar life experiences to promote a common goal. They are: Arabforce, Vetforce, Abilityforce, Earthforce, Faithforce, Outforce and SWN (Salesforce Women Network). These Equality groups at Global Level have organized activities and workshops as well as collaborated with Tsofen an Organisation which aspired to promote high-tech sector in the Arab community.

Source: Geektime, 22nd May, 2022, https://www.geektime.com/diversity-in-tech-how-companies-are-closing-the-gap/ Accessed on 19/06/2022

16.4.1 National Culture and R&D

The R&D function is greatly influenced by the national culture, which has an impact on the organizational structure and design. The impact that national culture may have on the R&D structure is greatly dependent on the type of research that an organization undertakes.

Types of research

Research may be of three types: basic research, applied research, and development research. Further, these different types of research are categorized on the basis of attributes like the level of 'task uncertainty', 'task inter-dependence', and 'size'. Apart from these attributes, environmental factors such as market forces and commercial pressure play an important role in deciding the impact of culture on the structure of R&D.

R&D structures

R&D structures are created in such a way that they integrate both knowledge and creativity. Anneke Offereins and Ben Fruytier studied the impact of national culture on seven structural factors (tasks, cooperation, conflict, autonomy, decision-making, leadership, and reward and appraisal systems) in the organization.

Based on how the tasks are structured and how the employer-employee relationship is built, there are three different types of structures that are possible for the R&D function: production structure, control structure, and employment relationship. Refer to Table 16.2 for the characteristics of these structures.

Table 16.2: R&D Structures

R&D Structure	Characteristics
Production structure	• This includes factors like the tasks, cooperation, and conflict situations in the organization. • This structure deals with distribution of tasks to employees.
Control structure	• This includes factors like autonomy, decision-making, and leadership. • It deals with task coordination and finding out who takes the final decisions.
Employment relationship	• This includes factors like reward and appraisal systems.

Source: ICFAI Research Center

Dimensions of national culture

Considering the dimensions of national culture as mentioned by Geert Hofstede, Table 16.3 briefly describes the cultural dimensions that affect R&D structures. Of the seven structural factors, autonomy was found by Offereins and Fruytier, to be the most affected by national culture.

Table 16.3: Geert Hofstede's Dimensions of National Culture*

Dimension	Definition
Power distance	Acceptance of hierarchical levels, that is, inequality in the distribution of power.
Uncertainty avoidance	Avoiding risk and ambiguity
Masculinity/femininity	Higher masculinity shows higher competitive spirit, independent thinking, assertiveness, etc. while higher femininity shows higher inter-dependence, nurturing nature, etc.
Individualism/collectivism	People's preference to work as individuals or in a team.

* More details regarding these dimensions have been provided in Unit 1.

Source: ICFAI Research Center

It was seen that R&D personnel from national cultures that rank high on power distance and uncertainty avoidance, prefer less autonomy and a strong leadership accompanied by appropriate reward and appraisal systems. R&D personnel from a national culture that ranks low on power distance and uncertainty avoidance and high on femininity prefer greater autonomy and decision-making authority.

They also prefer a leadership which is nurturing and not dominating. This seems to foster higher creativity and innovation.

16.4.2 Organizational Culture and Innovation

Innovation is a critical factor that enables an organization to gain a sustainable competitive advantage in a highly dynamic and competitive business environment. Rising R&D expenditure and the costs of acquiring patents act as a constraint on organizations. Instead of formal controls, a more effective method of managing innovation would be through appropriate organizational culture. In their study conducted on eight biotechnology organizations, William Q. Judge, Gerald E. Fryxell, and Robert S. Dooley tried to identify the type of organizational culture that fosters innovation and the steps managers can take to ensure that kind of culture is created and sustained within the organization.

Organizational culture fostering innovation

According to Judge and Dooley, organizations which are successful in making the employees feel like family or imbuing them with a sense of belonging are better innovators than organizations that used formal methods of control. Creating a goal-directed community in the R&D function, in which the objectives are set by the top management but the ways to achieve the objectives are decided by the employees, will help in fostering innovativeness. Organizations which develop such communities are more inclined toward empowerment than control.

Managerial actions to foster innovativeness

To foster and manage innovativeness in the organization, managers have to undertake activities such as:

- Ensuring balanced autonomy: In organizations that scored high on innovation, the employees of the R&D function enjoyed operational autonomy while the strategic autonomy was left to the top management. This created a balanced distribution of autonomy.

- Integrating technical skills and teamwork: Highly innovative organizations believe in having objectives that are realistic and not too rigid timelines, and in providing a chance for interaction to take place between people.

- Creating personalized recognition/reward systems: Highly innovative organizations have been observed to depend more on the intrinsic reward systems, which help in motivating the employees to be more creative.

Activity 16.1

Technocrat Electronics (TE) is a company which manufactures electronic consumer durables. It is known for the unique products it brings out every year invoking surprise and delight among consumers. Innovation is critical to the

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success of the company. Describe the tenets of an ideal culture that will foster and manage creativity in a company like TE?

Answer:

16.5 Measurement and Control of R&D

R&D performance measurement is a component of the R&D control process. Performance measurement is particularly difficult for the R&D function because it is a complex process which is rapidly and continuously changing. There is also the problem of extended time frames, that is, the time taken for the results to fructify is high. There is also an opinion among R&D personnel that if the R&D function is controlled, the level of creative freedom will be lower. Performance measurement of the R&D function is important because of the large investments organizations make in R&D to build their strategic infrastructure and gain a sustainable competitive advantage.

Example: R&D Spending and Profitability: What's the Link?

Apple was able to exploit R&D investments across multiple products, - Mac desktop, laptop computers, iPod, iPhones, plus Apple TV products. Apple always developed technologies to complement one another. For instance, an R&D investment made to enhance the iPhone operating system, had not only benefited range of its smartphones but also its iPod Touch devices. Interestingly Apple's strategy to apply fairly concentrated R&D to a broad spectrum of markets was responsible for the company's very high return on research capital. The productivity of R&D was the primary reason to generate high profits for the company and ultimately increased share price. Return on Research Capital (RORC) was used to track technology companies' R&D productivity and also gave investors a clue about likely fluctuations in share value.

Source: Ben Mcclure, 31st January, 2022, https://www.investopedia.com/articles/fundamental-analysis/10/research-development-rorc.asp Accessed on 19/06/2022

16.5.1 Types of Controls

Margaret A. Abernethy and Peter Brownell used the Perrow model to explain the use of financial, behavioral, and personnel controls in the R&D set-up. The Perrow model suggests two aspects that can be used to differentiate activities:

- Presence or absence of standard methods for performing the activities -- 'task analyzability'

- Level of diversity in the activities present -- the 'number of exceptions'.

Both these aspects put together come under 'routineness' of task. Routine tasks are tasks that have standard methods of performance and a fair amount of predictability, while non-routine tasks are tasks in which there are no standard methods of performance and there is a high diversity in activities. Depending on the level of uncertainty tasks and the number of exceptions, the type of controls used differs. Table 16.4 describes the different types of controls used for R&D activities.

Table 16.4: Types of Controls

Control	Description
Financial Control	• Used in case of high task analyzability and a fewer number of exceptions. • Best suited for manufacturing units. • Difficult to incorporate financial controls in an R&D set-up as: o Link between costs incurred and the levels of activities is not clear. • Not possible to assign monetary values to all the activities.
Behavioral Control	• Used in case of clear link between inputs and outputs and fewer exceptions. • Includes a set of rules and regulations to be followed by employees in the organization. • Can be incorporated using data from the present operations.
Personnel Control	• Used in case of low task analyzability and higher number of exceptions. • Also referred to as clan controls or social controls These are self and group control processes. • Do not have rules and regulations, i.e., no formal controls. • Affects the way in which the employees are selected, the teams in which they work, and also the extent of peer group self-regulation. • Includes adoption of stringent hiring process and training and development initiatives.

Source: ICFAI Research Center

16.5.2 Systems Approach to R&D Performance Measurement

The R&D department has many components, each of which may be measured through the performance measurement system. These components make up the R&D system.

Components of the R&D system

Mark G. Brown and Raynold A. Svenson in a study described R&D as a system consisting of the components "inputs, the processing system, outputs, the receiving systems, and the outcomes". Each of these components, along with their constituents, may be measured through the performance measurement system. Table 16.5 shows the components of an R&D system.

Table 16.5: Components of the R&D System

Component	Includes
Inputs	Information, investments, facilities, people, and ideas.
Processing system	R&D functions where these inputs are converted into outputs through research and development, project reports, proposals, etc.
Outputs	Patents obtained, products launched, the new knowledge obtained, etc.
Receiving system	Departments benefiting from use of the outputs of R&D.
Outcomes	Achievements that bring value to the organization (profits gained from new products or technologies).

Source: ICFAI Research Center

Interaction between the components of the R&D system

The feedback process within the R&D system occurs at three levels.

i. Feedback from measuring the processing systems in terms of approved budget for R&D, number of proposals written, etc. helps employees to bring about necessary improvements.

ii. Feedback from outputs in terms of quality, quantity, and cost - which is measured by both internal entities (e.g., R&D managers and other departments) and external entities (e.g., patent offices).

iii. Feedback from measuring outcomes in terms of information regarding customer satisfaction obtained from the marketing department.

Figure 16.1 shows the different components of the R&D system and the feedback process.

Figure 16.1: R&D System and Feedback Process
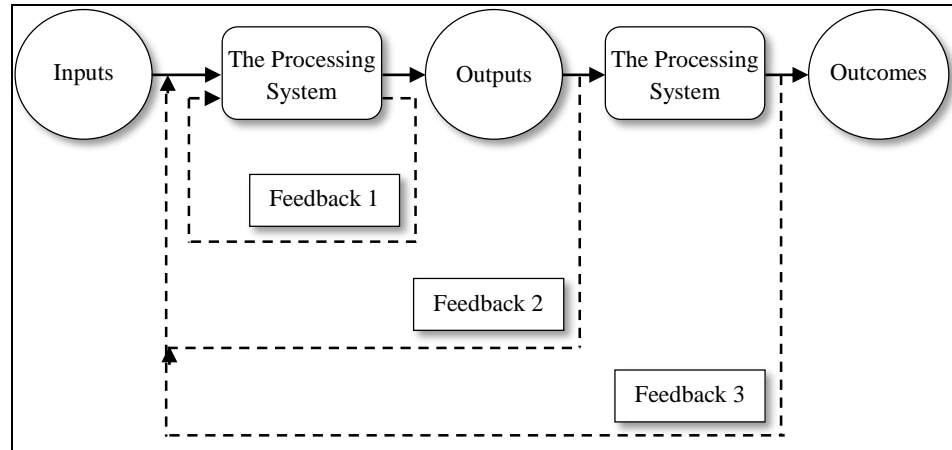
Source: ICFAI Research Center

Measuring the R&D functions is an important activity, for doing the same following factors are to be considered.

As per J.B. Quinn, some of the areas in the R&D function that can be measured are:

- Ongoing R&D activities

- R&D outcomes in terms of "expected economic value compared to costs"

- Productivity

- Eventual profits obtained from technologies used by the organization in reality.

However not always the R&D measurement systems may not yield the desired results. Some of the reasons for the failure of R&D measurement systems are given below:

- Focus on internal processes rather than outputs and outcomes of the R&D function

- High emphasis on behavioral controls

- Importance given to outputs like patents acquired and proposals written instead of on quality of output and cost incurred

- Complexity of system and large number of qualitative measures used Difficulty in estimating and quantifying the R&D function's contribution

- Difficulty in finding a link between the resources used in terms of investments and the intermediate results like the technologies discovered with the final outcomes like the products or services

- Large time gap between the research being undertaken and the product reaching the market

- Notion among R&D personnel and researchers that performance measurement curbs creativity and acts as a demotivating factor

- Intangibility of the strategic infrastructure.

Hence an effective measurement system is an important requiste in the organization. Considerations to design effective performance measurement systems include the following:

- Both internal as well as external measurements should be considered. Emphasis of measurement should be on the outputs as well as the outcomes

- For outputs, the measures should be based on quality, quantity, and cost; while for outcomes there should be an additional measure for the revenue generated. Only outputs which add value to the organization in monetary terms should be measured

- Measurement system should be simple to implement. Results should be quantifiable

- Measurement systems designed separately for research and development. Technical progress, timeliness, and costs should be measured. Productivity and ability to meet the deadlines should be measured.

16.5.3 R&D Activities and Levels of Effectiveness

Some of the aspects of R&D effectiveness are: planning effective R&D, recognizing the necessity of R&D in the market, managing the employees in the R&D function effectively, transferring technology to the production function efficiently, identifying proper financial measures for assessment of R&D, and utilizing effectively of R&D by other functions. Robert Szakonyi has given a framework for measuring R&D effectiveness which considers activities in R&D that portray effectiveness and levels of operation of the R&D department which form the basis of a measurement system.

Activities that portray R&D effectiveness

There are 10 activities that show the effectiveness of the R&D function, which are:

i. Selection of R&D: Choosing the right projects

ii. Project planning and management: Proper planning and management of projects

iii. Generation of new ideas: Availability of options from which option to select the projects

iv. Quality maintenance of projects & methods: Whether the quality of the R&D processes and methods is maintained

v. Motivating researchers: Whether the researchers and other technical people are motivated enough to take up projects

vi. Creating cross-functional teams: Whether all the functions of the organization get involved in the planning process

vii. R&D and marketing coordination: Whether the relationship between the R&D and marketing functions is good, as this helps in improving the products

viii. Technology transfer & production: Whether the technologies discovered can be scaled up for the production function

ix. R&D and finance cooperation: Whether there is open communication between the R&D and finance functions

x. R&D and business plan alignment: Whether the objectives of R&D are aligned with the objectives of the organization.

Levels of effectiveness

The different levels at which the R&D department can function show the gradual advancement of the activity from a stage of ambiguity to one of continuous improvement. These levels are assigned values from zero to five. Once all the activities have been assigned values depending on the level of effectiveness, a total of the points would give the measure of effectiveness. Table 16.6 illustrates Szakonyi's framework by describing the R&D and marketing coordination activity and the differences in approaching the activity at different levels.

Table 16.6: Levels of R&D Effectiveness - R&D and Marketing Co-ordination

Level	Value	R&D and Marketing Coordination
Issue not identified	0	R&D department denies importance of coordinating with marketing department for developing new products
Issue being addressed	1	Importance of coordination known but skills limited to the technical expertise and lack of skills for business application.
Appropriate skills available	2	Skills for developing applications from technology but lack of skills to develop technology in response to customer needs.
Proper methods used	3	Close association with marketing but lack of understanding regarding the responsibilities between technical and product concept.
Responsibilities clarified	4	Good coordination between R&D and marketing but lack of understanding regarding new product development.

Contd….

Continuous improvement in progress	5	Technical manager appointed as marketing head to help in better understanding of technologies and new product development techniques.

Source: ICFAI Research Center

16.5.4 Measuring Value of R&D

The value generated by R&D is divided into two parts:

- Value of strategic infrastructure
- Value generated by ongoing R&D projects

Assessing strategic infrastructure

As mentioned earlier in the unit, R&D cannot just be considered as a function or a collection of projects; it has to be considered as strategic infrastructure. To build on their competitive advantage, it is necessary that organizations invest in the right kind of resources and also improve on existing resources. The competitive advantage that R&D can give organizations can be tested by evaluating the resources on the following attributes.

- *Inimitability:* Test for whether the resource can be easily copied by competitors. This attribute helps in curbing the competition that the organization faces.

- *Durability:* Test to check how quickly the resource or technology is likely to become obsolete.

- *Appropriability:* Test to check who gets the benefit of the resource.

- *Substitutability:* Test to check whether another resource can serve the same purpose as that of the existing resource.

- *Competitive superiority:* Test to check whether that resource is better than that of the competitors.

Value from ongoing projects

A framework for the performance measurement of R&D for the value of ongoing projects has been developed by Vittorio Chiesa and Cristina Masella. The economic value created by an R&D project depends on the value generated by the existing or ongoing projects of the firm. This value can be depicted by the formula for NPV (Net Present Value) which will aid in identifying the performance measures to be used for the R&D department. The performance measurement system model starts with the equation:

$$NPV = \sum_{t} \frac{NCF(t)}{(1+h)}$$

------------ (Equation1)

Where,

NCF (t) = the related net cash flows

T = the forecast period, that is, the probable economic life of the R&D project

h = the hurdle rate (required rate of return)

The forecast period (T) is divided into two parts:

- The time period from the start of the project till the end i.e., year 1 to year t*

- The time period from the beginning of the utilization of the R&D outputs to the end of the planning horizon i.e., year t* to year T.

  - *Before year t**: Factors which influence the R&D activities are internal to the activity.

  - *After year t**: Factors from other functions of the organization also influence the performance of the R&D activity.

Taking the two time periods into consideration, the Equation 1 can be changed as follows:

$$NPV - \sum_{t=1}^{t^*} \frac{NCF\ (t)}{(1+h)^t} + \sum_{t-t^*+1}^{T} \frac{NCF}{(1+h)^t} \quad ----- \quad \text{(Equation 2)}$$

The net cash flows before the completion of the project [NCF (t < t*)] are the investment costs incurred at the start of the project planning horizon and are generally negative. The determined values are influenced by:

- The resource allocation decisions taken by the top management

- The effectiveness of the R&D.

The net cash flows after the completion of the project [NCF (t > t*)] incorporate the costs of engineering, manufacturing, and marketing, and the revenues earned. These cash flows are affected by the performance of the R&D function because:

- Revenues are affected by the capability of R&D to meet the technical objectives of the project.

- Costs incurred for the engineering and manufacturing processes are influenced by the level of association between the R&D and manufacturing functions.

- Amount of revenue obtained depends on the level of association between the R&D and marketing functions. The marketing function strives to give inputs to R&D regarding the customer needs and R&D functions to make necessary changes to the projects to match the products and processes to those needs.

16.5.5 R&D Audit

R&D audit is a part of the operational audit. If an organization has to constantly innovate, it has to invest heavily in research and development. The following guidelines will help an organization monitor its research and development better:

- Set a definite R&D goal
- Set aside an R&D budget every year
- Decide the extent of R&D required
- Select broad research concepts keeping in mind the organization's technological capabilities
- Involve all the employees in the decision regarding which project should be undertaken
- Conduct a trial run of the project before starting the research project on a full scale.

Evaluation of R&D activities

While conducting an R&D audit, the auditor should look into the different aspects, some of which are:

- Are the R&D objectives aligned with the overall objectives of the organization?
- Has the organization allocated a specified amount as the R&D budget, based on a detailed report of each project?
- Are the details of expenses of each project maintained separately and systematically?
- Is there control in material requisition and consumption?
- Are the R&D personnel recruited on the basis of merit and competency?
- Every R&D project may not prove to be commercially viable. Does the organization incur unnecessary expenses on projects that are not commercially viable?
- Are the R&D activities well coordinated with other functions?
- Does the R&D center have a well-stocked library and necessary equipment for conducting the research?

Check Your Progress - 1

1. What results from the discrepancies between the marketing function's expectations and the R&D function's delivery capability?

   a. Unavailability of suitable technical expertise

   b. Under-utilization or over-utilization of technical expertise

   c. Collection of relevant data from the marketing function

   d. Unavailability of adequate financial and material resources

   e. Appropriate usage of financial resources

2. Identify the R&D structure that includes the factors like tasks, cooperation, and conflict situations in an organization.

   a. Control structure

   b. Employment relationship

   c. Production structure

   d. Appraisal system

   e. Wage structure

3. Identify the option wherein you find the reasons for difficulty in performance measurement, considering R&D function in particular.

   i. R&D is a complex process which is rapidly and continuously changing.

   ii. There is a problem of contracted time-frames.

   iii. There is an opinion among R&D personnel that if the R&D function is controlled, the level of creative freedom will be lower.

   iv. Organizations invest large amounts of resources in R&D to build their strategic infrastructure and gain a sustainable competitive advantage.

   a. i, ii, and iii, but not iv

   b. i and iii, but not ii and iv

   c. ii, iii, and iv, but not i

   d. i, ii, iii, and iv

   e. i and iv but not ii and iii

4. To explain financial, behavioral, and personnel controls in the R&D set-up, the Perrow model refers to which level of diversity in the activities?

   a. Number of exceptions

   b. Task analyzability

   c. Routine tasks

   d. Non-routine tasks

   e. Standard methods of performance

5. According to the study of Mark G. Brown and Raynold A. Svenson, what are the components of the R&D system?

   a. Inputs, the processing system, outputs, the receiving systems, and the outcomes

   b. Information, investments, facilities, people, and ideas

   c. Research and development, project reports, proposals

   d. Patents obtained, products launched, new knowledge obtained

   e. Marketing, targets proposed, targets attained.

16.6   Management Control of New Product Development

Organizations look at the R&D function as a function that imparts a competitive advantage to them. This competitive advantage is obtained through the development of new technologies and products. Some approaches that are used to control new product development are: the Stage-Gate™ approach, application of the balanced scorecard, and the concept of concurrent engineering.

16.6.1 Stage-Gate™ Framework

The Stage-Gate™ approach, as described by Robert Cooper in 1993, considers the new product development as a process which involves certain stages right from the generation of a concept to the launch of the product in the market. The Stage-Gate™ framework enables an organization to reduce the time for new product launch and increase the effectiveness of the launch. The most commonly used Stage-Gate™ framework has six stages and five gates. Each stage represents a set of activities that are included as part of the new product development project. These stages incorporate aspects such as customer preferences, quality of product, product-market fit, etc. The gates in the framework are the places where the project is evaluated for quality through a stringent reviewing process. These gates help in differentiating between valuable and less valuable projects and indicate the required inputs and the expected outputs, that is, inputs for the next gate. Table 16.7 describes the different stages and gates.

Table 16.7: Stage-Gate™ Framework

Stage	Gate	Description
Stage 1		Assessment of the idea
	Gate 1	Decision to design the business plan
Stage 2		Designing of the initial business plan
	Gate 2	Decision to design the detailed plan, scrutiny, and development
Stage 3		Detail planning, scrutiny, and development
	Gate 3	Checking testability and validity
Stage 4		Testing and validation
	Gate 4	Final consent for manufacturing and launch of the product
Stage 5		Manufacturing and launching the product
	Gate 5	Decision to carry on manufacturing
Stage 6		Product support and program review

Source: https://www.stage-gate.com/about/stage-gate-innovation-performance-framework/discovery-to-launch-process/

The first four stages as described in the table are the innovation stages. The fifth stage is the commercialization stage of R&D. The sixth stage is concerned with ongoing support for the product and review of its performance in the market.

Putting Stage-Gate™ framework to use

The execution of the Stage-Gate™ framework involves certain steps which are:

- Internal evaluation, identification of issues thorough analysis of past projects, benchmarking with competitors enabling the organization to decide what is needed for the new product development process.

- Designing the new product development process on paper.

- Execution of the project - involving interaction with employees, training, designing the gate reviews, and putting the metrics in place.

It is a method to link the technology development process with the sales and marketing functions which in turn brings out the link with the customer. Focus on customer needs analysis and well integrated R&D and marketing functions help the organization in launching products which are not only customer-centric but also to launch them within a reasonable period of time.

Activity 16.2

VisionMax Pharma and Processes has launched a research project in the field of glaucoma treatment. The company follows the Stage-Gate approach to control different phases in its research projects. Describe the steps involved in putting this framework to use.

Answer:

| |
| |
| |
| |
| |

16.6.2 Balanced Scorecard

The Balanced Scorecard is a performance management system which helps in integrating the objectives of all the functions of the organization with those of the organization. It is a combination of both financial and non-financial measures which are called perspectives and are described as financial perspective, customer perspective, internal business process perspective, and learning and growth perspective. Implementing the balanced scorecard for the R&D function ensures integration of R&D with all the other functions of the organization.

Example: Business Report: Balanced Score Card and KPIs

Top Glove Corp Bhd (Top Glove) was a manufacturer and distributor of rubber gloves. During the COVID-19 pandemic, Top Glove Corporation Bhd's profitability was down due to increased input costs despite high demand for gloves and face masks. Strategically, to maintain its revenue Top Glove company's production capacity was increased by 10% and with a reduction in its capital via Share buyback. With the use of a balanced scorecard and a strategy map the company Top Glove had identified that it has to invest in digital innovations and R&D power. Digital Innovations has ensured cost-effectiveness, automation and increase in both employee success rate and productivity. CSR programs carried out around its factories had helped to diffuse wrong notion of child labor and environmental pollution while building its brand image. These initiatives had helped the company to achieve revenue targets, stakeholders (customers, employees, shareholders) satisfaction, coupled with heightened marketing,

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Source: Nive Owango, 1st April, 2022, https://csr-i.org/business-report-balanced-score-card-and-kpis%EF%BF%BC/ Accessed on 18/06/2022

Implementation of Balanced Scorecard in R&D

The integration of the Balanced Scorecard with the R&D activities involves the following steps:

- Deciding the strategic indicators for the organization

- Communicating the devised measurement system to all the business units, departments, etc.

- Creating individual scorecards for each business unit and department incorporating the relevant metrics and linking it to the measurements set at the organization level

- Matching the strategic objectives of the organizations with the metrics selected Documenting the reasons for the selection of specific metrics

- Finalizing the department level scorecard for R&D

- Passing on finalized R&D scorecard to the teams who then design the scorecard for themselves in alignment with the department's scorecard.

Integration of Balanced Scorecard and Stage-Gate™ Framework

The R&D function's metrics impact the various stages in the Stage-Gate™ framework. Each of the Balanced Scorecard perspectives can be mapped with the organizational strategic indicators and the relevant R&D metrics for various stages of the Stage-Gate™ framework. Table 16.8 brings out the link between some of the R&D metrics with different perspectives of the Balanced Scorecard.

It also brings out the link between the measures and the stages in the Stage-Gate™ framework and in turn the link between the Balanced Scorecard and Stage-Gate™ framework.

The following Table 16.8 depicts the above explanation.

Table 16.8: Balanced Scorecard in R&D Department

Balanced Scorecard Perspectives	Organizational Strategic Indicators	R&D Department Metrics; *(Relevant Organizational Strategic Indicators)*; Stages in Stage-Gate™
Financial	• Return on capital employed *(a)* • Revenue growth rate *(b)*	• R&D value creation at innovation stage; *(a,b)*; Stages 1-4 • R&D value creation at commercialization stage; *(a,b)*
Customer	• Customer retention rate *(c)* • Customer acquisition *(d)*	• Product market life cycle; *(c,d)* • Percentage of sales from new products; *(c)*
Internal Business Process	• R&D efficiency *(e)* • New product profitability *(f)*	• Average development cost per product; *(e,f)*; Stages 1-4 • Percentage of product ideas approved for a stage; *(e)*
Learning and Growth	• Employee retention *(g)* • Strategic skill coverage ratio by competency category *(h)*	• Number of patents awarded; *(h)* • Employee training duration

Source: Kakar, Adarsh. (2019). A Case for Using The Balanced Scorecard Framework at Project Stage-Gates..

https://www.researchgate.net/publication/333998677_A_Case_for_Using_The_Balanced_Scorecard_Framework_at_Project_Stage-Gates/citation/download

16.6.3 Concurrent Engineering

As per the Concurrent Engineering Research Center, concurrent engineering is a systematic approach toward the design of products and the way they are manufactured, assembled, stocked, transported, distributed, and recycled. It aims at optimizing product designs in terms of both external demands (e.g. price, quality, delivery time, delivery reliability, range, recyclability) and internal demands (e.g. cost, lead time, manufacturability, assemblability).

It covers a wide array of strategic, process, technological, and organizational integration methods to bring collaboration between R&D and other functions. It links the demands of the markets with the performance of the new product development function. Victor Paashuis and Harry Boer have suggested the New Product Development (NPD) strategy framework' to bring out the different types of integration between R&D and other functions and how they can be achieved.

Types of integration in NPD strategy framework

The type of integration between R&D and other functions could be:

- Increasing cooperation between different functions by creating cross-functional teams, sharing resources, setting goals for the teams, etc.

- Increasing the number of interactions between R&D and other functions that are involved in product design through sharing of knowledge, ideas, and analyses by way of meetings, telephone calls, etc.

- Different functions undertaking activities in a project simultaneously through informing other functions about the decisions regarding new products. This can be achieved by having standard procedures in place, increasing the number of interactions, and by having a clear set of objectives.

Methods for achieving integration

Integration of different functions is an important aspect of the new product development process. Table 16.9 lists the different methods of achieving interaction.

Table 16.9: Methods of Achieving Interaction

Method	Description
Integration through strategy	- Creating a right fit between the product and market - Designing the product according to the position the organization wants to achieve in the market and the strategies it plans to use for marketing products - Deciding a clear set of objectives for the new product development function which will help decisions regarding activities, technologies, and strategies best suited for the organization
Integration through process	- Improving the product design process through business process reengineering, choosing the right activities depending on the value created, etc. - Integrating only those activities of the new product development process which have a strong impact on the organizational activities

Contd….

Integration through technology	• Using computer equipment and transfer of critical domain knowledge, social and managerial skills, through on-the-job training or job rotation
Integration through organization	• Creating cross-functional teams, establishing a good work culture, standard operating procedures, etc.

Source: ICFAI Research Center

Check Your Progress - 2

6. According to the framework developed by Robert Szakonyi, there are certain activities that portray the effectiveness and levels of operation of the R&D function. These activities are:

    i. Project planning and management

    ii. Motivating researchers

    iii. Creating teams solely from the R&D function

    iv. Generating new ideas

    v. Coordinating the R&D and marketing functions

    a. i, ii, iii, but not iv and v

    b. ii, iii, iv but not i and v

    c. i, ii, iv, v but not iii

    d. ii, iii, iv, v but not i

    e. i, iii, iv, v but not ii

7. In assessing the strategic infrastructure pertaining to R&D, for what purpose the "inimitability" test of resources is done?

    a. Who gets the benefit of the resource

    b. Whether another resource can serve the same purpose as that of the existing resource

    c. Whether the resources can be easily copied by competitors or not

    d. How quickly the resource or technology is likely to become obsolete

    e. When the available resources can be made optimum utilization

8. Match the six stages of the Stage-Gate™ approach with their respective descriptions.

    Stages

    i. Stage 1

    ii. Stage 2

    iii. Stage 3

iv. Stage 4

v. Stage 5

vi. Stage 6

Description

p. Manufacturing and launching the product

q. Detailed planning, scrutiny, and development

r. Product support and program review

s. Designing of the initial business plan

t. Testing and validation

u. Assessment of the idea

a. i/u, ii/q, iii/p, iv/t, v/s, vi/r

b. i/p, ii/q, iii/t, iv/r, v/s, vi/u

c. i/u, ii/s, iii/q, iv/t, v/p, vi/r

d. i/s, ii/p, iii/t, iv/q, v/r, vi/u

e. i/q, ii/s, iii/p, iv/t, v/r

9. Each of the Balanced Scorecard perspectives can be mapped with the relevant R&D metrics for various stages of the Stage-Gate™ framework. Identify the R&D metrics which are relevant to the financial perspective of the balanced scorecard.

a. R&D value created in the innovation and commercialization stages of product development

b. Product market life cycle and percent of sales from new product

c. Average development cost per product

d. Number of patents awarded

e. Testing and validation

10. What is a systematic approach to the design of products and the way they are manufactured, assembled, stocked, transported, distributed, and recycled. It aims to optimize product designs in terms of both external demands and internal demands?

a. Stage-Gate Framework

b. Balanced Scorecard

c. R&D Audit

d. Concurrent engineering

e. Organizational culture

16.7 Summary

- Research and Development (R&D) is a key factor that contributes to the success of any business organization.

- There are many dilemmas that organizations face while controlling R&D: linking R&D activities to organizational and customer needs; planning and monitoring the R&D activities and making the people in the R&D function responsible for the activities they undertake; and viewing R&D as strategic infrastructure and not merely as a collection of projects and activities.

- R&D function being an integral part of any organizational set-up is influenced by the national culture and the organizational culture.

- The impact that national culture may have on the R&D structure is greatly dependent on the type of research that the organization undertakes.

- Organizational culture which makes the employees feel like family or imbuing a sense of belonging in the employees usually score higher on innovation as against organizations that use formal methods of control.

- The characteristics of 'task analyzability' and 'number of exceptions' help to decide whether to use financial, behavioral, or personnel controls in an R&D setup.

- The reasons for the failure of R&D measurement systems are: focus on internal measurements, difficulty in separating the R&D contributions to overall performance, extensive use of qualitative measures, etc.

- The performance measurement system should be designed after taking all such R&D specific issues into consideration.

- The different levels of effectiveness at which the R&D department can function are: issue not identified, issue being addressed, appropriate skills available, proper methods used, responsibilities clarified, and continuous improvement in progress.

- The value of R&D as strategic infrastructure can be judged based on parameters such as inimitability, durability, appropriability, substitutability, and competitive superiority.

- The monetary value of the ongoing R&D projects can be arrived at by calculating the net cash flows for two different time periods: the time period from the start of the project till the end, that is, year 1 to year t*; and that from the beginning of the utilization of the R&D outputs to the end of the planning horizon, that is, year t* to year T.

- Conducting an R&D audit is one of the ways of monitoring and controlling an organization's research and development activities.

- Management control of new product development is done through tools/techniques such as the Stage-Gate™ framework, the Balanced Scorecard, and concurrent engineering.

- The Stage-Gate™ framework enables an organization to reduce the time for new product launch and increase the effectiveness of the launch. The most commonly used Stage-Gate™ framework has six stages and five gates. Each stage represents a set of activities that are included as part of the new product development project.

- The Balanced Scorecard is a combination of both financial and non-financial measures which are called perspectives and are described as financial perspective, customer perspective, internal business process perspective, and learning and growth perspective. Implementing the Balanced Scorecard for the R&D function ensures integration of R&D with all the other functions of the organization.

- Concurrent engineering covers a wide array of strategic, process, technological, and organizational integration methods to bring collaboration between R&D and other functions. It links the demands of the markets with the performance of the new product development function.

- Integration through concurrent engineering can be achieved through different methods - integration through strategy, integration through process, integration through technology, and integration through organization.

16.8 Glossary

Balanced Scorecard: Blanaced scorecard is a performance management system which helps in integrating the objectives of all the functions of the organization with those of the organization.

Concurrent engineering: It is a systematic approach toward the design of products and the way they are manufactured, assembled, stocked, transported, distributed, and recycled. It aims at optimizing product designs in terms of both external demands and internal demands.

Financial Control: Financial controls are a part of the internal control system. They pertain to processes within the finance department as well as to processes in the entire organization. They ensure that the funds are used in an appropriate manner and that necessary evidence is maintained for verifying how the funds have been used. They also aim to safeguard the organization's assets and business documents.

Perrow Model: The Perrow model has been used to explain the use of financial, behavioral, and personnel controls in the R&D set-up. The model suggests two aspects that can be used to differentiate activities: the presence or absence of standard methods for performing the activities, i.e., 'task analyzability' and the level of diversity in the activities present, i.e., the 'number of exceptions'.

Stage-Gate™ approach: One of the management control approaches described by Robert Cooper in 1993, that considers the new product development as a process which involves certain stages right from the generation of a concept to the launch of the product in the market.

16.9   Self-Assessment Test

1. There are many dilemmas that organizations face while controlling R&D. Describe the different problems faced and the possible solutions with respect to each of these dilemmas.

2. What are the different dimensions of national culture that impact the R&D structures? How?

3. To foster and manage innovativeness in the organization, managers have to undertake certain activities. Describe any one of them in brief.

4. List the different types of controls that can be used in R&D. On which two factors does the choice of controls depend? How?

5. There are number of reasons why the R&D performance measurement systems fail. What are the considerations to be kept in mind to prevent such failures?

6. Describe how the value of R&D can be measured in terms of 'strategic infrastructure' and 'value generated by ongoing R&D projects'.

7. What is the significance of the stages and the gates in the Stage-Gate™ frame-work used for controlling the R&D function?

8. In the context of the R&D department, the different perspectives of the Balanced Scorecard are characterized by different strategic indicators. Match the different perspectives in Column A with the strategic indicators in Column B. Note that there can be more than one match for each perspective.

Column A: Perspectives of Balanced Scorecard	Column B: Strategic Indicators
i. Financial perspective	a. Customer acquisition
ii. Customer perspective	b. Revenue growth
iii. Internal business process perspective	c. Employee retention
iv. Learning and growth perspective	d. Innovation
	e. Market share
	f. Employee development
	g. Productivity
	h. R&D efficiency

9. Integration of different functions is an important aspect of the new product development process. What are the different methods of achieving this integration? Describe any two of them in brief.

16.10   Suggested Readings/Reference Material

1. Stephen P Robbins, David A. De Cenzo and Mary Coulter (2022). *Fundamentals of Management: Essential Concepts and Applications,* Fifteenth Edition| Pearson Paperback, 30 June 2022.

2. Subhash Chandra Das (2019). Management Control Systems – Principles and Practices, PHI Learning Pvt. Limited, Paperback – 15 July 2019.

3. Pravin Durai (2019). Principles of Management: Text and Cases, First edition, Pearson India Education Services Pvt. Ltd.; Second edition (31 August 2019).

4. Merchant, Kenneth A (2017). "Management Control System: Text and Cases", Pearson Education Asia.

5. Saravanavel, P (2022). Management Control Systems – Principles and Practices. First edition, Himalaya Publishing House.

16.11   Answers to Check Your Progress Questions

1.   (b)   Under-utilization or over-utilization of technical expertise

Under-utilization or over-utilization of technical expertise is an outcome of discrepancies between the marketing function's expectations and the R&D function's delivery. This discrepancy may be removed to some extent by collecting relevant data from the marketing function.

2.   (c)   Production structure

The production structure includes factors like the tasks, cooperation, and conflict situations in the organization. This structure deals with distribution of tasks to employees. It also brings out the level of task inter-dependence, which in turn relates to the cooperation factor.

3.   (b)   i and iii, but not ii and iv

Performance measurement is particularly difficult for the R&D function because   it is a complex process which is rapidly and continuously changing. There is also the problem of extended time frames, that is, the time taken for the results to fructify is high. There is an opinion among R&D personnel that if the R&D function is controlled, the level of creative freedom will be lower. However, it is still necessary to measure the performance of the R&D function as organizations invest large amounts of resources in R&D to build their strategic infrastructure and gain a sustainable competitive advantage.

4. **(a) Number of exceptions**

    According to the Perrow model, 'number of exceptions' is the level of diversity in the activities. The presence or absence of standard methods of performing the activities is known as 'task analyzability'. 'Routine tasks' refer to tasks that have standard methods of performance and a fair amount of predictability, while 'non-routine tasks' are tasks in which there are no standard methods of performance and there is a high diversity in activities.

5. **(a) Inputs, the processing system, outputs, the receiving system, and the outcomes**

    According to the study of Mark G. Brown and Raynold A. Svenson, the R&D system consists of "inputs, the processing system, outputs, the receiving systems, and the outcomes". The inputs of the system include: information, investments, facilities, people, and ideas. The processing system comprises the R&D functions where these inputs are converted into outputs through research and development, project reports, proposals, etc. The outputs are the patents obtained, products launched, the new knowledge obtained, etc.

6. **(c) i, ii, iv, v but not iii**

    Cross-functional teams involving all the functions should be created so that all organization functions can participate in the planning process.

7. **(c) Whether there sources can be easily copied by competitors or not**

    Inimitability tests is for whether the resource can be easily copied by competitors. This attribute helps in curbing the competition that the organization faces. E.g.: Patent protection for a new pharmaceutical company.

8. **(c) i/u, ii/s, iii/q, iv/t, v/p, vi/r**

    The Stage-Gate™ framework has six stages, each representing a set of activities that are included as part of the new product development project. These stages incorporate aspects such as customer preferences, quality of product, and product-market fit.

    Stage 1   Assessment of the idea

    Stage 2   Designing of the initial business plan

    Stage 3   Detailed planning, scrutiny, and development

    Stage 4   Testing and validation

    Stage 5   Manufacturing and launching the product

    Stage 6   Product support and program review

9. **(a) R&D value created in the innovation and commercialization stages of product development**

    For the financial perspective of the Balanced Scorecard, the metrics included for the R&D department are about the value created in the innovation and commercialization stages of the Stage-Gate™ framework. The link between the organizational objectives and the R&D department is achieved through the Stage-Gate™ framework. The future revenues and profits will depend on the value thus generated.

10. **(d) Concurrent engineering**

    Concurrent engineering is a systematic approach to the design of products and the way they are manufactured, assembled, stocked, transported, distributed, and recycled, as defined by the Concurrent Engineering Research Center. Concurrent engineering aims to optimize product designs in terms of both external demands (e.g., price, quality, delivery time, delivery reliability, range, recyclability) and internal demands (e.g., cost, lead time, manufacturability, assemblability). Concurrent engineering covers a wide array of strategic, process, technological, and organizational integration methods which bring about better collaboration between R&D and the manufacturing and marketing functions through more frequent interactions between them.

Unit 17

Control of Human Resource Management

Structure

"When people are financially invested, they want a return. When people are emotionally invested, they want to contribute."

- Simon Sinek, British American author

17.1   Introduction

Here, Simon reminding us that people at work, depending on their engagement, are emotionally invested who want to contribute to achieve organizational goals. Managing and control the employees' engagement rate is the key to reap maximum outcomes from human resource.

In the previous unit, we discussed the management control of research and development. In this unit, we shall discuss the control of the human resource management function in an organization.

An organization can be called as a 'preferred employer brand' by employees, prospective employees, and other stakeholders only if it can effectively manage its human capital. Human resource planning, the management control that is exercised on the Human Resources (HR) department's activities, and how the effectiveness of human resource management in the organization is assessed are integral to fulfilling the goal of the human resource management function.

The goal of human resource management is to help an organization meet its strategic goals by attracting, developing, and retaining employees and also by managing them effectively.

This unit will first explain the concept of human resource planning. We shall then move on to discuss how to control the functions of the HR department. We shall also discuss the various techniques for assessing the effectiveness of HRM, and the concept of workforce scorecard. Finally, we shall discuss the use of human resource information systems for control.

17.2 Objectives

After studying this unit, you should be able to:

- Explain the concept of human resource planning.

- Demonstrate on how to control the functions of the HR department.

- Discuss the various techniques for assessing the effectiveness of HRM.

- Explain the concept of workforce scorecard.

- Recognize the use of human resource information systems for control.

17.3 Human Resource Planning

Human Resource Planning (HRP) is an essential managerial function of an organization because it ensures adequate supply of human resources, proper quality of human resources and an effective utilization of human resources. It is concerned with the process of forecasting the demand and supply of human resources in the organization for the years to come.

The HR planning process primarily consists of two sets of activities - recognizing human resource needs and then fulfilling them through hiring, training, promotion, transfer, etc. The effectiveness objective of management control can be met if the HR plan conforms to the organizational strategies and corporate plans.

Micro level HR planning involves carrying out career planning for employees and succession planning for important positions in the organization. Macro level HR planning involves carrying out workforce (manpower) planning and salary planning, which requires information from each department about the workforce demand-supply situation, their demographic spread, their qualifications and competencies, attrition rate, etc. This data should be benchmarked against the corresponding data of select competitors, and assessed periodically or based on the internal and external environmental changes.

Standards are laid down at the beginning of the planning period, and are periodically reviewed. Variance analysis is carried out at the end of the planning

period in which actuals are compared with the budgets. Targets are set based on the budgets for each department. The organization's size and its hierarchical structure determine the nature of the HR planning process. The HR plan can be successful if it gains the support of the top management and the HR department, and the strong commitment and accountability of the line managers.

Example: Paytm's hiring

According to a Mint article (2020), Paytm said that because the company and its group businesses—including financing, insurance, wealth management and offline payments—have been expanding, additional tech and non-tech staff would be required. As a result, the organisation would employ 1,000 individuals.

The above information shows human resource planning of Paytm.

Source: PTI (2020), "Paytm hiring over 1,000 people to support expansion across businesses" Retrieved from https://www.livemint.com/companies/news/paytm-hiring-over-1-000-people-to-support-expansion-across-businesses-11598443305448.html; Accessed on 15th July, 2022.

17.4   Control of HR Department's Functions

The goal of human resource management is to help an organization meet its strategic goals by attracting, developing, and retaining employees and also by managing them effectively. It aims to achieve a fit between managing the organization's employees and the overall strategic direction of the organization.

Some of the areas that need to be controlled by the organization are recruitment and selection, training and development, attrition management, welfare management, and compensation management. These functions are outsourced by organizations to gain greater control over the HR processes and to achieve cost control. Metrics can be used in the control process to assess the various HR functions.

Refer to Table 17.1 for an indicative list of metrics used to measure the performance of some HR functions.

Table 17.1: Applicable Metrics for Some HR Functions

Function	Metrics[#]
Recruitment and selection	• Number of hires Cost per hire • Time taken to fill the vacancy Percentage of diverse candidates Percentage of diverse hires Interview-to-offer ratio • Offer-to-acceptance ratio

Contd….

Training and development	• Benefit-to-cost ratio Return on investment Payback period
	• Discounted cash flow (e.g., Net present value)
Attrition management	• Employee turnover rate Employee retention rate

 # This list is only indicative and not exhaustive.

Source : ICFAI Research Center

17.4.1 Recruitment and Selection

Recruitment refers to the process of inviting applications from potential candidates with the required skills and qualifications. Selection refers to choosing from among the short-listed candidates after conducting various tests.

A clear agenda must be prepared keeping in mind the expected commercial and organizational outcomes from the process. A clear tracking mechanism is required for the expected outcomes. The HR manager should clearly define the procedures of the recruitment process to ensure that the required standards are maintained. He/she should ensure that all the people involved in the recruitment process are well trained, and are aware of its specific goals and objectives. Nepotism (favoring relatives) and ethnocentrism (believing in the superiority of one's own social group) should be prevented as they can drastically affect the process' outcome.

Evaluating the results

Costs incurred in the recruitment process; the people involved; the quality of the new recruits; the final number of selected recruits; and the performance and success rates of each sourcing channel like employee referrals, staffing agencies, and job portals are the various aspects evaluated in controlling the process. Evaluation enhances the performance of the process and controls any wasteful investment.

Metrics are tracked to find out whether the recruiter and the candidate are satisfied with the recruitment process; find out the speed with which the recruitment process was conducted; and find out the number of employees recruited through consultancies, internal referrals, etc. The recruitment and selection processes should be properly linked to the induction, training, and performance management activities of the organization.

17.4.2 Training and Development

Organizations spend large amounts on training employees, and need to know how these resources are utilized. Job-impact (the effect of the training program on the employees' job performance) indicators are monitored to assess the effectiveness

of the training and development activities. Job impact measurement includes assessing the extent of impact the training program has on the employee's job performance, the extent to which the employee is using the skills gained from the training program in the job, and the problems faced by the employee in applying these skills in the job.

Tracking performance indicators over a period facilitates trend analysis that can be used as a pointer to check the effectiveness of the training and development interventions when analyzed over a long period.

Evaluating training investments

Training expenditure is considered as a strategic investment rather than as an expense. It is therefore necessary to measure the returns on the investment made on the training activities. Quantitative tools like benefit-to-cost ratio, training return on investment, payback period, discounted cash flow, and utility analysis are used.

Benefit-to-cost ratio: The benefit-to-cost ratio refers to the ratio between the program benefits (total benefits accruing to the organization from implementing the training program) and the program costs (total costs incurred on implementing the training program that include the cost of conceptualizing and designing the program, payments to trainers, expenses for hiring the venue, and other costs) of the training program. It compares the annual economic benefits from the training program with the costs incurred on it, and is used to control the costs incurred in implementing training programs. Surveys, questionnaires, interviews, focus groups, tests, observation, and performance records are some of the ways used to collect the data to measure the training program benefits. It is however difficult to quantify the intangible benefits arising from the training program.

$$\text{Benefit-to-Cost Ratio} = \frac{\text{Program benefits}}{\text{Program costs}}$$

A benefit-to-cost ratio of 1 shows that the program implementation costs are equal to the program benefits. A low benefit-to-cost ratio indicates that subsequent investments on a training program can be reduced.

Illustration 1

A training program was conducted for the managers of a large advertising firm on the new techniques being used in the field of advertising. The monetary benefits from the program were estimated to be ₹ 15 lakh. The total implementation costs of the training program were ₹ 9.5 lakh. Calculate the benefit-to-cost ratio for the program.

Solution: Program benefits = ₹ 15 lakh

Program costs = ₹ 9.5 lakh

$$\text{Benefit-to-Cost Rasio } = \frac{\text{Program benefits}}{\text{Program costs}} = \frac{₹ 15 \text{ lakh}}{₹ 9.5 \text{ lakh}} = 1.58 : 1$$

A benefit-to-cost ratio of 1.58:1 means that for every Re. 1 spent on the training program, the company was able to accrue benefits of ₹ 1.58.

Training return on investment (Training ROI): Training ROI is calculated by dividing the net program benefits (program benefits - program costs) by the program costs, and is expressed as a percentage. Training ROI gives a realistic picture of the benefits from a training program as net program benefits are taken into consideration rather than the total program benefits (taken in Benefit-to-Cost ratio).

$$\text{Training ROI (\%) } = \frac{\text{Net program benefits}}{\text{Program costs}} \times 100$$

Training ROI value is related to the benefit-to-cost ratio by a factor of one.

Illustration 2

Using data in Illustration 1, calculate the training ROI.

Solution: Program benefits = ₹ 15 lakh

Program costs = ₹ 9.5 lakh

Net program benefits = Program Benefits - Program Costs = ₹ 15 lakh - ₹ 9.5 lakh = ₹ 5.5 lakh

$$\text{Training ROI (\%) } = \frac{\text{Net program benefits}}{\text{Program costs}} \times 100 \quad \frac{₹ 5.5 \text{ lakh}}{₹ 9.5 \text{ lakh}} \times 100$$

$$= 57.89\%$$

A Training ROI of 57.89% means that the costs are fully recovered, and an additional 57.89% (of the costs) are the net benefits derived by the company from the training program.

Payback period: In the payback period method, the period for the return on investment is calculated by dividing the total investment made on the training program by the resultant net annual savings accruing from it. This method is used when organizations want to know the approximate time taken to derive ROIs in the form of benefits. Training programs that take long time to yield results can be avoided.

$$\text{Payback Period } = \frac{\text{Total investment on training}}{\text{Net annual savings}}$$

Discounted cash flow: The discounted cash flow approach uses the time value of money to evaluate a project's value. Net Present Value (NPV) method and the

Internal Rate of Return (IRR) method are two popular techniques using this approach. The NPV method compares the savings accruing each year with the expenditure required for the investment. The expected savings of each year are discounted by select interest rates. The outflow of cash is also discounted by the same interest rate. The NPV will be positive if the discounted value of the projected savings is more than the discounted value of the investment. Alternative investment options may be ranked in the descending order of the NPV. This method can be used to control the expenditure incurred on training programs by discontinuing investments which could take a longer time to show results. The investments on certain training programs which rank lower than others may be dropped.

Utility analysis: Utility analysis measures the economic contribution of the program in terms of how effective it was in identifying and modifying employee behavior, and the employees' future service contribution. It is a quantitative method that considers factors like the number of employees trained, the cost of the training program, the number of years for which the training program will continue to have an effect on a trainee's performance, and the value of the job for which the training was imparted.

Activity 17.1

The expected benefits of a training program are ₹ 10.5 lakh while the costs incurred on the training program are ₹ 8.25 lakh. Calculate the benefit-to-cost ratio and the training ROI of the program.

Answer:

17.4.3 Attrition Management

Attrition or turnover refers to the phenomenon of employees leaving the organization due to low job satisfaction, low pay, non-conducive job environment, or for better prospects. Attrition levels can be assessed through employee turnover rate and employee retention rate. These metrics are computed periodically, and the values are compared with the industry average and with the past records of the organization.

Employee turnover rate

Also known as the separation rate, the employee turnover rate measures the number of employees leaving the organization during a period as a percentage of the number of employees during the same period. It is calculated on a regular basis, usually quarterly or annually. The turnover rate calculated for each business

unit, function, or location, helps the management focus on specific areas that require attention. However, it does not differentiate between talented and experienced employees (who are difficult to replace), and employees with less experience or talent.

$$\text{Employee Turnover Rate} = \frac{\text{Number of employees leaving}}{\text{Average number of employees during the period}} \times 100$$

Illustration 3

In a company, 50 persons leave in the first quarter (January to March). The number of employees at the start of study period (January 1) was 700 and the number of people at the end of the study period (March 31) was 750. Calculate the annual turnover rate of the employees.

Solution: Number of employees at the beginning of the period = 700

Number of employees at the end of the period = 750

Number of employees who left during the period = 50

$$\text{Average number of employees during the period} = \frac{700 + 750}{2} = 725$$

$$\text{Employee Turnover Rate} = \frac{\text{Number of employees leaving}}{\text{Average number of employees during the period}} \times 100$$

$$= \frac{50 \times 4}{725} \times 100 = 27.59\%.$$

Note: The number 50 is multiplied by four to arrive at the annual turnover rate from the quarterly turnover data.

Employee retention rate

Also called as the stability index, the employee retention rate measures the extent to which the experienced workforce is retained in the organization. It is used to evaluate the functioning of the HR department with respect to the policies it follows. Retention of an experienced workforce helps keep the organizational performance consistent.

Number of employees with one or more years of experience

$$\text{Employee Retention Rate} = \frac{\text{Number of employees leaving}}{\text{Average number of employees during the period}} \times 100$$

Illustration 4

A company had 600 employees at the beginning of the year and 540 at the end. The number of new hires in this period was 60. 120 employees with different levels of experience left the organization during the period. At the end of the year,

480 employees had one or more years of experience. Calculate the employee retention and turnover rates of the organization.

Solution: Number of employees at the beginning of the year = 600

Number of employees at the end of the year = 540

Number of new recruits during the period = 60

Number of employees who left during the period = 120

Number of employees who have one or more years of experience = 480

Average number of employees during the period $= \dfrac{600 + 540}{2} = 570$

Employee retention rate $= \dfrac{480}{570} \times 100 = 84.21\%$

Employee turnover rate (for the year) $= \dfrac{120}{570} \times 100 = 21.05\%$.

Activity 17.2

A company had 1250 employees at the beginning of the year and 1190 at the end. The number of new hires in this period was 80. And the employees who left the organization are 140 pertaining to the different levels of experience.

At the end of the year, 1110 employees had one or more years of experience. Calculate the employee turnover rate and the employee retention rate of the organization.

Answer:

17.4.4 Welfare Management

Welfare measures are taken up to keep employees happy so that there is a resultant increase in their productivity. These measures can be individual measures like giving insurance benefits, and/or group measures like providing reading rooms and golf clubs to employees. In implementing welfare measures, the priority areas are identified first and funds for welfare schemes are then allocated to each area. Utilization of funds is later compared with the allocations to various areas. The organization should gauge change in employees' level of satisfaction attributable to the welfare measures, and re- examine whether the funds allocation across schemes was appropriate.

17.4.5 Compensation Management

According to the equity theory, employees will be satisfied and productive if they are paid equitably. Employees would perform negatively or would leave the organization if they perceive any inequity in the compensation. The HR department's performance can be analyzed based on equity in the design and implementation of the compensation structure. While designing a compensation structure, the following issues should be looked into:

- Pre-conceived notions of employees regarding equitable compensation.

- Comparison of the social and professional strengths (total strength) that an employee brings to the job and the satisfaction that he/she derives from the job.

- The correlation between the employee's performance and his/her compensation.

- Comparison of compensation paid for similar jobs in other organizations in the same industry or other industries.

Note: The first three issues are related to internal equity while the fourth pertains to external equity.

Internal and external equity

Internal equity refers to the perception of employees on whether they are equitably paid in comparison with their peers in the organization. External equity refers to the perception of employees on whether they are equitably paid in comparison with their counterparts in other organizations and/or industries. A negative perception of external equity may lead to high attrition rates in the organization. Internal equity influences employees' perception regarding equity more than external equity, as employees are less aware of the compensation paid in other organizations and the corresponding employment conditions.

The pay structure should be periodically evaluated to ensure that it is equitable (both internal and external) and that it is properly implemented. Both the fixed and variable components of pay should be controlled. The control of compensation management is applicable to both the fixed and variable components of pay. Payment of incentives for risks taken up by employees while meeting quantitative performance targets on behalf of the organization is an emerging area of concern.

Example: HCL's Compensation

According to Times of India article (2022), in an effort to keep talent, HCL Technologies has established a 5-year roadmap for compensation visibility for mid-level managers and freshmen.

Contd….

The company said that they have analysed the reasons behind individuals resigning the jobs and accordingly a pay pathway is created that reflected peoples' expectations.

The above information shows that HCL Technologies has changed their compensation strategy in line with peoples' perception.

Check Your Progress - 1

1. The benefit-to-cost ratio in evaluating benefits from training refers to the ratio between the benefits and the costs of the training program. Identify the statement that is true with regard to this ratio as a tool for evaluating investments in training and development.

    a. The only way of collecting the data to measure the benefits of the training program is through surveys.

    b. This ratio compares the annual economic benefits from the training program with the costs incurred on it.

    c. A benefit-to-cost ratio of 0 indicates that the costs of implementing the program are equal to the benefits from the program.

    d. Using this ratio, it is easy to measure the qualitative benefits resulting from the implementation of the training program.

    e. This ratio compares the HR cost to the profit of an organization.

2. Keeping attrition levels to the minimum is one of the key responsibilities of the HR department. Which of the following techniques are used for measuring attrition levels in an organization?

    i. Employee turnover rate

    ii. Benefit-to-costratio

    iii. Employee retention rate

    iv. Interview-to-offer ratio

    a. Only ii and iii

    b. Only i and iii

    c. Only i and iv

    d. Only iii and iv

    e. Only i and ii

3. Employee turnover rate is an important metric used in attrition management. With respect to this metric, identify the statement that is true.

   a. It measures the extent to which the experienced workforce is retained in an organization.

   b. It makes a clear distinction between the talented and experienced employees and employees with less experience or talent.

   c. It is calculated as the number of employees leaving as a percentage of the average number of employees working during a period.

   d. It is also referred to as the stability index.

   e. It explains the cost to the company.

4. Welfare measures are undertaken by organizations to keep employees happy with the expectation that there will be a consequent increase in employee productivity. Identify the ways in which welfare management can be carried out effectively.

   i. By re-examining whether funds allotted to particular welfare schemes are getting properly utilized.

   ii. By gauging the satisfaction level of the employees under the welfare measures provided.

   iii. By finding out whether funds have been appropriately allocated to each priority area.

   iv. By overlapping welfare and safety measures.

   a. Only i and ii

   b. Only i and iii

   c. Only ii and iii

   d. i, ii, and iii

   e. ii, iii and iv

5. The performance of the HR department can be analyzed based on the equity in the design and implementation of the compensation structure. Identify the aspect in compensation management that is not related to internal equity.

   a. An individual's preconceived notions regarding equitable compensation.

   b. Comparison of compensation paid for similar jobs in other organizations in the same industry or other industries.

   c. An individual's comparison of the social and professional strengths (or total strength) that he/she brings to his/her job.

   d. The total satisfaction that he/she takes away from his/her job.

   e. Correlation between the performance of the individual and the compensation he/she receives.

17.5 Selected Techniques for Assessing Effectiveness of HRM

People are central focus of economy. They create the value to the organization by producing goods and services. Production (goods or services) in any organization does not depend just on plant and equipment or land or money but also on abilities of the people working in the organization. People working in the organizations form human capital of the organization. Human capital refers to the abilities and qualities of people that make them productive. Human Resourses Department builds the capabilities of the human resources of the organization by various learning / training and development programs. Every organization should have controlling mechanism to maximize the productivity of the human resourses management.

The effectiveness of HRM can be assessed using techniques like survey feedback, Human Resource Development (HRD) audit, evaluation of HR interventions, human resource accounting, and assessment of employee engagement.

17.5.1 Survey Feedback

Surveys are scientific methods through which data is collected on a set of variables in one or more areas of focus (like attitudes, perceptions, and state of affairs in the organization) and analyzed to get the desired information. They are conducted by internal or external experts.

Survey feedback is used as a control tool as it helps in getting feedback about the various problems and challenges faced by organizations and in finding different ways to bring about organizational changes. Periodic surveys help in sensing the existing climate in the organization. In many organizations, employee satisfaction surveys have been replaced by organizational climate surveys that provide detailed information about the changes (existing or desired) in the organization in the eyes of the employees.

Survey feedback is also useful for the management to assess the existing feelings and opinions of the employees before initiating major changes in strategy, structure, systems, management style, or culture. Indirectly, such survey feedbacks may also help prepare the employees for the impending change.

17.5.2 HRD Audit

According to T. V. Rao, father of Indian HRD, "An HRD audit is a comprehensive evaluation of the current human resource development strategies, structure, systems, styles, and skills in the context of the short-term and long-term business plans of a company. It aims to findout the future HRD needs of a company after assessing the current HRD activities and inputs available." HRD audit is used as a control and diagnostic tool in organizations regarding existing HR practices and the expected changes in the system. An HRD audit helps in

clarifying the respective roles of the HR department and the line managers in HR development. Individual interviews; group interviews; workshops; questionnaires; observation; analysis of primary data; and analysis of secondary data from reports, records, manuals, and other published literature are some methods used to conduct an HRD audit.

Example: Mamaearth's HRD audit

According to The Economics Time (2022), as per Karan Bajwa, VP-Human Resources at Mamaearth, "creating happiness at every touchpoint for an employee is key to all they do in HR and all of the company's policies and processes are designed bearing this in mind." The HR staff at Mamaearth also makes it a point to analyse and redesign the company's human resource development strategy every six months to make sure they remain contemporary.

The above information shows that the company conducts HRD audit every six months to ensure that HR strategies remains relevant.

Source: Hemanshi Tewari (2022), "First Unicorn of 2022: "Goodness Inside" Mamaearth's HR strategies" Retrieved from https://hr.economictimes.indiatimes.com/news/hrtech/talent-acquisition-and-management/first-unicorn-of-2022-goodness-inside-mamaearths-hr-strategies/88686809; Accessed on 15th July, 2022

17.5.3 Evaluating HR Interventions

HR interventions refer to the proactive involvement of the HR department in an organization's activities to enhance the organization's performance. Actions to reduce attrition levels and improve employees' performance through training and development activities are some HR interventions.

The effectiveness of a particular intervention can be determined in monetary terms by following the steps:

i. Identifying the potential costs over the relevant time period and calculating the present value of costs.

ii. Identifying the potential benefits over the relevant time period and calculating the present value of benefits.

iii. Calculating the NPV (present value of benefits minus present value of costs) of taking up the HR intervention.

iv. If the NPV is positive and significantly high, the HR intervention is considered to be effective.

17.5.4 Human Resource Accounting

Human Resource (HR) accounting refers to the process of identifying, measuring, and communicating the value of the human resources of the organization.

Benefits of human resource accounting

Following are the various ways in which the top management uses the HR accounting models in HR planning and control.

- The ratio of human capital to non-human capital shows whether the organization is labor intensive or not.

- The HR accounting models assign different weights to different categories of employees. The ratio (among these categories) depicts the nature and quantity of the workforce composition.

- The HR accounting models help in identifying the changes in the workforce structure over time in the organization. For instance, since the human capital value is based on the current age of employees and expected earnings in a given future time period, the trends of values over the years would suggest the aging of the workforce. Aging influences the rate of growth and the relative market share of the organization. This again has implications for the HR managers to modify recruitment, training, and compensation policies to ensure behavioral control of employees.

- Investors also benefit from the voluntary disclosure of the value of human capital.

17.5.5 Assessment of Employee Engagement

Level of employee engagement in an organization is mainly dependent on two distinct yet related factors - employee satisfaction and employee commitment. Employee satisfaction is the level of contentment or happiness, which employees assign to various elements of their job/position, their organization, and the general feeling about their employment. Employee commitment is the pride people feel for their organization as well as the degree to which they intend to remain with the organization, desire to serve or to perform at high levels, positively recommend their organization to others, and strive to improve the organization's results. Employees exhibit a high degree of engagement with their employer if they are both satisfied and committed to the organization. An organization which is considered as a 'great place to work' or as 'an employer of choice' is characterized by high levels of employee engagement. Employee engagement levels may be assessed periodically through surveys.

Ways to Increase Employee Engagement

The productivity of an organization is influenced by the level of employee engagement. To increase employee engagement, organizations, apart from focusing on organizational performance, should focus on the employees; should create a good culture; strengthen policies that help them carry out their work and empower them; and design metrics to induce the desired changes.

The following points can be kept in mind to increase employee engagement.

- Repetitive jobs result in boredom and stress. To avoid this, organizations should introduce variety in the jobs and go for job rotation.

- Meetings should be conducted on a periodic basis to communicate any information and/or changes in the organization.

- The employees should be provided with an open environment that allows them to be redeployed if they feel that they do not have the right job.

- The expectations from the employees at all levels should be communicated openly and freely.

- The management should make an effort to know their employees. It should take care of them in such a way that would make them feel satisfied and help them maintain a work-life balance.

- All types of successes (individual, team, and organization) should be celebrated equally and deserving employees should be thanked and rewarded suitably for their contributions and achievements.

The employee engagement efforts taken up by the organization should be on a continuous basis.

17.6   The Workforce Scorecard

Though the top management values and recognizes the importance of human capital, it usually does not have the tools to measure workforce effectiveness, and hold the line managers accountable for the impact their team has on the long-term success of the organization.

The Workforce Scorecard framework was developed by Mark A. Huselid, Brian E. Becker, and Richard W. Beatty to overcome this limitation. As per this framework, the workforce is viewed in terms of the contribution made by it rather than the cost incurred on it. It also makes the line managers jointly responsible with the HR professionals for execution of the organization's strategy.

The Workforce Scorecard has four dimensions - workforce success, leadership and workforce behavior, workforce competencies, and workforce mindset and culture, which are all considered to assess workforce effectiveness.

It makes use of metrics instead of benchmarking.   The details are provided in the Table 17.2 for metrics used for each of the four dimensions of the scorecard. Let us go into the details of some of the words defined.

- Workforce success: It is the bottom-line workforce performance metric. It reflects the manner in which the workforce has contributed to the execution of the organization's strategy.

- Leadership and workforce behavior: It addresses the question of whether the workforce and its leadership team are consistently behaving in a manner that will lead to the achievement of the organization's strategic objectives.

- Workforce competencies: It includes the skills, knowledge, ability, and personal characteristics which serve as the foundation for workforce behaviors.

- Workforce mindset and culture: It reflects the behaviors that are considered appropriate in the organization and whether the organization has a workforce culture that is both strategic and high-performance-oriented.

Table 17.2: Workforce Scorecard – Dimensions and Measures

Dimensions	Measures
Workforce success	- Average price premium versus competition (as an indicator of a superior product or service) - Number and quality of customer complaints Sales volume due to customer referrals - Percent of products delivered defect-free - Quality of governance (as evaluated by shareholders)
Leadership and workforce behavior	- Employee turnover by performance level and by controllability - Extent of organizational learning Effectiveness in dealing with poor performers Percent of original ideas that are implemented Requests for transfer per supervisor
Workforce competencies	- Proportion of employees not meeting basic skill requirements - Percent of internal customers that rate staffing function highly - Managerial competence in subordinate development - Diversity of gender and race by job category
Workforce mindset and culture	- Consistency and clarity of message from top management and from HR - Diversity of ideas - Employee mindset readiness for strategic transition - Extent to which employees are clear about their own goals

Source: ICFAI Research Center

Example: IMI People Uses Rhonda Platform to Rate Employees' Work

IMI People, a US-based mechanical installation company, uses Rhonda platform that permits the company to communicate with its staff. Employees have the option of rating their weekly experience. If an employee receives a poor grade on their weekly work experience, the manager is responsible for checking in with them.

The above information shows how IMI People uses Rhonda to score the workforce

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Source: EDT (2020), "11 Benefits Of Workforce Analytics For HR Teams" Retrieved from https://www.forbes.com/sites/forbeshumanresourcescouncil/2020/04/03/11-benefits-of-workforce-analytics-for-hr-teams/?sh=51706421b796; Accessed on 15th July, 2022.

17.7 Human Resource Information Systems for Control

According to R. Broderick and J.W. Boudreau, Human Resource Information System (HRIS) is the composite of databases, computer applications, and the hardware and software necessary to collect/record, store, manage, deliver, present, and manipulate the data for human resources. It is a part of the Management Information System (MIS) that includes other functions like accounting, marketing, and production. HRISs are specialized application software developed for implementing, monitoring, and benchmarking HR processes.

HRIS is used for transaction processing and administrative purposes at the operational level. It helps in implementing action controls by - restricting user access to different business processes; maintaining an audit trail of transactions; and transaction authorization procedures based on well-defined policies. These controls are facilitated by automated document routing. The HRIS supports features like selective access to employee data within a business process based on employment attributes of the login user and those of the other employees. Of late, organizations are using the HRIS for strategic human resource management and decision making rather than being limited to supporting and monitoring the day-to-day activities of the HR department.

17.7.1 Using HRIS for Controlling HRM

HRIS is used in salary planning, workforce (manpower) planning, and variance analysis. It can be used to control HRM in the organization and achieve the management control objectives of efficiency, effectiveness, and disclosure and compliance.

Efficiency

The time and attendance module of the HRIS helps in tracking the person-hours spent by employees on various operational activities or projects. It is very easy to

track employees associated with various tasks in an integrated information system. As the employee's standard cost (rate of pay) and the actual cost (periodic payroll costs including fixed pay, variable pay, employer contributions to benefit plans, etc.) are available in the HRIS, it is possible to determine the organization's efficiency in the utilization of human resources for operational activities or projects. HRIS also helps in tracking and controlling costs related to recruitment, selection, training, and development. Features like employee self service, manager self service, and workflow in the HRIS helps reduce the time delays and expenses involved in HR administration.

Effectiveness

For personnel control, HRIS monitors employees' fitment in doing various jobs in terms of the job competencies required and employees' competencies. It helps in assessing the effectiveness of human capital management and in taking suitable corrective action like sponsoring selected employees for training programs or transferring employees. Internal equity reports can be generated from an HRIS by comparing the compensation with the information available on qualification, competencies, work experience, etc. For results control, the HRIS supports analytics features for tracking HR-related performance indicators for various business processes.

Disclosure and compliance

HRIS generates statutory reports to be submitted to the regulatory authorities. It plays a vital role in achieving the control objective of compliance and in maintaining the associated records as an evidence of compliance. Proper use of an HRIS can prevent non-compliance, and can anticipate future problems so that the HR department and the line managers may take preventive action.

For instance, we wil understand from how HRIS is applied at IBM and Shaw's Supermarkets.

Applications of HRIS

IBM

IBM installed a paperless online benefit enrollment plan that enables the company's current and retired employees to access details pertaining to their benefits from anywhere. The system enabled an employee to log on at home or anywhere else to access his/her details rather than restricting access only through the company's intranet. This system helped the company to eliminate the costs of printing and mailing the enrollment details of various benefit plans, and at the same time gave complete freedom to its employees.

Shaw's Supermarkets

Shaw's Supermarkets decided to opt for centralized human resource operations to manage its workforce. The company installed an Employee Self Service (ESS)

system. This ESS system enabled employees to access online forms, training material, and information pertaining to employee benefits and other payroll related information. They could access their personal information and modify it as and when required. With such tasks under the control of the employee himself/herself, HR managers and executives were able to focus on issues of strategic importance such as managing workforce, succession planning, and managing compensation, enhancing service to employees and managers, and ensuring data accuracy.

Example: L&T uses HRIS systems

According to The Economics Time (2021), for the purpose of gathering all employee data across all L&T work locations, the HRIS system is employed as a single source of information and integrated data management system. To track leave and attendance across 1,450+ locations, office and manufacturing premises, the time and attendance, all modules have been connected with the HRIS platform.

The above information shows how L&T company uses HRIS system for various purposes.

Source: Mediawire (2021), "L&T leads the digital transformation of HR function" Retrieved from https://economictimes.indiatimes.com/industry/indl-goods/svs/engineering/lt-leads-the-digital-transformation-of-hr-function/articleshow/85762474.cms; Accessed on 15th July, 2022

Check Your Progress - 2

6. Identify the techniques that may be used to assess the effectiveness of the HR activities in an organization.

    i. Survey feedback

    ii. HRIS

    iii. HR accounting

    iv. HRD Audit

    a. Only i, ii, and iii

    b. Only i, iii, and iv

    c. Only ii, iii, and iv

    d. i, ii, iii, and iv

    e. Only iii and iv

7. Following are the steps involved in determining the effectiveness of an HR intervention. Identify the correct sequence in which they must be carriedout.

    i. Identification of the potential benefits over the relevant time period

    ii. Calculation of the net present value of taking up the HR intervention

iii. Calculation of the present value of costs

iv. Calculation of the present value of benefits of taking up the HR intervention

v. Identification of the potential costs over the relevant time period

a. i-iii-v-ii-iv

b. ii-iv-i-v-iii

c. v-iii-i-iv-ii

d. iv-v-ii-iii-i

e. iii-iv-v-i-ii

8. What are **not** among the methods used for conducting an HRD audit to assess the effectiveness of the HR function?

a. Questionnaires; workshops

b. Utility analysis; writtentest

c. Individual interviews; analysis of published literature

d. Group interviews; observation

e. Analysis of reports; records

9. Mark A. Huselid, Brian E. Becker, and Richard W. Beatty developed the Workforce Scorecard framework. Which of the given statements is false with respect to this framework?

a. It views the workforce in terms of the contribution made by them instead of the cost incurred on them.

b. It uses benchmarking instead of metrics.

c. It makes line managers jointly responsible with the HR professionals for execution of the organization's strategy.

d. It has four dimensions that help in assessing the effectiveness of a workforce.

e. It tends to increase workforce competencies.

10. Controls are implemented in an HRIS through features such as restricting user access to different business processes, maintaining an audit trail of transactions, and transaction authorization procedures based on well-defined policies. Identify the control implemented.

a. Results

b. Action

c. Personnel

d. Cultural

e. Finance

17.8   Summary

- The goal of human resource management is to help an organization meet its strategic goals by attracting, developing, and retaining employees and also by managing them effectively.

- Human resource planning deals with recognizing and fulfilling the human resource needs of an organization.

- Recruitment and selection, training and development, attrition management, welfare management, and compensation management are some of the areas over which the organization needs to exert control.

- Evaluation of the recruitment process will help in exercising control over certain aspects of the recruitment process like the costs incurred on the recruitment process, the people involved in the process, the quality of the new recruits, the final number of recruits selected, and the success rate of each sourcing channel.

- The effectiveness of training and development activities of the organization can be assessed by monitoring job-impact indicators. The returns on the investment made on the training activities can also be measured by using quantitative tools like benefit-to-cost ratio, payback period, discounted cash flow, and utility analysis.

- The attrition levels in an organization can be assessed by using two metrics – employee turnover rate (separation rate) and employee retention rate (stability index).

- Welfare measures are undertaken by organizations to keep employees happy with the expectation that there will be a consequent increase in employee productivity.

- The equity theory related to compensation management states that employees should be equitably paid for them to be satisfied and productive. The compensation structure should be designed taking into consideration both internal equity and external equity.

- Survey feedback, Human Resource Development (HRD) Audit, evaluation of HR interventions, human resource accounting, and assessment of employee engagement are some of the techniques used for assessing the overall effectiveness of human resource management in the organization.

- Survey feedback is useful as a control tool as it helps in getting feedback about the various problems and challenges that the organization is facing and finding various ways to bring about organizational changes.

- HRD audit is used as a control and diagnostic tool in organizations with regard to the practice of the HR functions in the organization and the expected changes in the system.

- HR interventions refer to the proactive involvement of the HR department in the activities of the organization to improve the organization's performance.

- Human resource accounting refers to the process of identifying, measuring, and communicating the value of the human resources of the organization to the appropriate authority.

- Level of employee engagement in an organization is dependent on two distinct yet related factors - employee satisfaction and employee commitment. Employees who are both satisfied and committed to the organization are said to exhibit a high degree of engagement with their employer.

- The Workforce Scorecard approach views the workforce in terms of the contribution made by it instead of cost incurred on it. It has four dimensions - workforce success, leadership and workforce behavior, workforce competencies, and workforce mindset and culture.

- Human resource information systems are specialized application software built for implementing, monitoring, and benchmarking HR processes in any organization.

- The HRIS is useful for controlling HRM in the organization and achieving its management control objectives of efficiency, effectiveness, disclosure, and compliance.

17.9   Glossary

HR Interventions: HR interventions refer to the proactive involvement of the HR department in the activities of the organization to improve the performance of the organization.

HRD Audit: HRD audit is a comprehensive evaluation of the current human resource development strategies, structure, systems, styles, and skills in the context of the short-term and long-term business plans of a company. It aims to find out the future HRD needs of a company after assessing the current HRD activities and inputs available.

Human Resource Accounting: Human resource accounting refers to the process of identifying, measuring, and communicating information about the human resources of the organization in order to facilitate their better management.

Human Resource Information System (HRIS): Broderick, R. and Boudreau, J. W. defined the human resource information system (HRIS) as the composite of databases, computer applications, and the hardware and software necessary to collect/record, store, manage, deliver, present, and manipulate the data for humanre sources.

Human Resource Planning: Human resource planning deals with recognition and fulfillment of human resource needs of the organization. It brings out the link between the organizational objectives and the human resource department objectives, and helps in the designing of human resources programs which conform to those objectives.

Workforce Scorecard: The Workforce Scorecard approach views the workforce in terms of the contribution made by it instead of cost incurred on it. It makes use of metrics instead of benchmarking. It also makes the line managers jointly responsible with the human resource professionals for execution of the organization's strategy.

17.10 Self-Assessment Test

1. To meet the effectiveness objective of management control, the HR plan has to be formulated in such a way that it conforms to the organizational strategies and corporate plans. Explain the importance of the HR planning process in the light of the given statement.

2. The HR department should control its functions and activities as it plays a very important and strategic role in the organization. List out the various areas that can be controlled by the organization. Explain each of these areas.

3. Describe the various techniques used to assess the overall effectiveness of human resource management.

4. "Though the top management values and recognizes the importance of human capital, it usually does not have the tools to measure workforce effectiveness, and hold the line managers accountable for the impact their team has on the long-term success of the organization." Describe the framework developed by Mark A. Huselid, Brian E. Becker, and Richard W. Beatty to overcome this issue.

5. A human resource information system can be used for controlling the human resource management in the organization and achieve the management control objectives of efficiency, effectiveness, disclosure, and compliance. Explain.

17.11 Suggested Readings/Reference Material

1. Stephen P Robbins, David A. De Cenzo and Mary Coulter (2022). *Fundamentals of Management: Essential Concepts and Applications,* Fifteenth Edition| Pearson Paperback, 30 June 2022.

2. Subhash Chandra Das (2019). Management Control Systems – Principles and Practices, PHI Learning Pvt. Limited, Paperback – 15 July 2019.

3. Pravin Durai (2019). Principles of Management: Text and Cases, First edition, Pearson India Education Services Pvt. Ltd.; Second edition (31 August 2019).

4. Merchant, Kenneth A (2017). "Management Control System: Text and Cases", Pearson Education Asia.

5. Saravanavel, P (2022). Management Control Systems – Principles and Practices. First edition, Himalaya Publishing House.

17.12 Answers to Check Your Progress Questions

1. **(b) This ratio compares the annual economic benefits from the training program with the costs incurred on it.**

    The benefit-to-cost ratio compares the annual economic benefits from the training program with the costs incurred on it. Some ways of collecting the data to measure the benefits of the training program are: surveys, questionnaires, interviews, focus groups, tests, observation, and performance records. If the benefit-to-cost ratio is one, then the costs of implementing the program are equal to the benefits from the program. This ratio can be used to control the costs incurred on implementing the training program. One of the major limitations of this method is that it is difficult to measure the qualitative benefits resulting from the implementation of the training program.

2. **(b) Only i and iii**

    Attrition or turnover refers to the phenomenon of employees leaving the organization in a specified period for various reasons like low job satisfaction, low pay, non-conducive job environment, for better prospects, etc. Measuring the attrition levels of the organization is the first step in controlling them. The attrition levels of the organization are measured using two metrics - employee turnover rate and employee retention rate.

3. **(c) It is calculated as the number of employees leaving as a percentage of the average number of employees working during a period.**

    In the employee turnover rate method, the number of employees leaving the organization during a period is measured as a percentage of the number of people employed during the same period. It does not make a distinction between the more talented and experienced employees and employees with less experience or talent. This metric is also called the separation rate.

4. **(d) i, ii, and iii**

    Welfare measures are provided by organizations to keep their employees happy. They can be individual measures as well as group measures. In welfare management, to begin with, the priority areas are identified and the funds meant for welfare schemes are allocated to each priority area. Later, the utilization of funds is compared with the allocations to various areas. It is important to gauge the employees' level of satisfaction with the welfare measures. Moreover, it is important to re-examine whether the allocation of funds across the various welfare schemes was appropriate.

5. **(b) Comparison of compensation paid for similar jobs in other organizations in the same industry or other industries**

   The different aspects in compensation management are: (1) an individual's (employee's) preconceived notions regarding equitable compensation; (2) his/her comparison of the social and professional strengths (or total strength) that he/she brings to his/her job and the total satisfaction that he/she takes away from it; (3) the correlation between the performance of the individual and the compensation he/she receives; and (4) comparison of compensation paid for similar jobs in other organizations in the same industry or other industries. The first three are related to internal equity while the last one is related to external equity of the compensation management.

6. **(b) Only i, iii, and iv**

   Periodic assessment of the activities of the HR department will help in controlling these activities. Some of the techniques which can be used for assessing the effectiveness of the HR activities are - survey feedback, human resource development (HRD) audit, evaluation of HR interventions, and HR accounting. Human Resource Information Systems (HRIS) are specialized application software built for implementing, monitoring, and benchmarking HR processes in any organization.

7. **(c) v-iii-i-iv-ii**

   The effectiveness of a particular intervention can be determined in monetary terms by following three steps - identifying the potential costs over the relevant time period and calculating the present value of costs; identifying the potential benefits over the relevant time period and calculating the present value of benefits; and calculating the net present value of taking up the HR intervention.

8. **(b) Utility analysis; writtentest**

   The HRD audit is used as a control and diagnostic tool in organizations. It is used as a control tool on the practice of the HR functions in the organization and the expected future changes in the system. Some of the methods used to conduct an HRD audit are: individual interviews; group interviews; workshops; questionnaires; observation; and analysis of reports, records, manuals, and other published literature.

9. **(b) It uses benchmarking instead of metrics**

   The Workforce Scorecard approach views the workforce in terms of the contribution made by them instead of the cost incurred on them. It makes use of metrics instead of benchmarking. It also makes the line managers

jointly responsible with the human resource professionals for execution of the organization's strategy. The workforce scorecard has four dimensions workforce success, leadership and workforce behavior, workforce competencies, and workforce mindset and culture.

10. (b) Action

At an operational level, an HRIS is used for transaction processing and administrative purposes. Action controls are implemented in an HRIS through features such as restricting user access to different business processes, maintaining an audit trail of transactions, and transaction authorization procedures based on well-defined policies. These controls are facilitated by automated document routing.

Unit 18

Control and Governance of Information Systems

Structure

> *"Developing and implementing IT governance design effectiveness and efficiency can be a multidirectional, interactive, iterative, and adaptive process."*
>
> - Robert E. Davis, Author, consultant and University Professor

18.1   Introduction

Organisations must adopt mechanisms to ensure proper control and governance of information systems. This is particularly essential in today's times of growing importance and use of IT, that has increased the problems related to data security and data privacy.

In the previous unit, we discussed the management control of human resource management. In this unit, we shall discuss the control and governance of information systems.

There is a growing trend in organizations to create and maintain large and complex information systems. The growing importance and use of IT, for data sharing and enabling remote access, has increased the problems related to data security and data privacy. Organizations address these issues through the control and governance of information systems. The Information Technology (IT) function is being viewed as a key driver for achieving business growth and success.

This unit will first explain the need for and objectives of control of information systems. We shall then move on to discuss the concept of information technology governance and the frameworks developed by two agencies. We shall also discuss the different categories of management controls for information systems and the activities within them. Further, we will understand different types of application controls used for information systems. Finally, we shall discuss the importance of information systems audit, and the concepts of business continuity and disaster recovery.

18.2 Objectives

After studying this unit, you should be able to:

- Assess the need for and the objectives of control of information systems.
- Explain the concept of information technology governance and frameworks developed by two agencies.
- Identify different categories of management controls for information systems and the activities within them.
- Discuss the different types of application controls used for information systems.
- Recognize the importance of information systems audit.
- Discuss the concepts of business continuity and disaster recovery.

18.3 Overview of Control of Information Systems

Organizations need to create and maintain large and complex information systems as they facilitate informed decisions regarding the strategies to be implemented. They also help to improve the maintenance and quality of information stored and to improve communications with suppliers, clients, etc. Hence, it becomes essential for them to ensure the proper control of such systems.

18.3.1 Need for Control of Information Systems

The main reasons for the need to establish control over computer-based data processing are given here:

- High cost of loss of data and wrong decision-making: The consequences can be highly damaging to the business organization, if there is no proper backup or disaster recovery and business continuity plan. The quality, of data and decision-making software, determines the quality of decisions made in the organization. Control needs to be exercised to ensure high quality of the same, as the cost of incorrect decisions based on inaccurate information can be high.
- Possibility of computer abuse: Exercising control over computer-based data processing is necessary, due to large-scale prevalence of computer abuse like

hacking, virus attacks, illegal physical access, and abuse of privileges. Computer abuse can lead to severe consequences such as destruction of assets, theft, modification of programs or data, violation of privacy, disruption in operations, unauthorized use of assets, etc.

- Risk of computer errors: Errors made by computers can lead to unacceptable consequences such as loss of revenue, loss of credibility and customer confidence, lawsuits that can result in high litigation costs, and compensation payouts, etc. This is especially true, where many critical functions are performed automatically by a computer.

- Protection of hardware, software, and personnel: Adequate control measures have to be taken to protect the investments in information systems.

- Data privacy and confidentiality: Computers are used in organizations to store a lot of personnel data and proprietary information that are protected by privacy and intellectual property rights respectively. Therefore, there is a need to maintain the confidentiality of the data.

Example: Need for good IT Governance at Redis Ltd.

Redis Ltd. was a California based software company that was known for its open source in-memory NoSQL database, enterprise software, cloud services and solutions for large corporations. The company realized the need for a standard that could define best practices for their Information Security Management System(ISMS). To achieve this, Redis acquired the ISO/IEC 27001 cybersecurity certification in year 2022 that helped the company manage risks and vulnerabilities in the company. The ISMS also led to design and development of security controls based on the risks to customers' hosted information.

Source https://redis.com/blog/redis-iso-27001-cybersecurity-certification/ , Published July 19, 2022 Accessed on 15th September, 2022.

18.3.2 Objectives of Control of Information Systems

The main objectives of information systems control and auditing are:

- Safeguarding of assets from damage or destruction, unauthorized use, and unauthorized removal.

- Maintenance of data integrity, which includes ensuring that data is authorized, accurate, complete, non-redundant, timely, consistent, and confidential.

- Ensuring that information systems are developed, implemented, operated, and maintained to meet the needs of the major stakeholders.

- Ensuring that information systems are designed in such a way that they consume the minimum resources to achieve their objectives.

18.4   Information Technology Governance

Information Technology (IT) Governance is a formal framework to ensure that IT investments support organization's goals. It is the alignment of IT strategy with business strategy. It strives to produce measurable results towards attainment of organizational strategies and goals. It is an integral part of overall enterprise governance.

The definitions of IT Governance, according to ITGI[1], are: IT governance is the responsibility of the Board of Directors and executive management. It is an integral part of enterprise governance and consists of the leadership and organizational structures and processes that ensure that the organization's IT sustains and extends the organization's strategy and objectives.

The strategic and critical IT decisions regarding IT governance should be taken by the board of directors, rather than by the Chief Information Officer (CIO) or the business unit managers. Prominent frameworks that help organizations implement IT governance are the IT Infrastructure Library (ITIL), Control Objectives for Information and Related Technology (COBIT), and the Balanced Scorecard (BSC). Use of BSC for IT governance involves creating an IT scorecard, which aligns the IT strategy and performance management framework with the overall organizational strategy and performance management framework. ITIL and COBIT have been described briefly below.

18.4.1 IT Infrastructure Library (ITIL)

ITIL addresses issues relating to skill requirements and organization structure, and provides detailed information on how to manage IT operations. The ITIL framework is published in a series of eight books called sets. These sets are:

- *Service delivery:* This covers the various services that the data center needs to provide to the business organization.

- *Service support:* This gives guidelines on how the data center must make sure that the customers have access to related services.

- *Planning to implement service management:* This describes the necessary steps that are required to shift to ITIL and to derive the benefits from the shift.

- *Security management:* This talks about how an IT manager has to organize and maintain the security of the IT infrastructure.

- *Infrastructure management:* This describes the processes and tools used in planning, conveying, and managing the quality of IT services.

- *Business perspective:* This gives out the business requirements needed for successful development and delivery of IT services.

- *Applications management:* This tells us about the process of managing the software development lifecycle.

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[1] IT Governance Institute

- *Software assets management:* This guides the organization on Software Asset Management (SAM) and also talks about the measures to be taken to perform it effectively and efficiently.

18.4.2 Control Objectives for Information and Related Technology (COBIT)

COBIT was developed by the IT Governance Institute and the Information Systems Audit and Control Association (ISACA) of the US in 1992. It provides a set of IT control objectives that guides organizations on how to maximize the benefits from IT implementation by developing control and appropriate IT governance in the organization. It describes 34 IT control processes that are covered under four domains-Planning and Organization, Acquisition and Implementation, Delivery and Support, and Monitoring.

Planning and Organization: This presents 11 control processes that tell us how technology should be used to achieve organizational goals.

Acquisition and Implementation: This explains six control processes that talk about the strategies the organization should adopt to identify its IT requirements, procure technology, and implement the technology. It also provides guidelines on how to increase the shelf life of the deployed technology.

Delivery and Support: This describes 13 control processes that talk about the execution and results of implementing IT systems and about the support processes, such as security, which help in executing IT systems efficiently.

Monitoring: This domain mainly focuses on whether the IT system meets the purpose for which it has been deployed and also its ability to help the organization meet its objectives. It outlines four control processes and deals with issues such as compliance with regulatory requirements.

Example: COBIT Implementation at BVK Group

The Bayerische Versorgungskammer (BVK) was Germany´s largest pension group under public law. In order to provide Group members and policyholders with top-notch services that adhere to tight insurance rules, BVK engaged in cross-functional processing of enormous datasets. As a result, the BVK placed a lot of reliance on its IT, which served as the hub connecting all business units while assuring the timely and proper operation of systems and applications. In order to enable quicker responses to business demands, BVK made the decision to transform its IT division into an active business enabler. With the help of the COBIT 2019 framework tools, BVK streamlined the IT governance in this regard. Following the effective COBIT implementation, BVK was experiencing increased service quality, objective KPI measurement, and greater organisational transparency.

Source: https://www.bearingpoint.com/files/BVK_client-story_EN.pdf?download=0&itemId=905688 (Published 2021) Accessed on 15th September, 2022

18.5   Management Control of Information Systems

In the case of information systems, management controls are the managerial functions that have to be performed for ensuring planned and controlled development, implementation, operation, and maintenance of information systems. There are seven broad categories of information system management controls in an organization - top management controls, systems development management controls, programming management controls, data resources management controls, security management controls, operations management controls, and quality assurance management controls. (Refer Table 18.1)

Table 18.1: Information Systems - Management Controls and Activities

Management Control	Activities
Top management controls	• Planning • Organizing • Leading • Monitoring/ Evaluation
Systems development management controls	• Feasibility study and project initiation • Systems analysis and specifying user requirements • Systems design and development • Acceptance testing • Implementation and maintenance • Auditing the systems development management function
Programming management controls	• Planning • Controlling • Design • Coding • Testing • Operation and maintenance
Data resources management controls	• Defining, creating, redefining, and retiring data • Making the database available to users • Informing and servicing users • Maintaining the integrity of the database • Monitoring operations and performance
Security management controls	• Conducting security programs

Contd….

Operations management controls	• Control of computer and network operations • Maintaining datafiles, program files, and documentation • Help desk and technical support • Management of outsourced operations
Quality assurance (QA) management controls	• Establishing quality goals and standards • Checking conformity with QA standards • Identifying areas for improvement • Reporting to the management • Training employees in QA standards

Source: ICFAI Research Center

Example: Effect of Management Control Systems on Organizational Performance

LGT Group was among the world's largest family-owned asset management and private banking organisations. The bank was using an internal management control system based on Microsoft Excel which quickly reached its limits with regard to data storage, management and automated workflows. Considering the future needs, LGT started looking for a contemporary database driven management control system and finalized GBTEC, a German software solution provider. According to a report published by GBTEC in 2021, the internal management control system implemented by them offered better control through centralized administration and targeted reporting.

Source: https://www.gbtec.com/fileadmin/downloads/internal-control-system-lgt-gbtec.pdf.
(Published 2021, Accessed on 15th September, 2022)

18.5.1 Top Management Controls

The top management is involved in performing the activities of planning, organizing, leading, and controlling the information system in the organization. Let us see each of these in brief:

- *Planning:* This activity includes determining the long-term and short-term objectives of the information system function and the initiatives taken to achieve these objectives. The management has to establish processes to evaluate the quality and usefulness of the long and short-range plans. Feedback obtained should be evaluated and considered in future IT plans.

- *Organizing:* This activity involves collection, allocation, and co-ordination of the resources required for meeting the objectives. The focus here is on issues such as use of information technology in key decision-making processes; organizational flexibility; clarity of roles and responsibilities; organizational positioning of security, quality, and internal control functions,

etc. The IT department should be independent from other user departments so as to enable them to provide IT solutions in an unbiased manner.

- *Leading:* It involves motivating, guiding, and communicating with both the information systems function and the other staff members. The organizational policies should be clearly communicated, understood, and accepted by personnel at all levels. They should address issues such as integrity, ethical values, competence of the people, management philosophy, operating styles, and accountability. Specific attention is to be given to IT aspects, including security and business continuity planning.

- *Monitoring / Evaluation:* It involves comparing actual performance with the planned performance and taking remedial measures to correct deviations. The emphasis should not be restricted to enforcing standards but should also encourage innovation and continuous improvement. This will enable the organization to adapt to the changing business and technological environment as well as to align the information systems to the organizational strategy and maturity.

18.5.2 Systems Development Management Controls

The Systems Development Life Cycle (SDLC) is a popular, traditional model for systems development. The organization's SDLC methodology should include preparation of an adequate operations manual, which is updated on a regular basis. It should also ensure that adequate training material is developed to facilitate day-to-day use of the system by new users. The different stages in SDLC are:

- *Feasibility study and project initiation:* A feasibility study is conducted to check, whether the systems development program is viable or not. The right types of controls should be in place, while conducting the feasibility study. While approving the project, an adequate number of alternative options should be considered and presented to the approving authority. Each option should be evaluated in terms of its business benefits, costs, and strategic fit. The estimates of business benefits should be achievable, and workable methods for measuring achievement should also be defined. The business case for developing/ acquiring a new system should include the costs of staff training and of developing business continuity plan. The estimated payback period should be less than the likely economic working life of the system. If the viability of the business case relies heavily on long-term estimates, the risks associated with long-term measurement periods should be included in the project risk assessment. The cost/ benefit analysis should include appropriate margins to take into account underestimation of costs and overestimation of benefits. The project risks should be identified, measured, and considered by the approving authority. The appropriate authority should give formal approval for the project to proceed. Once formal approval has been given based on the feasibility study, a full-time and experienced project

manager should be appointed to manage the project. The organization should have formal standards of project management, which should be applied consistently. The project management standards should specify the milestones and / or timelines at which progress would be reviewed.

- *Systems analysis and specifying user requirements:* The existing system (if applicable) and the proposed system need to be analyzed. A formal user requirements specification and, if applicable, an operational requirements specification, should be prepared.

- *System design and development:* Controls at this stage should ensure that system design follows a defined and acceptable standard and the completed designs are discussed with and agreed upon by the users. The project's quality assurance procedures should make sure that project documentation such as design documents, specifications, test, and installation plans are reviewed against the organization's technical standards and policies, and the user requirements specification. The auditors/ information security experts review the internal control aspects of system design and development specifications. System testing by the development team should be considered as an integral part of the development activity. The system installation plan should be developed and its quality reviewed.

- *Acceptance testing:* A responsible person with adequate authority should be appointed to take overall charge of the data conversion and acceptance testing programs. A data conversion plan should be drawn up to define the role of each employee, to see that proper controls are in place, that proper back-up and recovery processes are devised, etc. Proper change management procedures should be strictly enforced to control any changes brought about in the software configuration items and ensure that the final versions of the various software components are consistent and not conflicting.

- *Implementation and maintenance:* In this phase, the software is installed in the production environment, the required data is brought over to the new system, and the operations start using the new system on a day-to-day basis. Management control during the maintenance phase is a formal process of issue tracking, analysis, prioritization, and resolution. The other major control aspect is management of change requests.

- *Auditing the systems development management function:* The systems development management function can be audited in three ways. They are:

  o Concurrent audit: A concurrent audit is a mechanism by which the auditor can pinpoint errors at an early stage of system development, thereby resulting in cost saving for the organization.

  o Post-implementation audit: In a post-implementation audit, the auditor acts as a reviewer of the particular application system after it has been developed and implemented.

o   General audit: The information systems auditor performs a general review of the systems development process. This helps the auditor to determine the extent to which he/ she can rely on the controls embedded in the system.

18.5.3 Program Management Controls

Program management control involves the program development life cycle, which consists of five sequential stages and one parallel stage. These stages are:

- *Planning:* In this stage, the effort (person-hours), number of personnel with different skill sets, the development/ implementation schedule, etc., are determined. For the planning process to be effective, the scope of the program should be clearly defined and the effort estimations should be based on formal techniques and metrics collected from earlier development projects.

- *Control:* This phase runs parallel to all the other phases. It involves monitoring the task progress in the different phases of the programming life cycle, comparing it against the plan, and taking the necessary corrective action and/or preventive action. It also involves controlling the quality of the programming process and the programs delivered.

- *Design:* The design of any system involves a compromise between user requirements and what can be achieved in practice due to various constraints. The primary concern of the project manager during the design stage is to ensure that system designs match requirements as strictly as possible and provide a basic blueprint of the proposed system for the subsequent development work.

- *Coding:* Coding involves writing and documenting source code using programming languages to implement the program design. Three approaches in which this implementation and integration can be achieved are: the top-down approach that gives priority to high-level modules; the bottom-up approach that gives priority to lower level modules; and the threads approach where the implementation of the programs is done on the basis of the importance of the function.

- *Testing:* The three major types of testing are: unit testing of the functionality at the module level; integration testing of the interactions between the modules; and system testing of the program as a whole to see whether it meets user requirements. As part of management controls, the scope and objectives of testing should be decided beforehand, and the test results need to be documented and analyzed. For example, test observations may be classified as requirement defects, design defects, coding defects, usability issues, etc. In terms of importance and urgency, defects may be further classified as showstopper, critical, non-critical, and trivial defects.

- *Operation and maintenance:* If the released program is not maintained properly, it can lead to corruption of the database, failure in meeting the user requirements, or operational inefficiency. Program maintenance resolves program defects and addresses requirement changes initiated by the user. Control of program maintenance ensures that new problems do not crop up while resolving existing defects, addressing new requirements, or fine-tuning performance.

18.5.4 Data Resources Management Controls

Data are a critical resource for an organization, which require centralized planning and control. Four objectives for better management of data are: sharing of data by different user groups (sharability); making the data available to the user at the time and place and in the form in which it is needed (availability); ensuring that the data is amenable to change based on the requirements of the user (evolvability); and maintaining data integrity (integrity). The Data Administrator (DA) performs the administrative and policy formulation functions. The Data Base Administrator (DBA) focuses on the technical aspects of the issues specified by the DA such as laying down the internal schema, preparing a program to create data, and implementing database control. An important aspect of data resource management control is personnel control. The increasing importance of data availability, data integrity, and data privacy/ confidentiality emphasizes the need for proper choice of personnel.

[2]Big Data- An Analytical Tool to Insurance Industry

Overview

Insurance companies are accountable to vast amount of data that is highly valuable, which is stored or retrieved, but not used. With the right analytical tools, companies can use these data, to produce relevant and timely information. A survey report of Novarica Insurance Technology Research Council on October 2015, revealed that, out of 86 of its member executives, who participated in the survey, specializing in insurance IT (Information Technology), only about 20% stated that their organization is gearing up to make the move from 'little data' to 'big data' to become future ready. Big data can become more instrumental in changing the way, the key decisions are performed.

Big Data- Benefits

Big Data as an analytical tool, helps to deliver new opportunities for growth, bringing greater value to businesses with richness and near completeness of information.

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[2] MahfujMunshi, Big Data, Analytics and Business Intelligence: Making the industry future ready, 2015,https://www.infosys.com/industries/insurance/white-papers/Documents/making-industry-future-ready.pdf

The benefits that big data and the right analytics and BI tools can offer are:

- Greater reliability and consistency in data;

- Gather deep insights from potential data;

- System transparency, which enables the stakeholders to access information anytime, anywhere; and

- Real-time data collection.

Big Data in Insurance Industry

Big data, in insurance companies, comprises financial risk claims and actuarial information among other critical aspects that help the insurers to make sound informed decisions. But as time goes by, traditional IT infrastructure can bring unprecedented challenges in handling information that pose a major road block to the survival of insurance companies. To prepare for these big-data related challenges, the companies can combine analytics and business intelligence tools to work with big data to deliver enormous benefits like:

- Insightful information to make better strategic decisions,

- Better alignment of rules and regulations set by external stakeholders,

- Enhanced segmentation of customers, markets, products, and services,

- Supportive management teams to bring strong understanding of business functions,

- Generate reports on customers portfolios that enables fraud detection, and

- Identify micro-trends to indicate the ones that can be maximized for better outcomes.

Conclusion

Henceforth, Big data that is relevant, timely, and accessible will be most valuable to key decision- makers. Analytical tools also allow insurers to not only leverage information gathered in traditional ways, but also through various other media like social networks, mobile, websites, beacons etc. This gives insurers, the access to valuable information that is more complete and rich, enabling them to create an edge in developing right products for their customers, and marketing them to the right audience.

18.5.5 Security Management Controls

The physical and logical information system assets of an enterprise may face threats because of both man-made and natural hazards. Hence, these assets need to be protected against both types of hazards. The objective of the information systems security management control is to reduce losses to an acceptable level over a certain time period. Physical information system assets are protected by physical security whereas the logical assets (data/ information and software) are protected by a logical security system. The information systems security

administrator is responsible for controls related to threats to physical security and logical security. A security program involves: review of the security situation; assessment of vulnerability to risks (such as fire, voltage fluctuations); and continuous evaluation and improvement of safeguards (such as provision of fire alarms and fire extinguishers, use of voltage regulators and circuit breakers). The security policy needs to be adapted to suit the changes in the security environment.

Exposure analysis

The exposure or Expected Loss (EL) of an asset to a threat is the product of three terms: the probability of occurrence of a threat event (P_{te}), the probability of control failure (P_{cf}), and the monetary value of asset loss (L), in case the threat materializes.

Exposure or expected loss is given by the expression: $EL - P_{te} \times P_{cf} \times L$

Activity 18.1

The price of a common hardware component is ₹ 7,000, the probability of an employee attempting to steal it during a year is 15%, and the probability of the security guard detecting the theft is 60%. Calculate the exposure of the asset to risk.

Answer:

18.5.6 Operations Management Controls

Operations management is responsible for the daily operations of information systems. It provides the necessary computing environment and support for the information system development team to design and implement new systems, as well as support existing systems. Operations management controls are divided into different categories like control of computer and network operations, maintaining data files, program files, and documentation, help desk and technical support, and management of outsourced operations.

Control of computer and network operations

The controls in this function should ensure that:

- Control over computer operations involves activities associated with program execution, scheduling regular jobs and workload arrangements, preventive and remedial maintenance of systems, etc.

- The operations management should establish and document standard procedures for information systems operations including network operations.

- Managing service level agreements, transfer pricing, and acquisition of consumables are controlled as part of a related activity known as production control.

- Another related activity is performance monitoring of information systems and deciding on subsequent capacity additions.

- Network managers face a variety of interconnectivity, integration, policy setting, control and coordination, and security issues in their network enterprise.

- Control of physical access to network infrastructure is a very important component of management control of network operations.

Maintaining data files, program files, and documentation

The controls in this function should ensure that:

- All the data files and program files are stored in a secure and clean environment.

- Access to files is allowed only for authorized purposes.

- Backup of important data files is taken regularly and kept both at on-site and offsite locations.

- Up - to - date documentation to support computer operations and inventory of acquired software is maintained.

- Licensed software is properly used and secured so that it cannot be lost or stolen, or illegally copied.

Help desk and technical support

The controls in this function should ensure that:

- The help desk supports users who require assistance or face problems while using the information system.

- Organizations can establish a composite help desk facility utilizing both internal resources and the services of an external agency for specialized systems or facilities.

- Knowledge systems or expert systems may be developed to capture the expertise of the help desk staff. This is helpful for staff members newly recruited in this function as it also sensitizes them about recurring problems.

Management of outsourced operations

When information systems functions are outsourced partially or completely to a service provider, the control requirements include the following:

- Monitoring the service provider's compliance with the terms and conditions of the outsourcing contract.

- Evaluating and reviewing periodically the service provider's internal controls.

- Evaluating the disaster recovery preparedness of the service provider.

To reduce the risk of outsourcing, it is also important to monitor the long-term financial viability of the service provider.

Activity 18.2

ABC Bank is a bank based in the US. It plans to outsource the research and analysis wing of its investment banking operations to SM Technologies Ltd. in India. What are the different aspects that it has to consider before entering into such an arrangement?

Answer:

18.5.7 Quality Assurance Management Controls

Quality assurance management is concerned with conformance to quality standards and an ongoing process of continuous improvement. The information systems quality assurance function includes different activities in its scope. They are: establishing quality goals and standards for the information systems function and projects; checking whether the information systems conform to quality assurance standards; identifying areas for improvement; submitting the audit reports to the management; and training the staff in the relevant quality assurance standards and procedures.

The quality assurance personnel are independent of the information system function and their performance is evaluated based on their success in achieving the 'quality goals' of the organization. There are many industry-wide standards for the information system function developed by reputed national and international agencies. Prominent among them are the ISO 9000, the Capability Maturity Model (CMM) standard for software development, etc.

Capability Maturity Model (CMM)

CMM illustrates the evolution of the software process from an unplanned and immature state to a well-planned and mature state. It deals with activities like planning, engineering, managing the development, and maintaining the software. This helps organizations in achieving the objectives with respect to cost, time, and quality. CMM creates a benchmark for the organizations to monitor the level of maturity of their software processes by comparing it with those in the industry. There are five common features by which the key practices in CMM can be grouped. These features are: commitment to perform; ability to perform; activities performed; measurement and analysis; and verifying implementation. The CMM model has five maturity levels, which are described in Table 18.2 and explanation by taking ISO 27001:2005 for Multi Commodity Exchange (MCX) as an example.

Table 18.2: Capability Maturity Model - Levels of Maturity

Level of Maturity	Features
The Initial Level (Level 1)	• The software process is unplanned with continuous changes and modifications being made to the process. • Budgets, quality, etc., are not defined clearly. • The performance is contingent on the strengths and knowledge of the employees.
The Repeatable Level (Level 2)	• Disciplined process: • The planning and monitoring activities are well established. • The success of the previously undertaken projects is well monitored and can be replicated. • There is a project management system in place, which controls the project in hand taking into consideration the previous successes.
The Defined Level (Level 3)	• Standard, consistent process: • Software engineering activities and management functions are well established and replicable. • Cost, time of delivery, etc. are under control and quality is thoroughly monitored. • The potential of the process is well understood by all the people within the organization.
The Managed Level (Level 4)	• Predictable process: • Proper measurements are in place and the project can be measured. • Depending on these measurements, the organization is in a position to forecast the trends in the quality of the process and product. If the measurements are not met, the processes are immediately adjusted. • The products are of high quality.
The Optimizing Level (Level 5)	• Continuously improving process: • The organization is in the continuous improvement mode through constant efforts to improve the capacities and process performance. • The improvements are achieved through improvements in the existing processes and innovations.

Source: ICFAI Research Center

[3]ISO 27001:2005 for Multi Commodity Exchange (MCX)

Multi Commodity Exchange of India Ltd. (MCX) was established in 2003. It is an independent exchange based in Mumbai, India. It provides future trading in gold, silver, agricultural commodities, etc.

MCX has been continuously raising the bar through effective research and product development, intelligent use of information and technology, innovation, thought leadership and ethical business conduct. MCX has been certified with ISO standards, ISO 9001:2015 Quality Management System, ISO 14001:2015 Environment Management System, ISO 22301:2019 Business Continuity Management System and ISO/IEC 27001:2013 Information Security Management System.

Check Your Progress - 1

1. Match the given phases of the SDLC model with the respective activities carried out during these phases.

   Phases

   i.   System analysis and specifying user requirements

   ii. System design and development

   iii. Acceptance testing

   iv. Implementation and maintenance

   Activities

   p. The software is installed in the production environment, the required data is brought over to the new system, and the operations start using the new system on a day-to-day basis.

   q. A formal user requirements specification and, if applicable, an operational requirement, are the major deliverables at this stage of the SDLC.

   r. System testing by the development team is an integral part of this activity.

   s. Proper change management procedures should be strictly enforced to control any changes brought about in the software configuration items and ensure that the final version of the various software components is consistent and not conflicting.

   a. i/p, ii/q, iii/r, iv/s

   b. i/q, ii/r, iii/s, iv/p

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[3] Adapted from "Multi Commodity Exchange Bags ISO/IEC 27001:2005."
<http://www.moneycontrol.com/india/news/pressmarket/multi-commodity-exchange-bags- isoiec-270012005/282831>

   c. i/r, ii/s, iii/p, iv/q

   d. i/s, ii/p, iii/q, iv/r

   e. i/q, ii/p, iii/s, iv/r

2. Program management control involves the program development life cycle, which consists of five sequential stages and one parallel stage. Identify from the following statement, which is incorrect with respect to the program development lifecycle.

   a. For the planning phase to be effective the scope of the program should be clearly defined and the effort estimations should be based on formal techniques and metrics calculated from earlier development projects.

   b. The design phase runs parallel to all other phases.

   c. In terms of importance and urgency, defects identified in the testing stage can be classified as showstopper, critical, non-critical, and trivial.

   d. If the released program is not maintained properly, it can lead to corruption of the database, failure in meeting the user requirements, or operational in efficiency.

   e. The threads approach under coding performs programs on the basis of functional importance.

3. What refers to 'making the data available to the user at the time and place and in the form in which it is needed'?

   a. Resolvability

   b. Privacy

   c. Availability

   d. Integrity

   e. Sharability

4. Of the seven broad categories of information system management controls in an organization, identify the activities that include control of computer and network operations; maintaining data files, program files, and documentation; help desk and technical support; and management of outsourced operations.

   a. Systems development management controls

   b. Data resource management controls

   c. Operations management controls

   d. Quality assurance management controls

   e. Programming management controls

5. Identify a statement, which is incorrect with respect to the Capability Maturity Model used in quality assurance management control of information systems.

    a. The CMM model describes six levels of maturity.

    b. CMM illustrates the evolution of the software process from an unplanned and immature state to a well-planned and mature state.

    c. CMM deals with activities like planning, engineering, managing the development, and maintaining the software.

    d. CMM creates a benchmark for the organization to monitor the level of maturity of their software processes against those in the industry.

    e. CMM is an evolution of the software process from an unplanned and immature state to a well-planned and mature state.

18.6   Application Control of Information Systems

Application control of information systems is a security measure that restricts or blocks unauthorized applications from executing in ways that put data at risk. It is designed based upon an organization's objectives and purposes. With the appropriate usage of controls, an organization can greatly reduce the threats and risks associated with application usage.

The objective of application control is to ensure that application systems safeguard assets and maintain data integrity. Application controls are different from management controls in the following ways.

*   They are predominantly exercised by hardware and software; the role of people is limited.

*   They are applicable to data and data processing and not to system development, maintenance, and operation processes.

*   Their existence depends on a cost-benefit analysis of each application, whereas the existence of management controls is based on a cost-benefit analysis of the whole set of application systems.

*   They are more concerned with safeguarding assets and maintaining data integrity than ensuring system effectiveness and efficiency.

IT Application controls by auditors and management, addresses 3 types of application controls; Input Controls (transactions captured, accurately recorded, and properly authorized), Processing Controls (transaction processing has been performed as intended), and Output Controls (accuracy of processing result).

Apart from these boundary controls, database controls and communication controls form the basis for management control mechanism in IT systems. Let us go into details of these control mechanisms.

Figure 18.1 depicts the Application Controls in Information Systems.

Figure 18.1: Application Controls in Information Systems
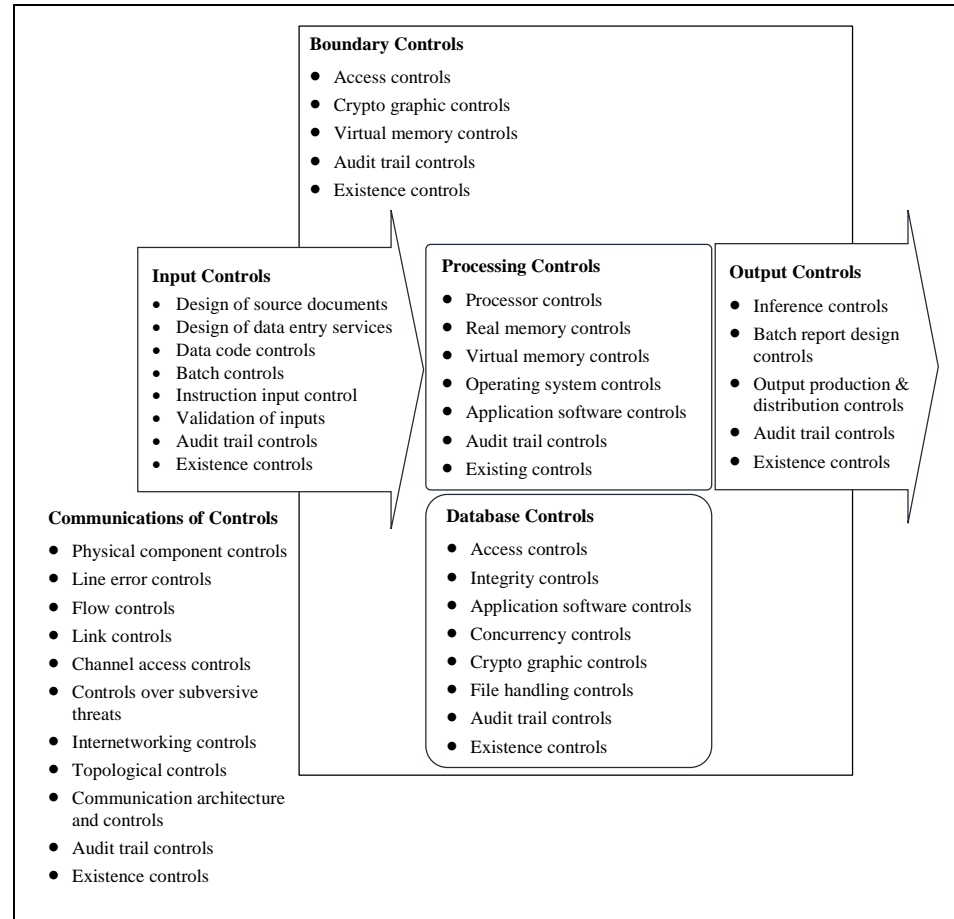
Source: ICFAI Research Center

18.6.1 Boundary Controls

Boundary controls exist at the interface between the computerized information system and the person intending to use the system. These controls are elaborate and complex. In general, the information system auditor spends the maximum time evaluating their effectiveness. These controls include access controls, cryptographic controls audit trail controls and existence controls. Let us go into details of these aspects.

Access controls

Access controls are the primary control systems found in the boundary subsystem.

These controls serve two objectives - preventing unauthorized access to the system and preventing unauthorized use of the system.

When the system administrator specifies the access rights, the security policy is known as mandatory access control policy.

When the system administrator assigns certain privileges to selected users, who in turn can assign rights to other users to access and use data, the security policy is known as discretionary access control policy.

User identification is a prerequisite for an effective access control mechanism.

Remembered information like passwords, and objects like swipe cards have been the most common means of verifying a user's identity. There is now an increasing usage of biometric techniques that are based on personal characteristics -- fingerprint, signature, hand geometry, voice, and facial features (e.g. iris/ retina pattern).

Based on the user's identity, the information system provides a suitable level of access.

Cryptographic controls

Cryptographic control involves the scrambling of data into meaningless text, so that anyone, who does not have the key cannot unscramble the data and understand its content.

The digital signature is an important application of cryptographic controls.

Example: GlobalSign Partners with Skribble for Electronic Signature

Skribble was a Swiss based provider of digital signatures. The company provided its eSignature platform to organisations for their digital signing needs. The company partnered with GlobalSign Solutions to develop a digital signature with legally binding proof, so that it could be offered to a larger workforce. As per a case study published by GlobalSign in 2020, the new integrated cloud based solution provided sophisticated electronic signatures in the lowest amount of time, helping customers save time and money. GlobalSign helped Skribble guarantee the security and identity verification of users by handling the issuing of the digital signature certificates necessary to meet the strict requirements of sophisticated electronic signatures.

Source: https://www.globalsign.com/en/resources/case-studies Published 2020, Accessed on 15th September, 2022

Audit trail controls

The audit trail is used to document the events that take place within the boundary subsystem.

It helps in detecting errors and also in checking whether the resources are being utilized properly.

As part of boundary controls, the audit trail keeps track of details of who attempted to log on to the information system, when they attempted to log on, whether they were successful, how long they remained logged on to the system before logging out, how much of the system resource was consumed by the user during a session, etc.

Existence controls

Existence controls of any subsystem are concerned with protecting the existence of the subsystem and ensuring its recovery in case of failure.

If the user is unable to access the system through the interface, it is referred to as a failure of the boundary subsystem.

Failure of hardware components can often be prevented by periodic preventive maintenance activities. In case of failure, the component may be repaired or replaced.

18.6.2 Input Controls

Input controls are required to ensure that the data and instructions entering the system are correct. Data capture deals with recognition and recording of events, which are important to the enterprise. Data capture methods can be classified into document- based data capture, direct entry data capture, and hybrid data capture. The use of a particular method for capturing data has a bearing on asset safeguarding, data integrity, system effectiveness, and the system efficiency objectives of an information system.

The different types of input controls are:

Design of source documents and data entry screens

A user-friendly layout and style of the source document reduces the chances of error by the employee. The quality of the screen design also affects the correctness of the data input.

Data code controls

Unique codes are used to identify data items in an information system. Well-defined codification schemes help reduce data entry error and increase the speed of data entry.

Batch controls

Data capturing and entry activities are prone to mistakes, so it is necessary to control them properly. Control totals are used to check the batch data for discrepancies. There are three types of control totals:

- *Financial totals:* Totals of monetary fields
- *Hash totals:* Totals of any kind of numeric values in the respective fields
- *Document or record counts:* Totals of the number of records in the batch

Validation of data input

Data input validation checks may be done at the field level, record level, batch level, or file level. For example, check digits are used in some applications for validating data inputs.

Audit trail controls

The audit trail control is used to document the source, the substance, and the timing of the data that is entered in the application system. The audit trail helps in enhancing the effectiveness and efficiency of the input subsystem by helping to rectify inefficient actions on time.

Existence controls

Existence controls for the input subsystem are the controls, which help in the recovery of the input data and instructions. Existence controls are usually more important for data input than for instruction input.

18.6.3 Communication Controls

Communication controls assume more importance in the present age, where information can be transmitted across the globe through various channels. During the communication of information from one place to another, information travels from one medium to another, giving rise to various types of exposure. These are: transmission impairments, failure of components, and subversive threats.

To subside the same, the following are different types of communication controls:

Transmission impairment

Transmission impairment results in a difference between the data sent by the sender and the data received by the receiver, in terms of quality and/ or integrity. Attenuation (weakening) and distortion of the signal are two major types of transmission impairments. Noise, which refers to the random electric signals that affect the performance of the transmission medium, is the third type of transmission impairment.

Component failure

Components in the communications subsystem are responsible for transporting data among all the other subsystems within a system and for transporting data or receiving data from another system. Failure of any of these components could result in loss of data.

In component of failure**,** physical component control reduces expected losses from the communication subsystem by selecting proper physical components that have characteristics, which make them reliable, either by reducing the probability of failure or by incorporating features that mitigate the possible effects of component failure.

Subversive threats

Subversive threats arise due to malicious attempts by intruders to damage the integrity of a component in the communication subsystem. Passive attacks may compromise data confidentiality. Active attacks may change the data or re-route it to a different destination.

Types of communication controls are as enumerated below:

- *In transmission impairment:* Communication architecture and controls, internetworking controls, topological controls, channel controls, link controls, flow controls, and line error controls
- *In component failure:* Physical component control
- *In subversive threats:* Providing a physical barrier across the transmission medium or by encrypting the data transmitted through it
- *Audit trail controls:* These controls are used to keep track of the events, their sequence, and timing with regard to the communicated data from the initiation of the communication to the time it reaches the receiver. Audit trails also help in recognizing performance problems or data integrity problems that take place within the communication network.
- *Existence controls:* These controls in the communications subsystem serve to restore the communications network in case of failure. They include the use of proper technology, adequate preventive maintenance, the presence of redundant components to increase reliability, and a backup and recovery mechanism.

18.6.4 Processing Controls

The processing subsystem receives the data from the input or communication subsystem and after processing it, sends it to the communication, output, or database subsystem. The different types of processing controls used are -- processor controls, real memory controls, virtual memory controls, and operating system controls.

18.6.5 Database Controls

The different types of controls in the database management subsystem can be classified as: access controls, integrity controls, application software controls, concurrency controls, cryptographic controls, file handling controls, audit trail controls, and existence controls.

Access controls

Access controls serve two objectives - preventing unauthorized access to data and preventing unauthorized use of data. The functioning part is same as explained under the 'Boundary Controls'.

Integrity controls

Integrity controls ensure that the data is correct and complete. They help to ensure the uniqueness of data codes. With the help of integrity controls, some of the errors in data input can be identified and rectified.

Application software controls

The integrity of the database subsystem depends partly on the controls applied through the application program using the database.

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Concurrency controls

These controls allow users of a database to share the same data resources and thus avoid the use of multiple versions of the same data item (which can result in data inconsistency).

Cryptographic controls

Encryption techniques are used to protect the integrity of the data in the database.

File handling controls

Data files should not get deleted accidentally. While the computing system may take care of file handling controls to a certain extent, the final responsibility would rest with the system administrators or users.

Audit trail controls

It is necessary to keep track of all the activities that take place -- including insertions, modifications and deletions, the time of occurrence, etc. to know how the database reached its current status. The system may maintain an audit log of the transactions and multiple versions of the data in terms of pre-image (data image before an event) and post-image (data image after an event).

Existence controls

The database needs to be restored in the event of destruction or damage due to various reasons like application program error, system software error, hardware failure, etc. Roll forward and roll back are the two major types of database recovery operations.

- *Roll forward:* If there is loss of recent information due to database failure, a previous version of the database backup can be used along with the transaction log to recreate the current version.
- *Roll back:* If there is a wrong update of the database, the current version of the database can be used along with the transaction log to recreate the previous version.

18.6.6 Output Controls

The output subsystem of the application system delivers the information to the end users. The different types of controls exercised in the output subsystem are:

Inference controls

Inference controls are used to address the needs related to permissions given to users to access a statistical database for obtaining summary information about data and protecting the privacy of persons whose data is stored.

Batch report design controls

The title page of a batch report should clearly display the authorized recipients (distribution list) of the report, security classification indicating the sensitivity of the data contained in the report, and whom to contact if the report is defective.

Output production and distribution controls

Batch output controls include controlling access to standard stationery (paper, cd-rom) on which the batch output would be produced; permitting only authorized users to execute batch report programs; preventing modification of the generated output; restricting the distribution of the batch output to authorized users, etc. Online output is generated and made available at the user's terminal based on the user's authorized access rights, after validating the user's identity.

Audit trail controls

Audit trails track the output given to the users, the identity of the user who received the output, the time at which the output was received, etc. It helps to check whether the output is being used by unauthorized people or in an unauthorized manner. The audit trail is also helpful in documenting the amount of resources being utilized to produce the required outputs.

Existence controls

In an output subsystem, existence controls are required in case there is loss of output due to some problems. Useful techniques for existence controls of the output subsystem include - maintenance of pre-image and post-image, storage of spooled print files, and restarting the output generation from an intermediate checkpoint.

18.7   Information Systems Audit

According to Ron Weber, information systems auditing is the process of collecting and evaluating evidence to determine whether a computer system safeguards assets, maintains data integrity, allows organizational goals to be achieved effectively, and uses resources efficiently. An information systems audit provides the people who rely on a particular information system with an authoritative and objective opinion on the extent to which they can safely rely on that system.

An information systems auditor should have knowledge about both information systems and audit practices. The Information Systems Audit and Control Association (ISACA) conducts certification examinations for individuals who seek the Certified Information Systems Auditor (CISA®) certification.

18.7.1 Information Systems Audit Procedures

The information systems audit procedures involve the following tests:

- *Tests of controls*: This is done to obtain evidence about the suitability of design and effective operation of the accounting and internal control systems. This evidence is usually obtained by testing the information systems applications.

- *Tests of transactions*: Conducted to check the effectiveness and efficiency of the database system.

- *Tests of balances*: Conducted to make a final evaluation regarding the degree of misstatements that could arise due to any failure of the information systems to safeguard assets and maintain data integrity.

There are three techniques in which computers can be used in information systems audit. Table 18.3 lists the important characteristics of each of these techniques.

Table 18.3: Use of Computers in Information Systems Auditing

Technique	Characteristics
Auditing around the computer	Auditors calculate expected outcomes before entering inputs into the system and then compare the actual outcomes with the expected outcomes.
	Used when the systems adopted are simple and the outcomes can be retraced to the inputs.
	Also used for auditing Commercial Off-the-Shelf (COTS) software
	Advantages:
	- Does not require technical expertise
	- Cost-effective
	Limitations:
	- Cannot be used in complex computer systems.
	- Does not clarify the behavior of the system when information containing errors is encountered.
	- Does not give information as to whether the system logic is appropriate.
Auditing through the computer	Deals with assessing the processing steps, programming logic, edit routines, and programmed controls.
	Used when the information system is complex and there is a huge amount of inputs/ outputs.
	Used when the processing logic and controls are present in the information system.
	Limitations:
	- Higher costs
	- Requires higher technical expertise

Contd....

Computer Assisted Audit Techniques (CAAT)	- Use software for performing audit procedures (such as reading computer files, selecting information, performing calculations, and printing reports) and other specific auditing tasks. - Generally used to conduct substantive tests for verifying monetary values in transaction details and account balances. - Help in increasing the effectiveness and efficiency of auditors.

Source: ICFAI Research Center

Example: Disaster management at Ireland's Healthcare System

Healthcare organizations were considered to be a prime target for ransomware attacks due to the nature of their operations and relatively less secure IT infrastructure throughout the industry. Ireland's Healthcare System (HSE) experienced one such ransomware attack in 2021, which resulted in the closure of many outpatient services, IT disruptions at 5 hospitals, delay in the results of the COVID-19 test, and delay in staff paychecks. More than three months and $100 million in recovery activities alone were required for the nearly complete recovery and restoration. However, the impact of the attack could be minimised due to some good disaster recovery methods in place which did not allow the attack to spread further and impact other cloud based systems.

Source https://invenioit.com/continuity/4-real-life-business-continuity-examples/, Published March 2022, Accessed on 15th September, 2022

18.8   Business Continuity and Disaster Recovery

Business continuity is the organization's ability to carry out its business operations with negligible disruption or downtime during a natural or man-made disaster. Business Continuity Planning (BCP) and Disaster Recovery Planning (DRP) are processes that are essential to any organization as they ensure continuity of business even in the face of unforeseen circumstances. The two terms BCP and DRP, though often used synonymously, are different from each other. DRP is a plan that ensures that the organization resumes business after the occurrence of a disruptive event. BCP is broader in scope and it attempts to ensure that - even in the event of a disaster - the required IT services are available and that there is minimum disruption in the business activities.

18.8.1 Business Continuity Management

Business continuity management deals with three broad aspects:

- *Availability:* This aspect deals with the availability of the information technology infrastructure in the organization. It is necessary for organizations to keep a specific level of IT infrastructure available at all times.

- *Reliability:* This aspect deals with the service level management and the focus is more on processes than on technology. Organizations aim at enhancing its operational effectiveness through efficiently managing the IT infrastructure.

- *Recoverability:* This aspect deals with the business continuity planning aspect. Organizations focus on the fact that important business activities continue to function even in the face of disaster.

Business Continuity Planning

BCP puts in place those processes and procedures, which ensure that there is a continuous flow of the essential business functions before, during, and after the occurrence of the disastrous event. The first step in BCP is to list out the critical functions in the organization, and accordingly allocate the available budget. Then, the processes and procedures, which would help in carrying out the business operations, should be established. As per the Gartner Group, a business continuity plan should comprise the following:

- A disaster recovery plan that contains details about the strategies to be adopted in case of failure of the procedures during disasters.

- A business resumption plan that contains details about the various ways of carrying out the essential services at the crisis site.

- A business recovery plan that contains details of ways in which the business operations can be recovered at an alternate location.

- A contingency plan that contains details of how to deal with external events that would create a serious impact on the organization.

  For instance, let us discuss the [4]business continuity plan at Ames and Mphasis.

American Express Bank

The American Express Bank (Amex) understood the strategic importance of business continuity, when the two hijacked planes struck the World Trade Center towers on September 11, 2001. After the incident occurred, the teams at Amex and its partner Electronic Data Systems had very little time to evacuate the building, abandoning 100 servers that handled front-end customer processing.

The teams relocated to the bank's backup operations located at New Jersey, which was first created during the Y2K threat. Its business recovery plan enabled the bank to quickly take backup of its data. The plan also helped the bank to resume operations immediately and enabled processing of about 19,000 transactions (70% of the transactions that occurred during the day) that was valued at US$ 14.3 billion.

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[4] Adapted from "MphasiS Disaster Recovery/Business Continuity Plan."
    <http://www.mphasis.com/pdfs/MphasiS_Business_Continuity_Plan.pdf> and
    <http://www.atkearney.com/main.taf?p=5,3,1,115,4>

MphasiS Ltd.

MphasiS Ltd. (MphasiS), formed in June 2000, is a global IT and BPO services company. The business continuity plan -- known as the Continuity of Business (CoB) plan – was created so as to keep the operations going at the minimum level in the company's Bangalore and Mumbai facilities in face of a disaster. At MphasiS, the CoB was designed in such a way that there is a separate team handling individual dimensions of the plan.

The different teams and responsibilities were: executive management team which takes the decision to begin action on the plan; recovery management coordinator, who manages the entire operation; IT recovery group; logistics recovery group; delivery recovery group, and the corporate communication (public relations) group.

The objectives to be achieved during the recovery operation were:

- Maintaining high service quality levels for the services given to clients

- Supporting the employees through proper training and care

- Offering the shareholders with excellent services

18.8.2 Disaster Recovery Planning (DRP)

As discussed above Disaster Recovery Planning (DRP) is set of processes that are essential to any organization as they ensure continuity of business even in the face of unforeseen circumstances.

Some of the objectives of DRP are:

- To provide a sense of security in the organization

- To curtail the risk of permanent loss to the key assets of the organization

- To reduce disorder during the disaster.

- To minimize decision-making during the disaster as it is a highly stressful and emotional time for everyone

- To provide a standard for testing the plan by simulating the various disaster recovery situations

- To ensure control of the systems and the resources during a disruptive event.

Example: Business Continuity and Disaster Recovery Planning for a Leading Indian Bank

Web Werks was among the top data center hosting services provider in India. One of their clients, a leading Indian nationalised bank needed to secure its global website and sensitive data as well as add a disaster recovery set-up to its existing IT infrastructure, as per the new RBI data protection guidelines.

Contd….

The data centers for the bank needed to be connected to a secure private network to safeguard from various types of cyber threats and also have DR (Disaster Recovery) sites in various seismic zones around India. For this purpose, Web Werks hosted the bank's global website on private cloud within Web Werk's Data Centers. In addition to this, special server provisions were made for real-time replication for backup and disaster recovery. A backup policy was created that took into account a number of variables, including the maximum allowed data loss, the maximum recovery time, the availability of data, the corrective steps to be taken in the event of a backup failure, and the backup strategy.

Source: https://www.webwerks.in/customersuccessstories/web-werks-helps-one-indias-leading-national-bank-secure-its-global-website, Published July 2022, Accessed on 15th September, 2022

Categorizing the functions

Before drawing up a disaster recovery plan, the organization should identify and prioritize its functions based on whether they are critical, vital, sensitive, or non-critical as explained below:

- *Critical functions:* These are functions that cannot be performed unless they are replaced by similar functions. They cannot be replaced by manual methods.

- *Vital functions:* These are functions that can be manually performed but only for a short period of time.

- *Sensitive functions:* These are functions that can be performed manually for an extended period at a reasonable cost.

- *Non-critical functions:* These are functions that are episodic in nature and may extend for a period at little or no cost to the organization.

Components of a disaster recovery plan

The following are the components of DRP:

- *Emergency plan:* An emergency plan contains an action plan for the steps to be carried out immediately after the occurrence of the disaster. The steps in an emergency plan depend upon the nature of plan. The plan includes:

  - The list of persons to be notified immediately after the occurrence of the disruptive event

  - The actions that need to be taken immediately

  - The process of carrying out the evacuation

  - The conditions that need to be fulfilled before ascertaining that the site is safe and can be reused.

- *Backup plan:* A backup plan ensures that the critical information systems functions of the organization are quickly *restored*. While preparing a backup plan, it should be ensured that a backup is taken of all the vital resources of the organization. It includes:
  - The type of backup
  - The frequency of backup
  - The location of the backup
  - The site for assembling the resources and restarting the operations
  - The priorities assigned for recovering the various systems
  - The time frame set for the recovery of each system.

- *Recovery plan:* A recovery plan ensures that all the information systems functions of the organization are completely restored.

- *Test plan:* A test plan acts as an aid in spotting the deficiencies in the other three plans. It entails testing the readiness of the organization and the employees to face any disruptive event. This testing is done by simulating a series of disasters and listing the norms or standards against which various plans are measured to test their sufficiency and completeness.

Testing a Disaster Recovery Plan

The DRP is tested for the following reasons:

- To test the awareness and readiness of the employees to face the disaster
- To identify the omissions made in the plans
- To act as a checking mechanism to ensure implementation of good security practices by the organization.

The three phases in DRP testing are:

- *Paper test:* The plan is tested when it is still on paper. It is an abstract level testing, which involves the major players in the executing team attempting to determine what might happen in case a particular type of disruption takes place.

- *Preparedness test:* This test is a smaller or localized version of the full test and is carried out after the first phase of DRP testing. In this test, the actual resources are expended while carrying out simulation during a system crash.

- *Post-test:* A post-test constitutes a group of activities that are to be carried out after the occurrence of the disruptive event.

After successfully resuming operations, the management should lay down procedures for evaluating the adequacy of the plan and revise it accordingly.

Activity 18.3

The main computer server at SRL Systems crashed in April 2009, which resulted in significant loss of mission-critical data. At that point of time, the company had not put an effective disaster recovery plan in place. The Chief Operations Officer appointed one of his deputies to design such a system, which would ensure continuity of business even in the face of unforeseen circumstances. Before drawing up the DRP, how should the organization's functions be categorized? What components should the plan comprise? Enumerate the objectives, which the DRP should address.

Check Your Progress - 2

6. What purpsoes serve the access controls?

    i.   Preventing unauthorized access to the system

    ii.   Scrambling the data into meaningless text

    iii. Documenting the events that take place within the boundary subsystem

    iv.   Preventing unauthorized use of the system

    a.   i and ii

    b.   ii and iii

    c.   i and iv

    d.   ii and iv

    e.   iii and iv

7. Even the most effective and efficient information system fails to deliver the required result, if erroneous data is entered into the system. Data capture methods can be classified into three types, what are they?

    a.   Document-based; direct entry; data code

    b.   Direct entry; hybrid; cryptographic

    c.   Cryptographic; hybrid; document-based

    d.   Document-based; direct entry; hybrid

    e.   Cryptographic; document based; data code

8. In the application control of information systems, how existence controls can be used?

    a.   Keep track of details like who attempted to log on to the information system

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b. Maintain the chronology of events from the time the data is communicated till the time the data is received by the receiver

c. Restore the communications network in case of failure

d. Help in recognizing performance problems or data integrity problems that take place within the communication network

e. Excludes redundant components to increase reliability

9. Existence controls restore the database in an information system in the event of destruction or damage due to various reasons like application program error, system software error, hardware failure, etc. What are the two major types of database recovery operations?

a. Pre-image, post-image

b. Current version, previous version

c. Roll forward, roll back

d. Physical, logical

e. Direct entry data capture, hybrid data capture

10. Match the following phases of testing a disaster recovery plan with the activities that these phases entail.

Phase

i. Preparedness test

ii. Post-test

iii. Paper test

Activities

p. It is an abstract level testing which involves the major players in the executing team attempting to determine what might happen in case a particular type of disruption takes place.

q. In this test, the actual resources are expended while carrying out simulation during a system crash.

r. These activities include sending back the resources to the appropriate places, disconnecting the equipment, sending back the personnel, and deleting all organizational data from third-party or backup systems.

a. i/q, ii/r, iii/p

b. i/p, ii/q, iii/r

c. i/r, ii/p, iii/q

d. i/p, ii/q, iii/r

e. i/q, ii/p, iii/r

18.9   Summary

- The main objectives of control of information systems are safeguarding of assets, maintenance of data integrity, effectiveness in achieving organizational objectives, and efficient consumption of resources.

- IT governance consists of relationships and processes that direct and manage an organization, help it to achieve its business goals, and generate value for its investments in IT, while minimizing the risks.

- Prominent IT governance frameworks are the IT Infrastructure Library (ITIL), Control Objectives for Information and Related Technology (COBIT), and the Balanced Scorecard (BSC).

- ITIL addresses skill requirements and organization structure, and provides detailed information on how to manage IT operations.

- COBIT provides a set of IT control objectives that guide organizations on how to maximize the benefits from IT implementation by developing control and appropriate IT governance in the organization.

- Use of the BSC for IT governance involves creation of an IT scorecard, which aligns the IT strategy and performance management framework with the overall organizational strategy and performance management framework.

- Management controls of information systems are the managerial functions that have to be performed for ensuring planned and controlled development, implementation and operation, and maintenance of the information systems.

- There are seven broad categories of information system management controls in an organization − top management controls, systems development management controls, programming management controls, data resources management controls, security management controls, operations management controls, and quality assurance management controls.

- Application controls of information systems refer to the control features in each application system. The objective of these controls is to ensure that application systems safeguard assets and maintain data integrity.

- The different types of application controls are boundary controls, input controls, communication controls, processing controls, database controls, and output controls.

- Information systems auditing is the process of collecting and evaluating evidence to determine whether a computer system safeguards assets, maintains data integrity, allows organizational goals to be achieved effectively, and uses resources efficiently. An information systems audit provides the people, who rely on a particular information system with an authoritative and objective opinion on the extent to which they can safely rely on that system.

- Information systems audit procedures involve tests of controls, tests of transactions, and tests of balances. There are three ways in which computers can be used in information systems audit - auditing around the computer, auditing through the computer, and Computer Assisted Audit Techniques (CAAT).

- Business continuity management (BCP) deals with three broad aspects: availability, reliability, and recoverability.

- BCP puts in place those processes and procedures which ensure that there is a continuous flow of the essential business functions before, during, and after the occurrence of any disastrous event.

- DRP is a plan that ensures that the organization resumes business after the occurrence of a disruptive event.

18.10 Glossary

Application Controls: Application controls refer to the control features in each application system that is a part of the information systems of an organization.

Business Continuity Plan or Planning (BCP): BCP puts in place those processes and procedures, which ensure that there is a continuous flow of the essential business functions before, during, and after the occurrence of any disastrous event.

Business Continuity: Business continuity is the organization's ability to carry out its business operations with negligible disruption or downtime during a natural or manmade disaster. Business continuity management deals with three broad aspects: availability, reliability, and recoverability.

Capability Maturity Model (CMM): The CMM model, developed by the Software Engineering Institute of the Carnegie Mellon University, depicts the important constituents of an effective software process. It illustrates the evolution of the software process from an unplanned and immature state to a well-planned and mature state. It deals with activities like planning, engineering, managing the development, and maintaining the software.

Control Objectives for Information and Related Technology (COBIT): COBIT was developed by the IT Governance Institute and the Information Systems Audit and Control Association (ISACA) of the US in 1992. It provides a set of IT control objectives that guides organizations on how to maximize the benefits from IT implementation by developing control and appropriate IT governance in the organization.

Disaster Recovery Plan or Planning (DRP): DRP is a plan that ensures that the organization resumes business after the occurrence of a disruptive event.

Exposure Analysis: The exposure or Expected Loss (EL) of an asset to a threat is the product of three terms: the probability of occurrence of a threat event (P_{te}), the probability of control failure (P_{cf}), and the monetary value of asset loss (L) in case the threat materializes. The equation is as follows: $EL - P_{te} \times P_{cf} \times L$.

IT Governance: IT governance can be defined as the organizational capacity exercised by the board, executive, and IT management to control the formulation and implementation of IT strategy and ensure the fusion of business and IT.

IT Infrastructure Library (ITIL) Framework: The (ITIL) framework was developed by the Central Computing and Telecommunications Agency of the British government to help British companies manage their IT resources efficiently. ITIL addresses issues relating to skill requirements and organizational structure, and provides detailed information on how to manage IT operations.

Strategic Information Systems: Strategic information systems are those information systems applications that serve the top management's needs for strategic performance control.

18.11 Self-Assessment Test

1. Enumerate the main reasons for the need to establish control over computer-based data processing. What are the objectives of control of information systems?

2. What is IT governance? Name the prominent frameworks that help organizations implement IT governance. Describe one of these frameworks in detail.

3. In the case of information systems, management controls are the managerial functions that have to be performed for ensuring planned and controlled development, implementation, operation, and maintenance of information systems. List the broad categories of management controls for information systems. Explain the importance of quality assurance management controls.

4. The Systems Development Life Cycle (SDLC) is a popular, traditional model for systems development. Describe the different stages in the Systems Development Life Cycle (SDLC).

5. Explain how application controls of information systems are different from management controls.

6. "Access controls are the primary control systems found in the boundary subsystem". Explain.

7. During the communication of information from one place to another, information travels from one medium to another, giving rise to various types of exposure. Describe each of the types of exposure briefly.

8. Explain the different tests used in information systems audit procedures. What are the different ways in which computers may be used in information systems auditing?

9. Explain the different aspects of business continuity management.

10. What are the objectives of disaster recovery planning in an organization? On what basis should functions in an organization be categorized before drawing up a disaster recovery plan? What are the components of a disaster recovery plan? Describe the three phases in DRP testing.

18.12 Suggested Reading / Reference Material

1. Stephen P Robbins, David A. De Cenzo and Mary Coulter (2022). *Fundamentals of Management: Essential Concepts and Applications,* Fifteenth Edition| Pearson Paperback, 30 June 2022.

2. Subhash Chandra Das (2019). Management Control Systems – Principles and Practices, PHI Learning Pvt. Limited, Paperback – 15 July 2019.

3. Pravin Durai (2019). Principles of Management: Text and Cases, First edition, Pearson India Education Services Pvt. Ltd.; Second edition (31 August 2019).

4. Merchant, Kenneth A (2017). "Management Control System: Text and Cases", Pearson Education Asia.

5. Saravanavel, P (2022). Management Control Systems – Principles and Practices. First edition, Himalaya Publishing House.

18.13 Answers to Check Your Progress Questions

1. **(b) i/q, ii/r, iii/s, iv/p**

    A formal user requirements specification and, if applicable, an operational requirement, are the major deliverables at the system analysis and specifying user requirements phase of the SDLC. In the system design and development phase, system testing by the development team is an integral part of the development activity. Statistics of defects uncovered during quality reviews, testing, and other forms of quality control are maintained and analyzed for trends and corrections made. As a part of the acceptance-testing phase, proper change management procedures should be strictly enforced to control any changes brought about in the software configuration items and to ensure that the final versions of the various software components are consistent and not conflicting. In the implementation and maintenance phase, the software is installed in the production environment, the required data is brought over to the new system, and the operations start using the new system on a day-to-day basis.

2. **(b) The design phase runs parallel to all other phases**

    The control phase in the programming management control runs parallel to all the other phases and involves monitoring of the tasks progress in

the different phases of the programming life-cycle, comparing it against the plan, and taking the necessary corrective action and/ or preventive action.

3. **(c) Availability**

The four objectives for better management of data are: sharing of the data by the different user groups (Sharability); making the data available to the user at the time and place and in the form in which it is needed (Availability); ensuring that the data is amenable to change based on the requirements of the user (Resolvability); and maintaining data integrity (Integrity).

4. **(c) Operations management controls**

The activities of operations management control include control of computer and network operations; maintaining data files, program files, and documentation; helpdesk and technical support; and management of outsourced operations.

5. **(a) The CMM model describes six levels of maturity**

The CMM model describes five levels of maturity.

6. **(c) i and iv**

Access controls serve two purposes - preventing unauthorized access to the system and preventing unauthorized use of the system. Documenting the events that take place within the boundary subsystem is done using the audit trail to check, whether the resources are being utilized properly and to help in detecting errors. Cryptographic controls are a major technique used in boundary controls. They protect the integrity of data by scrambling it into meaningless text.

7. **(d) Document-based; directentry; hybrid**

Datacapture deals with recognition and recording of events, which are important for the enterprise. Data capture methods can be classified into document-based data capture, direct entry data capture, and hybrid data capture. The use of a particular method for capturing data has a bearing on asset safeguarding, data integrity, system effectiveness, and the system efficiency objectives of an information system. For instance, if the data capture method requires manual operations such as data entry through the keyboard, the probability of mistakes increases.

8. **(c) Restore the communications network in case of failure**

Existence controls in the communications subsystem are used to restore the communications network in case of failure. It includes the use of proper technology, adequate preventive maintenance, presence of

redundant components to increase reliability, and backup and recovery mechanism. Audit trail controls in communication controls are used to maintain the chronology of events from the time the data is communicated till the time the data is received by the receiver and they also help in recognizing performance problems or data integrity problems that take place within the communication network. As part of access controls of information systems, audit trail controls keep track of details like who attempted to log on to the information system.

9. (c) **Roll forward, rollback**

Roll forward and roll back are the two major types of database recovery operations. Roll forward is used, if there is a loss of recent information due to database failure. Here, a previous version of the database backup can be used along with the transaction log to recreate the current version. Roll back is used if there is a wrong update of the database.; the current version of the database can be used along with the transaction log to recreate the previous version. In audit trail controls, the system may maintain an audit log of the transactions and multiple versions of the data in terms of pre-image (data image before an event) and post- image (data image after an event). Physical asset and logical asset are the two types of information system assets of an enterprise.

10. (a) **i/q, ii/r, iii/p**

In the paper test, the plan is tested when it is still on paper. It is an abstract level testing which involves the major players in the executing team attempting to determine what might happen in case a particular type of disruption takes place. In the preparedness test, the actual resources are expended, while carrying out simulations during a system crash. It is performed regularly on various aspects of the plan and is a cost-effective way of gradually obtaining evidence about the effectiveness of the plan. It also provides ways of enhancing the plan in stages. A post-test constitutes a group of activities that are to be carried out after the occurrence of the disruptive event. These activities include sending back the resources to the appropriate places, disconnecting the equipment, sending back the personnel, and deleting all organizational data from third-party or backup systems.

Unit 19

Implementation of Management Control Systems

Structure

"The essence of management control is maximising the areas over which we have some control over the outcome while minimising the areas over which we have   absolutely no control over the outcome".

- Peter Bernstein – Financial historian and Economist

19.1   Introduction

It is important to create robust management control systems on controllable aspects of business while mitigating risk on what is not controllable.

In the previous unit, we discussed the controls and governance of Information Systems. In this unit, we shall discuss how to implement management control systems.

Organizations should have realistic expectations from management control systems (MCS). MCS may not always be effective (in design or implementation).It may not guarantee that the organization will achieve its objectives of effectiveness, efficiency, accuracy of financial reporting, and compliance. These control systems merely enhance the probability of achieving its objectives.

This unit will first discuss the operationalization of a management control system, and then discuss the various organizational roles and responsibilities involved in implementation of control systems. We shall then move on to discuss the challenges involved in implementing these controls. Finally, we shall discuss the impact of the organizational life cycle on the evolution of an organization's control requirements.

This shall be followed by an exhaustive discussion on Enterprise Risk Management — its objectives, types of risks involved, the risk management process, and the COSO ERM framework.

19.2 Objectives

After studying this unit, you should be able to:

- Discuss how a management control system gets operationalized.
- Recall how control activities like meetings, communication, monitoring play a vital role in the management control system.
- Recognize the importance of various organizational roles, both internal and external, in implementation of management control system.
- Visualize the challenges that may be faced by an organization in course of its implementation of management control system.
- Explain the impact of the organizational life cycle on the evolution of an organization's control requirements.
- Discuss the Enterprise Risk Management concept in lieu of its objectives, components, types and COSO ERM framework in particular.

19.3 Operationalizing a Management Control System

There is no certainty that management control systems will always be effective, either in terms of design or in terms of implementation. These systems can only increase the probability of achievement of organizational objectives of effectiveness, efficiency, accuracy of financial reporting, and statutory compliances.

Management controls should be integrated or in-built into the organization's activities. These in-built control systems will influence the organization's capacity to achieve its objectives and also help in improving the quality of its business operations. Let us discuss some of the best practices in the operation in the industry.

According to the "Internal Control - Integrated Framework" proposed by the Committee of Sponsoring Organizations of the Tread way Commission (COSO), there are five components of management control - control environment (comprising people attributes, management attributes, and the direction and guidance provided by the Board of Directors); risk assessment (identification of

risk that may derail the organization's progress in the pursuit of its objectives, analysis of each risk to estimate the probability of its occurrence and impact, and the suitable action that has to be taken to manage the risk); control activities; information and communication; and monitoring the control system.

19.3.1 Control Activities

Control activities refer to the policies and procedures that are used in an organization to provide a reasonable assurance that the directions and instructions given by the management are followed appropriately. Control activities differ depending on the business environment, organizational objectives, complexity in business operations, people involved in implementation of these activities, and organizational structure and culture. Table 19.1 lists some such control activities.

Table 19.1: Control Activities in Management Control System

Control Activity	Description
Top level reviews	Top management's review of organization's performance (against forecasts, benchmarks, etc.) and the progress of strategic initiatives.
Direct functional / activity management	Functional/activity manager's / review of operational performance, reconciliation of records, etc.
Information processing	Include control activities to ensure that information regarding transactions is correct, complete, and authorized.
Documentation	Examples: Policy manuals, organograms, standard operating procedures, evidence of ongoing use of control systems.
Segregation of duties	Dividing the duties (such as making a demand draft and checking/authorizing it in a bank) in the organization among employees to minimize errors - intentional or unintentional.
Physical controls	Include physical security of assets and periodic verification of the physical existence of assets as per the records.
Analysis of performance indicators	Data analysis to identify trends, deviations, etc., so that corrective action may be taken, if required.
Meetings	For coordination, problem solving, strategic planning and performance review, innovation, etc.

Source: ICFAI Research Center

Meetings

Patrick Lencioni identified four types of meetings that will serve different purposes - the daily check-in, the weekly tactical, the monthly strategic, and the quarterly off-site review. According to Lencioni, conducting these meetings will help enhance decision-making and reduce the time taken in the decision-making process. Table 19.2 gives the various types of meetings and their features.

Table 19.2: Types of Meetings and their Features

Type of Meeting	Features
Daily check-in	• Duration: 5-10 minutes • Employees stand and discuss the tasks and activities they will handle that day. • Clarifies the priorities to be set and how they have to be tackled. Reduces the time spent on scheduling daily activities. • Held at a fixed place and time; should not be cancelled due to low attendance. • Discussion should be restricted to the daily priorities of the activities.

Weekly tactical	• Duration: 45-90 minutes.
	• Conducted to discuss problems that need to be handled immediately; should avoid discussion of long-term decisions.
	• Comprises three parts –
	  o *Lightning round*: Deals with everyone trying to bring out 2-3 of their most important priorities for the week.
	  o *Progress review*: The team tries to compare the progress of activities with the specific critical metrics that have been decided by the organization.
	  o *Real time agenda*: The agenda of the tactical meeting is decided depending on the outcomes of the lightning round and the progress review.

Monthly strategic and Ad hoc strategic	• Duration: Monthly - 2 to 3 hours. • Conducted regularly to discuss key strategic issues that arise during the weekly tactical meetings.

Contd….

	• Key aspects (only 2 to 3) that may affect the business are discussed.
	• Ad hoc strategic meetings should be called for to sort out exceptional strategic issues that require to be addressed urgently.
	• The meeting's agenda should be decided before-hand through research and preparation on the topics to be discussed.
Quarterly off-site review	• Duration: Quarterly - 1 to 2 days; conducted in a location away from office.
	• Focus of this discussion is about the issues regarding long-term strategies, employees, teams, the industry, and the competitors.
	• Less number of presentations and outside speakers. Avoid tourism spots as they may lead to distractions.

Source: ICFAI Research Center

19.3.2 Communication

Information systems will not be effective without proper communication between the various management levels. Communication helps in passing on the information, work coordination, assigning of responsibilities, etc. Two types of communications take place in any organization - internal communication and external communication.

Internal communication

Meetings act as mechanisms of internal communication. Consistency/inconsistency of management's behavior with its formal communications (oral/written) is an important component of internal communication to employees. Employee orientation and socialization helps in spreading the organization's culture, and shared values to new and existing employees. Internal communication includes -

• Informing the employees about the importance and functioning of the control systems, and the role each employee has to play within the control system

• Making the employees aware of problems that may arise and the ways to handle them

• Letting employees know how their activities affect the jobs of other employees

• Having both regular and exception reporting systems in place which will help employees report important business related information to the higher levels in the hierarchy

- Collecting and processing employee feedback and ideas related to business functions, products, continuous process improvement, etc.

- Ensuring proper two-way communication between the management and the board of directors.

External communication

External communication includes communication with the suppliers, customers, external auditors, regulators, etc. Through such communication, customers can provide feedback about the quality of products and services, and external auditors and regulators can provide information about the effectiveness of the internal controls of the organization.

Most business processes these days are being outsourced to organizations located worldwide. Managers, who cannot be present at all the outsourced locations, face problems in controlling aspects like time and costs of the business. These issues can be solved by using various software and communication Technologies.

Importance of Communication in Outsourcing Relationships

Medical Product Outsourcing magazine has surveyed original equipment manufacturers, contract service providers, and industry consultants to identify the 10 most common problems faced in outsourcing relationships and the solutions for addressing these problems.

One of the most important problems faced in outsourcing / offshoring relationships is insufficient communication or absence of communication.

To solve this issue, experts advise that it is always better to put down the terms and conditions clearly on a paper. This paper work would help in enhancing the understanding. It would also help in clarifying any queries related to the specifications.

Experts suggest that the whole project team should have proper communication. Some companies are facilitating multilayer communication in which employees belonging to similar domains at each end can communicate with each other. The project managers, on the other hand, should have complete and clear knowledge about all crucial aspects of the project. Companies are also sending employees to the clients' locations to work with them and have a clear understanding of the project.

Communication is carried out on a daily and regular basis through phone, e-mail, etc. Companies also conduct monthly or quarterly face-to-face meetings that deal with issues, problems, and progress of the project.

19.3.3 Monitoring the Control System

Organizations should develop controls so that they become flexible to adapt to changes, and incorporate any changes in plans when required. As the business

environment is volatile, the control systems should be reviewed and monitored regularly to assess their relevance and suitability for the organization at a given point of time. This monitoring involves evaluating the design and functioning of the controls at proper intervals of time and fixing the mini case of any discrepancies.

Continuous monitoring of control systems includes: regular management and supervisory activities, periodic audits - both internal and external, and inputs from external stakeholders such as customers and regulators. Separate assessment of controls can also be performed through self-assessment by the management or by audits commissioned specifically for this purpose.

Continuous monitoring and separate assessment of controls helps in improving the control system's effectiveness. The former helps in providing feedback on whether the control components are effective or ineffective, while the latter, helps in understanding the control system's effectiveness as a whole and, in turn, of the continuous monitoring processes. Decision regarding separate assessment of activities depends on factors like level and type of changes taking place and the risks that these changes pose for the organization; the proficiency of the people involved in implementing the controls; and on the outcomes of the continuous monitoring effort.

While implementing control systems, it is important that the organizations should have proper systems in place to identify, communicate, follow up, and correct discrepancies (if any) in the set plans and objectives. The control functions should be closely integrated with the management functions of planning, organizing, staffing, and directing.

Example: Importance of effective operational MCS

Marriott Hotels was the world's highest ranked hotel chain. In 2021, despite the pandemic, it recorded 3% growth.

The success of Marriott Hotels depended on its ability to deliver technology based customisation. It had succeeded exceedingly well in operationalising control systems while keeping them flexible and easy. For example

- Mobile Key allowed the customer to check in remotely and not through the Front Desk

- The Mobile Request app could deliver multiple requests from a single customer to enable customisation.

Operational management controls must be simple and effective.

Source: https://digitaltravel.wbresearch.com/blog/marriott-international-betting-customer-facing-technology-strategy-research September 2022, Accessed on November 8, 2022

Activity 19.1

Employees of Sri Sys International assemble at 9.45 a.m. (every working day in the office conference hall) to discuss the tasks and activities that they would handle for the day. This meeting takes place for five to ten minutes. What is this meeting called? What are the advantages of holding this type of meeting? Name the other types of meetings that can take place in an organization.

Answer:

19.4 Organizational Roles Involved in Implementation

The Management Control Systems (MCS) is a set of administrative procedures wherein the behavior of one set of people in an organization influences the behavior of another set. This can be in the interest of an organization provided the top management decisions are put into practice at every organizational level. Thus, the MCS design and implementation is possible only when the organization plays its role at every stage of it. Let us see some of the measures which can adopted for proper implementation of control, systems in the organization.

The MCS of an organization comprises different procedures to help in the proper monitoring and control of its various operations. Management control is implemented by a number of people who may be either internal entities or external entities. Each entity plays a different role and has a different responsibility towards the effective implementation of an MCS.

19.4.1 Internal Entities

The internal entities who contribute to the effectiveness of the control systems include the management, board of directors, internal auditors, and most of the employees. Table 19.3 lists the important internal entities and their functions.

Table 19.3: Internal Entities and their Functions

Internal Entity	Functions
Management	*Chief Executive Officer (CEO)* • CEO is the highest authority responsible for the MCS • Functioning of the MCS depends on his/her attitude and integrity • Responsible for: o Providing managers with the right means of pursuing performance objectives

Contd….

	o Deciding on the values and standard operating procedures which are integral to MCS
	o Assessing how well the managers implement the control systems in their respective departments.
	Chief Financial Officer and Controller
	• Responsible for:
	o Devising budgets and other plans for the entire organization
	o Monitoring performance on all fronts - operational, financial, and compliance.
	Departmental managers and managers far specific activities
	• Number of hierarchical levels determine the degree of responsibility that each departmental or lower level manager has in implementing control policies and procedures
	• Responsible for:
	o Monitoring the effectiveness of controls in their specific departments and for specific activities
	o Devising the departmental and functional controls.
	o Finding discrepancies and other issues
	o Communicating problems to the higher levels of management that will significantly affect the achievement of organizational objectives.
Board of directors	• The board members should have proper knowledge about the organization's operations and activities.
	• Board members form different committees, which help them in the proper discharge of duties. The committees include the audit and the compensation committees. All the committees are important for the control process even though each of them focuses on different components of management control and corporate governance.
	• They should be able to spend the time and effort needed to fulfill their responsibilities towards the organization.
	• Responsible for:
	o Governance, and supervising and directing the management of the organization
	o Selecting the key members of the top management
	o Guiding the organization in making certain critical decisions regarding objectives and strategies

	o Implementing appropriate controls by providing proper supervision
	o Regularly communicating with all the important internal and external entities involved in the control process.
Internal auditors	• Internal auditors are responsible for evaluating the controls and suggesting improvements in them.
	• They should be in a position to contact the board whenever necessary, and also have the power and authority to suggest improvements when required.
	• They should be appointed in such a way that there is no conflict of interest or bias involved regarding any of the functions or operations that they are auditing.
	• According to the Institute of Internal Auditors, the internal auditors should not be selected in such a way that they have to audit functions or operations of which they are a part.
	• Responsible for:
	o Evaluating the controls and suggesting improvements in them
	o Assessing whether the financial and operating information is reliable and the methods used for obtaining information are appropriate
	o Assessing whether the control systems conform to the set standards and regulations
	o Protecting the assets and ensuring proper utilization of resources
	o Assessing the operations to check whether the outcomes of the operations are matching with the set objectives of the organization.
Employees	• Each employee, within his/her role and responsibility, contributes to the control process.
	• They need to accept accountability for reporting discrepancies, operational issues, non-conformance to the code of ethics, etc., to their supervisors or designated authorities.
	• They should avoid resorting to unethical activities due to any coercion from their supervisors and should also be given the assurance that they will not be punished if they report such coercion.

Source: ICFAI Research Center

For instance, let us understand the important roles of people at different levels of hierarchy in a project-based organization and their responsibilities in the project control system implementation process.

Example: Importance of Internal entities in MCS

In March 2020, Yes Bank, India's youngest private bank collapsed, after growing rapidly for 8 years. This was due to poor business decisions by the MD and Board, which included

- Bad Investments in companies like DHFL, IL&FS and Zee

- Hiding of NPAs (Non- performing assets) on the balance sheet

- Maintaining Low PCR (Provision Coverage Ratio) of just 43%

The RBI took 2 years to notice these lapses, and after thorough investigations, decided to handover the management to SBI.

The internal entities and oversight bodies such as Internal auditors, the CEO and the management members re critical to good governance.

Source: https://medium.com/consulting-insights/yes-bank-case-study-analysis-c01a0dcfd825 dated April 11, 2021; Accessed on June 27, 2022

Project Control System Implementation Process

The success of the project control system depends greatly on the degree to which its implementation is viable and effective within the framework of the project's requirement. The viability of the project control system depends on the level of important and worthy information that it provides. The main purpose of any project control system is to facilitate the achievement of results within the specified time and resource constraints.

The implementation of a project control system involves the following human elements:

- Participation and support from the top management

- Involvement of the other members and communication

- Project control engineer's effectiveness

The direct participation and support from the top management is of utmost importance when implementing the project control system. It helps in making employees aware that these control systems are important. It also helps the top management in obtaining direct feedback and in preventing duplication of activities within the different project areas. As the top management is answerable to the customers in case of higher expenses and increased delivery time, it is extremely important that the top management is closely associated with the project.

While implementing a project control system, it is necessary to let people involved in the project know the different controls that will be in place. It is also important that the people are kept informed about the necessity and advantages

of the control system. The organization should have open communication with the employees and accept feedback regarding the project control system.

Another important role is that of the project control engineer. The project control engineer is responsible for maintaining the control system and monitoring its implementation on a daily basis. He / she has to keep track of daily activities and monitor whether they match with the week's scheduled activities..

The project control engineer should help the team members in gathering relevant information regarding the project. He / she has to keep track of the budgets and time. If there are any budget overruns or slippages in project schedule, he / she should discuss it with the concerned team members to understand the reasons for the variance before highlighting them to the management.

19.4.2 External Entities

External entities that play a vital role in an organization's control systems include external auditors, legislators and regulators, customers and suppliers, and financial analysts. Refer to Table 19.4 for the list of important external entities and their functions.

Table 19.4: External Entities and their Functions

External Entity	Functions
External auditors	• External auditors play an important role in the financial statement audit of any organization.
	• They offer an objective view and help the organization in accomplishing its financial and other objectives.
	• They help in doubly ensuring that the financial statements are fairly presented, and in assisting the management in discharging their duties regarding controls properly.
	• They need to have right knowledge of the organization's internal control systems so as to conduct an effective audit.
	• If the internal control systems are deficient, the auditor may have to undertake thorough checks of the financial statements and the supporting evidence to arrive at a conclusion.
	• Through audit findings, external auditors convey to the organization systematic information and suggestions regarding actions to be taken to accomplish set goals.
	• They also identify deficiencies in the internal control system; provide suggestions for improvement; and are also used for quality audit, safety audit, environmental audit, etc.

Legislators and regulators	• Legislators and regulators develop rules that organizations have to abide by while developing and implementing internal control systems that comply with the law of the land. • Important laws and regulations generally relate to financial statements; in certain cases, they also relate to the compliance aspects of operational and environmental issues.
Customers and suppliers	• Customers and suppliers help organizations in improving their activities to meet the operations, financial, as well as compliance objectives. • The organization should take care that proper processes are in place to take feedback into consideration and rectify issues on a timely basis.
Financial analysts	• Financial analysts assess whether the organization's effectiveness-current performance as well as potential for future performance - is good enough from the perspectives of investors and /or lenders. This is done by examining the objectives of the organization, the financial statements, adaptability to changes in the environment, etc. • They provide information that helps organizations know how their performance is rated; the environmental risks that they may be subject to; and newer strategies that they may adopt to improve performance. This in turn helps it in improving the internal control process.

Source: ICFAI Research Center

Example: Importance of External Entities in MCS

On March 31, 2021, TSBSL (Tata Steel Bhushan Steels Limited), declared a revenue of 7000 crores and a consolidated profit of 6 crores. Three years before, Bhushan Steels had filed for bankruptcy, and was bought over by Tata Steel.

Bhushan Steels went into bankruptcy for the following reasons:

• Continue to take loans without repaying the earlier ones

• Build production capacities, knowing that the steel prices falling to $300 a ton from $1300 a ton

• Divert bank loans to investment in other organizations such as First Financial.

Contd….

> In this case external agencies such as Project Monitoring teams of lenders, Audit agencies of Bhushan Steels and the Board of Directors were all complicit in the governance lapse.

Source: https://www.businesstoday.in/latest/corporate/story/how-tata-steel-turned-around-bankrupt-bhushan-steel-296337-2021-05-18 May 18, 2021, Accessed on June 27, 2022

Check Your Progress - 1

1. According to the internal control framework proposed by the Committee of Sponsoring Organizations of the Tread way Commission (COSO), which of the following is not one of the five components of management control?

    a. Control environment

    b. Information and communication

    c. Corporate governance

    d. Monitoring the control system

    e. Risk assessment

2. Patrick Lencioni recommends four different types of meetings which will serve different purposes. Match these types of meetings with the frequency with which they are usually conducted.

    Types of meetings

    i. Check-in

    ii. Tactical

    iii. Strategic

    iv. Off-site review

    Frequency

    p. Weekly

    q. Daily

    r. Quarterly

    s. Monthly

    a. i / q, ii/p, iii/s, iv/r

    b. i/p, ii/q, iii/r, iv/s

    c. i/r, ii/p, iii/q, iv/s

    d. i/s, ii/p, iii/q, iv/r

    e. i/p, ii/q, iii/s, iv/r

3. Conducting meetings helps improve decision making and also in reducing the time taken for the decision-making process. Which of the following

meetings consists of three parts — the lightning round, progress review and real-time agenda?

a. Daily check-in

b. Weekly tactical

c. Monthly strategic

d. Quarterly off-site review

e. Annual general

4. Which of the following is an/are entities internal to an organization and are responsible for the implementation of management control?

i. Board of directors

ii. Management

iii. Internal auditors

iv. Employees

a. Only i and ii

b. Only ii and iii

c. Only i, ii, and iii

d. Only ii and iv

e. i, ii, iii, and iv

5. In the implementation of management control systems, the internal auditors of an organization are responsible for:

i. Assessing whether the control systems conform to the set standards and regulations

ii. Assessing the operations to check whether the outcomes of the operations are matching with the set objectives of the organization

iii. Guiding the organization in making certain critical decisions regarding objectives and strategies

iv. Protecting the assets and ensuring the proper utilization of resources

a. Only i and ii

b. Only ii and iii

c. Only i, ii, and iv

d. Only ii, iii, and iv

e. Only i, ii and iii

19.5 Challenges in Implementation of Control Systems

Management controls are designed in such a way that the control activities involved are monitored on a continuous basis or separately. The most important factor while implementing control systems is that the organizations should have proper processes in place to identify, communicate, follow up, and rectify

discrepancies (if any) in the set plans and objectives. They are implemented by a number of people both internal and external to the organization. Each of them plays a different role and has different responsibilities towards the effective implementation of a MCS. Let us see what the issues to be addressed in this process are.

Control systems can be effective if they are designed and implemented appropriately. For technical control subsystems, such as inventory control or sales forecasting, a good control system design can reduce implementation problems to a great extent. For control components concerned with behavioral aspects, implementation problems often occur even if the design of the control system is good. Control is a process that is executed by people, and the relevant procedures should be practiced thoughtfully, rather than mechanically. Consistency of execution is important for the successful administration of MCS. The issues faced in implementation can be of two types: hindrances to the management control process, and dysfunctional consequences of implementing the management control system.

19.5.1 Hindrances to the Management Control Process

The management of any organization should focus and continuously monitor the implementation and administration of MCS. It may also have to interfere and take suitable action when the control system is not able to handle a specific situation. Following are some of the issues that hinder the management control process.

- Problems in the control environment due to organizational values, management style, and management's priorities.

- Lack of a proper organization structure and clear hierarchy.

- Lack of proper personnel, especially for the key organizational roles that are involved in management control.

- The employees' preferences and needs, and the reward systems used should correspond with each other. The employees should also appreciate the rewards given to them.

- Deficiencies in the employees' training and development.

- Managers and employees may fail to discharge their control-related responsibilities due to poor judgment, incomplete information, errors, or intentional mistakes.

- Lack of proper communication between the supervisors and subordinates (or line and staff). The controlled person may not accept the control process or may fail to understand what is expected of him / her.

- The controlled person (say, line manager) and the controlling person (say, internal auditor) may team up to cover up financial frauds or violate the control procedures.

- Employees may not be committed to the set performance targets due to their perception. Employees may not perform well if they feel that the performance targets are too high or too low.

- Delays in providing reasonably correct data required for management control.

- Differences in the planning horizons of different functions can affect the control systems' performance as it involves the combined efforts of the managers from various departments.

- Difficulty in assessing the total costs incurred in implementing the control system.

- Management over ride, that is, the illegitimate use of management authority to show that the organization's performance is better than it actually is or to bypass procedures and policies for personal gain.

The issues of conflict of interest between the manager and the organization and the difficulty of monitoring can be explained in terms of the agency theory.

Agency Theory and Control System Implementation

The Agency Theory is defined as the analysis of principal-agent relationships, in which one person, an agent, acts on behalf of another person, a principal; that is, the principal assigns work and delegates decision-making to the agent. In the context of management control system, the principal-agent relationship can be of two types in an organizational set-up. One, the relationship between the shareholders (principal) and the CEO or the top management (agent) and two, the relationship between the CEO or the top management (principal) and the managers (agent) at the lower levels in the hierarchy. Some studies on the agency theory also cover the supervisor-subordinate and employer-employee relationships under the principal-agent framework. The agency theory is based on the assumptions that agents are self-interested, not ready to take risks, and do not prefer to work hard.

Principals and agents are expected to have conflicting interests. The theory also assumes that agents are opportunistic in nature.

Conflict of interest

Financial compensation along with leisure time, a good work culture, etc., motivates agents to work hard. The harder the agent works, the higher is the value he / she generates for the principal. If the agent prefers leisure time over hard work, he / she is said to be work averse. If he / she demonstrates work aversion by purposefully avoiding work, it is termed as shirking. The principal's basic objective will be to maximize the returns on investments made. The control dimensions of compensation and incentive programs attempt to bring about goal congruence between the agent and the principal. Though the principal uses management control systems to minimize the opportunistic behavior of agents, the implementation can never be expected to result in perfect alignment of the goals of all agents with that of the principal.

Another area of conflict of interest is risk preference, that is, the risk that the principals and the agents are ready to take. The agency theory states that agents do not like to take high risks, that is, they are risk averse. It emphasizes the importance of taking into account uncertainty and risk considerations while designing management control systems, especially compensation and incentive systems. However, as all agents under the purview of the same control system need not have the same risk preference, there will be problems in the implementation of control systems.

Difficulty in monitoring

When the principal is not able to monitor the activities of the agent properly, he / she may not be in a position to compensate the agent appropriately. A condition called information asymmetry results when the principal does not have complete information about the agent's contribution to the organizational outcomes.

When there is a lack of monitoring, information on whether the activities are beneficial to the principal is available only to the agent. That is, the agent has more information regarding the activities than the principal and this information is called private information. This conflict of interest and private information leads to a moral hazard, that is, the agent attempts to misrepresent information to the principal.

19.5.2 Dysfunctional Consequences of Management Control Systems

Management Control Systems

Management Control Systems should ideally help organizations achieve their objectives of effectiveness, efficiency, and compliance -- this is possible through shared understanding of the importance of the control system, commitment to the organization's objectives, and mutual trust between the management and the employees. However, in reality, MCS implementation may lead to consequences that are counter-productive to the achievement of organizational objectives. The control system should be closely monitored to check whether it is actually motivating managers and employees to act in the organization's interests so that necessary corrective actions may be taken in the design and / or implementation.

Following are some of the possible dysfunctional consequences of control systems.

* In a control system / environment that emphasizes negative reinforcement, managers and employees may focus on diverting the blame than trying to find ways to solve problems or discrepancies.

* Rigid controls can lead to negative emotions like fear and resentment, negative attitudes, and counter-productive behavior like active or passive resistance to the control system implementation.

* Overemphasis on quantification and on measuring all possible parameters may simply increase the cost of control without corresponding benefits.

- Standard operating procedures and rules may not allow the employees to think innovatively and creatively. They also restrict the employees from the dynamics of the environment and hence, hamper adaptability.

- Goals and standards setting may lead to 'inversion of means and ends', mainly if the performance parameters are decided based on ease of quantification and measurement.

- In performing multiple activities, an employee or manager may choose to focus more on the activity that gives him / her more returns than giving enough attention to each of his / her responsibilities.

- A manager or employee may manipulate the control systems at the cost of organizational objectives to portray a better picture of performance than what the reality is.

- Lagging indicators of performance such as accounting profits or return on investment (ROI) may mislead the management in the short term, and may not be very useful for proactive management control.

- When different functions or divisions in the business are inter-dependent, optimization of performance of an individual function or division may not result in an optimal performance of the entire organization.

- If the control system holds managers responsible for achieving targets which are not in their control but are subject to significant influence of the environment, it reduces the credibility of the top management and the control system.

- Compared to good performance, bad performance of an employee or a team gets reported to the higher authority, usually faster. This kind of a feedback mechanism is biased against employees and may risk his / her future career prospects.

Bad Timing

The company implemented ERP during the peak business season. Companies, during this period, usually do not change their business conduct or go for any form of restructuring. They focus on profit-making activities, fighting competition, and generating income. ERP implementation at Hershey at this time interrupted the company's normal business and created confusion in the company. Hershey suffered on both ends - they were not able to do justice to the ERP implementation, which was interrupted during the last moment, and they were not able to solve the problems that arose in the regular business. Hershey could have avoided this by taking up the ERP implementation project in the lean period of the year.

Too Many Things at the Same Time

Apart from implementing ERP at the wrong time, Hershey made another mistake. It went for a simultaneous implementation of other enterprise applications like

CRM. While the company was busy solving problems in its businesses, ERP and other applications were not fully implemented. When the regular business problems were solved and changes made in the business processes to go with the applications, the applications failed to function properly as the implementation was incomplete and as there was gap in the implementation process.

Example: Overcoming challenges in implementing MCS

In the year 2020, a young and dynamic furniture brand, Urban Ladder, was acquired by Reliance in an all cash deal.

The online furniture brand had created an organization that was top brand recall for its stylish furniture offerings. Yet, when its competitor and better funded Pepper Fry went offline, Urban Ladder was not ready.

Its control processes were aligned to driving online sales and its infrastructure and people capability was aligned to online fulfilment.

When it became necessary to enter the offline market, Urban Ladder had neither the funds nor the ability to transform to the new model.

 It is important to keep flexible control systems to align to changing business strategies.

Source: https://inc42.com/features/urbanladder-reliance-furniture-market/ November 18, 2020 Accessed on June 27, 2022

Activity 19.2

In an industry of your choice, give hypothetical examples of probable dysfunctional consequences of management control systems in a multinational corporation.

Answer:

19.6   Impact of Organizational Life Cycle on Control Systems

The journey of an organization life cycle (OLC) commences the moment a business organization is set up. OLC crosses different phases and at every phase it highlights a set of obstacles to deal with and to proceed to next phase. Thus, the management closely monitors the OLC with a control system for furtherance of its business. Let us see how control systems are to be adopted during various phases of organization's life cycle.

Every organization has a life-cycle and the control requirements change depending on the stage of the life-cycle in which the organization is in. According to Larry E. Greiner, organizations usually go through five different phases of development and growth - the creativity phase, the direction phase, the decentralization phase, the coordination phase, and the collaboration phase. Refer to Table 19.5 for the various phases and their features. The growth phases have been referred to as 'evolution' and the transition between these phases as 'revolution'. A shift from one stage to another is a difficult process that involves change in the rules for organization's functioning, the control systems and procedures, as well as the way in which it will react and adapt to the external environment. The organization's survival and success depends on its ability to handle these transition issues effectively.

Table 19.5: Phases of Development and Growth

Phase	Features
Creativity phase	• Begins at the inception of the organization • High focus on developing products/services to compete with the existing players in the market, and on getting orders from customers • Focus is on technical and operational aspects than on the management aspects • High level of informal communication within the organization • Market conditions and the external environment influence the business decisions and are usually taken by the owners • As the organization grows, the focus shifts to innovation, creativity, achievement of economies of scale, putting higher investments, and financial controls.
Direction phase	• The organization appoints a leader who directs the organization's performance and takes it on a path of controlled growth. • It adopts a functional organization structure and employees tend to specialize in a specific function such as marketing or production. • It puts in place control systems for accounting, budgets, inventory management, etc. • Departments are typically viewed as revenue centers or cost centers.

Contd....

	• Standard operating procedures and formal reward systems are devised and implemented.
	• Communication becomes formal as more levels are introduced in the hierarchy.
	• Decision-making authority lies with the senior management team.
	• As the organization grows, it becomes difficult to manage and control it due to the presence of many hierarchical levels and functional departments. This leads to dissatisfaction and frustration among the lower level managers and employees as they are not allowed to apply their expertise and take business decisions on their own.
Decentralization phase	• A decentralized structure is implemented, wherein the lower level managers are given the authority to take decisions and the responsibility for business growth.
	• Direct communication between the top-management and the lower levels decreases and takes place via occasional site visits, circulars, etc.
	• The top management also restricts its decision-making responsibility to strategically important decisions.
	• The organization tries to increase motivation levels by introducing the concept of profit centers and by giving incentives.
	• Greater autonomy and higher incentives motivate managers to perform well.
	• Internal control and reporting systems help monitor the activities of lower level managers.
	• Issues arise when the managers fail to comply with the plans and budgets of the organization, and choose to use their own discretion in decision-making.
	• The top management perceives a loss of control and tries to restore the centralized structure, which is actually difficult to do. Rather, the management needs to implement suitable coordination. mechanisms to align the behavior of line managers toward organizational objectives.

| Coordination phase	- It involves an extensive use of formal monitoring and control systems, which are created and implemented by the top management. - The functional or geographical organization structure is changed to form a divisional or product based structure. - Planning processes become more formalized and are thoroughly evaluated. - The staff functions are strengthened to closely monitor the activities and outcomes of line managers. - Decisions regarding investments are thoroughly evaluated by headquarters. - Divisions are considered to be investment centers and resource allocation is done considering the return that each center generates on the investment made. - Strategically important activities and decisions are centralized while day-to-day operating decisions are decentralized. - Incentive systems are revamped to emphasize organizational performance rather than mere individual performance. - Coordination mechanisms help in improving resource allocation between the different units. - Managers are expected to take decisions that comply with the rules and processes of the organization, which could lead to the problem of goal displacement. - Managers and employees tend to resent the increased number of rules and regulations that have to be followed. - Conflicts often occur between the members of line and staff functions. - Presence of a large number of standard procedures to be followed hampers the innovativeness of employees. - Competitive position of the organization may be weakened due to rigid internal processes.
Collaboration phase	- Increased levels of collaboration between the line and staff functions. - Emphasis on social controls and self-discipline rather than formal control mechanisms.

	• Organizations may further change their structure from a divisional structure to a matrix structure.
	• Focus on creating inter-disciplinary teams that comprise members from both line and staff functions.
	• Employees are trained to work in cross-functional teams and manage conflicts constructively.
	• Integrated information systems are put in place to enhance day-to- day decision making.
	• Incentive systems are modified to reward team efforts rather than individual accomplishments.
	• The overall atmosphere of collaboration fosters innovation.

Source: ICFAI Research Center

Figure 19.1 depicts the control systems usually implemented in the different stages of an organization's life-cycle.

Figure 19.1: Organizational Life Cycle and Control Systems
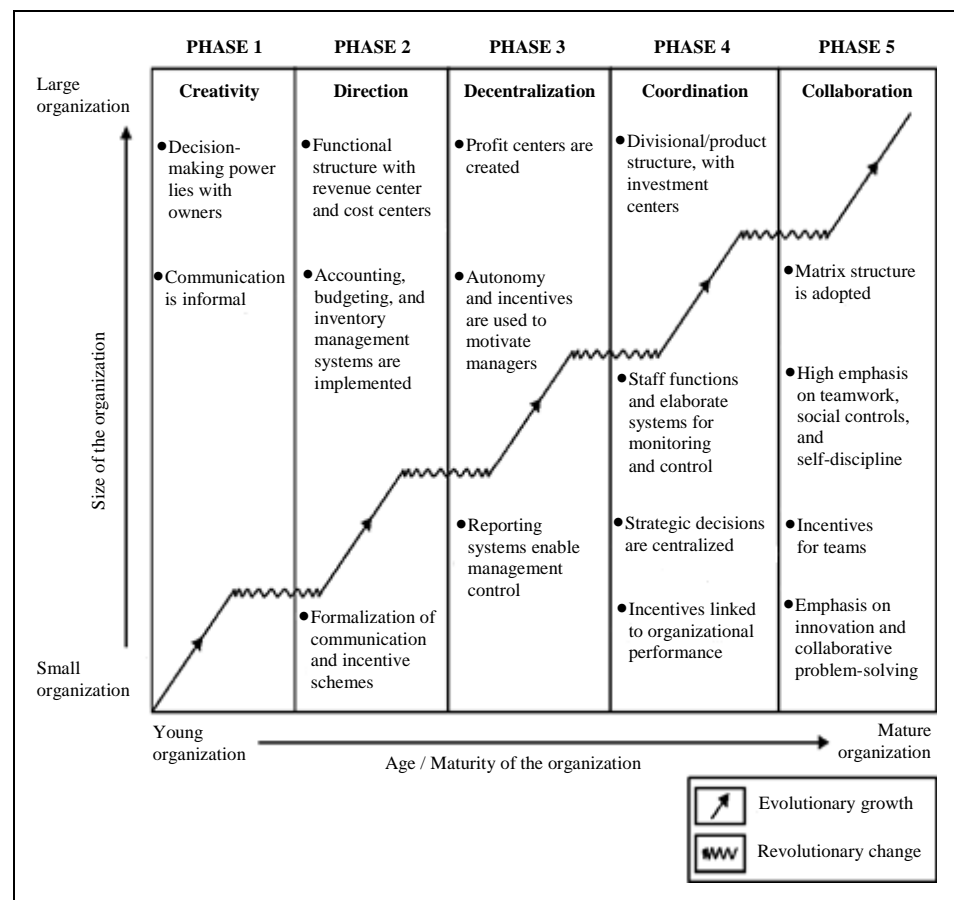
Source: ICFAI Research Center

Activity 19.3

Ink & Color (I&C) is a printing and publishing company which has presence in all the Indian states. The company is now in a stage where the lower level managers have been given the authority to take decisions and the responsibility for growing the business. The top management has retained the responsibility of taking strategic decisions. It has given a profit-center status to all its branches country-wide and gives performance-based incentives to branch managers. In which stage of the organizational life-cycle is I&C in? How would control systems help the company in this stage? Give a brief outline of the next phase in the company's life-cycle.

Answer:

19.6.1 Control Systems and Organizational Decline or Change

Kim S. Cameron, Myung Kim, and David A. Whetten have defined organizational decline as, "a condition in which a substantial, absolute decrease in an organization's resource base occurs over a period of time." Organizational decline can occur due to reasons such as the organization's age (old), excessive bureaucracy, inability to adapt to the changing environment, and lack of availability of resources for the functioning of the organization, more conflicts, lack of motivation among employees and exit of key employees.

Organizational decline may be accompanied by more conflicts, greater resistance toward change, decrease in the top management's credibility, downsizing, lack of motivation among employees, and exit of key employees. These situations can be handled if the organization can enhance its efforts toward making employees understand the strategies through better and more frequent communication. Some of the ways in which organizations can handle organizational decline are by centralizing key decisions, changing job profiles, and devising better ways of downsizing. Apart from organizational growth, decline, or turnaround, change takes place when the control system is modified or when a new one is implemented. Following are some of the issues that have to be considered while implementing new control systems or modifying an existing one.

- All employees may not agree to a change. Therefore, implementation of change should be initiated with people who accept change so that they will convince others who resist the change.

- Change in the control system requires change in the organization structure and processes. This requisite will actually help in meeting the organization's objectives without any distractions. Organizations should know the amount of change required and how much of it will actually help in meeting the organization's objectives.

- Proper training should be provided to managers and employees.

- If it is a project control system, the new control system has to be tested using pilot projects to certify the system's advantages to the stake-holders. This will help in understanding the new system and the technical problems that may arise.

Example: Importance of Organizational Life Cycle on MCS

Eramet was Europe's third largest Mining and Metallurgical company with EBITDA (Earnings before interest, tax, depreciation and amortization) of EURO 1bn for the year 2021. It was among the most profitable and environmentally responsible companies in the world, in the mining industry. They were so particular about ERM (Enterprise Risk Management) that they had their own ERM Institute.

In order to improve the EHS (Environmental health and safety) culture in the organization, they embarked on 2 specific ERM initiatives.

- Digitised all incident reporting mechanisms to ensure immediate response

- Improved the quality and quantity of inspections

Post implementation of the ERM practice, the accidents came down by 35%

Source: https://auto.economictimes.indiatimes.com/news/passenger-vehicle/cars/how-tata-motors-wins-the-ev-game-in-spite-of-mahindras-decade-old-head-start/84408734 July 14, 2021 Accessed on June 27, 2022

19.7 Enterprise Risk Management

The Enterprise Risk Management (ERM) is a managerial technique applied for managing the risk. ERM provides a framework for identifying the particular events or circumstances, assessing them, and formulating a strategy towards attainment of the objectives. It strives to create a value for the stakeholders of an organization. Let us discuss the significance of ERM in an organization.

In simple words, Enterprise Risk Management is

- A system that considers all enterprise processes, including planning, decision-making, implementing, examination process, irrespective of whether it is strategic or not.

- It covers all individuals who are at different levels of an organization structure.

- It is an object-oriented system because it serves as a guide while making strategic decisions and in its accomplishment.

- It is a risk assessment of an enterprise thereby helping in knowing the results of the risks taken at all levels.

- It helps in identifying the potential risks as and when they occur and in deciding the means to tackle such risk.

- Its ultimate objective is to accomplish enterprise objectives in toto.

19.7.1 How to Achieve the Objectives?

To be effective, ERM operates within the entity's established mission and vision statement. The management establishes strategic objectives, frames strategies and sets objectives aligned with the enterprise structure.

The COSO ERM framework is universal in nature and is designed to achieve the entity's objectives set forth in the following four categories:

- Strategic – high-level goals, aligned with and supporting its mission

- Operations – effective and efficient use of its resources

- Reporting – reliability of reporting

- Compliance – compliance with applicable laws and regulations.

For example, generalized risk management objectives envisaged by companies to frame their ERM approach include the following:

- Understand and interpret risks across multiple functions and business units, as to effectively manage the enterprise-wide risks, on a cost-effective basis.

- Interpretation of risks, so as to effectively manage and achieve competitive advantage.

- To visualize and include safeguards against earnings-related surprises.

- To enhance and improve capabilities, as to respond effectively to situations of low profitability, unforeseen business risks including catastrophic risks.

- Effectively manage scarce internal resources, so as to achieve measurable cost savings.

- Monitor, manage and allocate capital more efficiently.

Risk management goals and objectives should align with the enterprise's business objectives and strategies. Therefore, the organization's business model provides an important context for risk management.

For example:

- It takes into cognizance the areas of business operations, thereby targeting specific markets and geographies.

- The strategy includes identifying relevant products and services for defined markets, standardizing marketing channels, and highlighting specific characteristics of products that differentiate its products and services from the competitors.

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- It is built on constituents of the business, i.e. the factors of production, including processes through which the entity converts materials and labor into products and services; the employee factor, i.e. the employees-the entity hires, trains and retains them; the external agencies, i.e. the suppliers and customers with whom the organization does business; and finally, the investors, i.e. the share-holders and lenders that source its capital requirements.

- Risks are inherent in all business operations and the entity is exposed to uncertainty at all levels. Therefore, the business objectives and strategies help understand risks the entity is expected to encounter, and in turn highlights the need for setting objectives as envisaged by management. The COSO framework recognizes such a need and includes "objective setting" as a component of the ERM framework.

19.7.2 Components or Elements of Enterprise Risk Management

The universally accepted COSO Framework defines the components of Enterprise Risk Management (ERM) as under.

Enterprise Risk Management comprises of eight related components. These are decided based on the management operations and their integration toward at attainment of an entity's objectives. The eight components are:

- *Organization culture / Internal environment*: The internal environment of an entity reflects its risk management system. That means, its risk management philosophy, risk appetite, anticipated responses, the environment in which it operates and the like.

- *Organization objectives*: For every organization, objectives need to be crystal clear before making a roadmap for the potential events towards it. Here, an appropriate 'Enterprise Risk Management' serves as a guide to ensure that the designed process is in coincidence with the objectives and proposed potential events of an entity besides notifying whether the risk involved is consistent with the risk appetite of the entity.

- *Events identification*: Events, both internal and external, need to be identified by an entity, toward attainment of its objectives. Underneath, it becomes necessary to differentiate between risks and opportunities for an entity. The reason is, opportunities set a pathway for the management strategy toward its entity's defined objectives. While, the risks involved readdresses the entity's risk appetite and capacities to remove the roadblocks toward attainment of its objectives.

- *Risk assessment*: This refers to analyzing and measuring the risks involved in the light of the entity's objectives. The assessment helps in deriving a course of action for managing the same. Risks are assessed on an inherent and residual basis.

- *Risk responses*: The management analyses the type of risk responses involved and selects the appropriate risk responses that become suitable for its entity's objectives. The selection process is based upon the entity's risk tolerances and its risk appetite levels.

- *Control frame-work:* The controlling strategy is adopted while framing an entity's policies and procedures besides complying the risk responses that are inherent in it.

- *Identification of information and communication*: The identification is based upon its relevance to the entity's objectives. This information and communication helps the people to fulfill their responsibilities effectively. This fulfillment is very important for any entity towards meeting its risk responses, opportunities and objectives.

- *Monitoring*: The monitoring of enterprise risk management helps in making modifications, as and when it becomes necessary. It is accomplished through ongoing management activities, separate evaluations, or both.

Enterprise risk management is not a hierarchical structure or a procedure-oriented process flow. It is a composite process and is multi-dimensional, multi-directional, iterative process, in which, almost any component can influence the other. It is a comprehensive, multi-disciplinary action-oriented composite framework.

Value maximization is possible when the management sets strategy and objectives in tandem, so as to achieve an optimum balance between growth and return goals and related risks. This is possible by effectively deploying the resources, in pursuit of the entity's objectives.

19.7.3 Enterprise Risk Management

Enterprise Risk Management can be comprehended as:

- *Risk appetite in line with an entity's objectives and goals:* The management needs to correlate the risk appetite of the business with its entity objectives. For this, it needs to interpret and evaluate the risk appetite in line with the business objectives and goals. Towards this, the strategies need to be designed considering possible strategic alliances, identifiable objectives and varied mechanisms to manage related risks.

- *Decision-making process:* The decision-making process should help in reduction and minimization of risks. It should provide alternative responses for a given risk situation.

- *Minimize business shocks:* The management should identify suitable risk responses to identify and reduce the business shocks, potential risks and surprises. This helps in minimizing the same.

- *Managing multiple and cross-enterprise risk:* It is practical that every entity is prone to multiple and cross-enterprise risks. The management needs to provide a suitable risk response in order to avoid or to overcome the same.

- *Capitalizing on opportunities:* The management is expected to know the potential events for the attainment of its entity objectives. This helps them in realizing and capitalizing the opportunities with a proactive approach.

- *Improvisation of capital allocation:* The management is expected to know the risk element involved for the attainment of its entity objectives. This information helps them in analyzing and assessing the capital requirements and to allocate the same in a prudent manner.

These features that are inherent in the Enterprise Risk Management help the management in attaining its entity's performance and profitability targets. Also, it serves as a means to prevent the loss of the entity's scarce resources. It ensures effective reporting and compliance to relevant laws and regulations. It strives to avoid the damage to entity's reputation and its related associations. To summarize, Enterprise Risk Management serves as a guide to accomplish the objectives of an enterprise and to overcome its possible pitfalls and setbacks.

Example: Importance of Risk Management in MCS

Tata Motors was India's 3rd largest car manufacturer by market share. The focus of the company had been on petrol/diesel cars. The people capability, culture and partner ecosystems reflected this focus.

After the acquisition of Jaguar Land Rover, the organization life cycle experienced a dramatic change in terms of technology, design capability and innovation.

This was reflected in the remarkable story that Tata Motors built in the EV segment between 2018 and 2020. In three years, Tata Motors rode Nexon into the market as the best in class EV. The mix of range/cost/service that Nexon offered, made it the best-selling EV in India.

In 10 months Tata Motors had sold 10000 units.

The Life Cycle of an organization could be influenced significantly by adopting the capabilities of an acquired entity.

Source: https://www.erm.com/projects/eramet/ May 2020 Accessed on June 27, 2022

19.8 Types of Risks and Risk Management Process

In the foreword to the ERM framework, COSO emphasized the need for a "robust framework to effectively identify, assess, and manage risks in an organization". The objective is to develop a framework that can be readily usable by the management for evaluating and improving their organization's Enterprise Risk Management. Let us understand the ERM framework.

As outlined by COSO, ERM Framework has classified risks as under:

- *Internal Risks:* Underneath, the management adopts the rules-based approach to minimize, mitigate and eliminate the internal risk. Towards this, a well defined acceptable behavior in an entity helps in minimizing the chances of misbehavior, thereby minimizing the internal risk element in the organization.
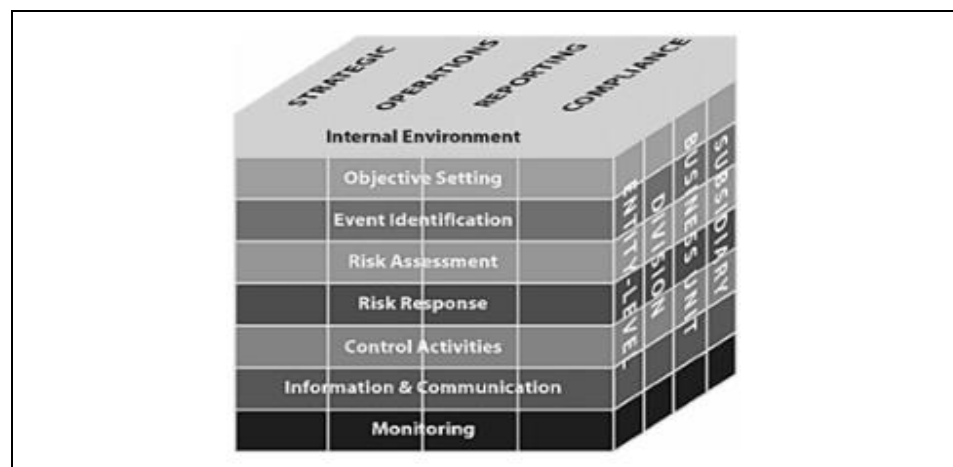
- *Strategic Risks:* Underneath, there exists three management structures to address the strategic risks. They are:

  o An External Arm – Risk Advisory Board

  o An Internal Arm – Centralized risk management group, potentially involving senior management, or

  o An Internal network of risk managers disbursed throughout the organization.

- *External Risks;* Underneath, these risks are outside the control of an entity. To evaluate and minimize the external risk, there exists three analytical tools as follows:

  o Stress Analysis – Stress testing

  o Scenario Interpretations and Analysis, and

  o Techniques like "War-gaming" – a tool for analyzing the effects that may arise on radical moves in its competitor's strategies.

19.9 The COSO ERM Framework – Relationship between Objectives and Components

In terms of COSO, there exists a direct connectivity between the entity's objectives and the Enterprise Risk Management Components. The ERM components will help the organization to achieve the objectives.

As defined by COSO, the COSO framework is depicted in a three-dimensional matrix, in the form of a cube. Its objectives are bifurcated into four parts — strategic, operations, reporting and compliance. These are represented by the vertical columns, eight components by horizontal rows, and lastly the entity's units by the third dimension. This reflects on the ability to focus on the entirety of an entity's enterprise risk management, or by objectives category, component, entity unit, or any subset thereof.

Figure 19.3: ERM Framework

Source: https://www.accaglobal.com/pk/en/student/exam-support-resources/professional-exams-study-resources/strategic-business-leader/technical-articles/coso-enterprise-risk-management-framework.html; Accessed on 1st Dec, 2022

Check Your Progress - 2

6. The optimization of the performance of an individual function or division may not result in the optimal performance of the entire organization. Identify what should be _between different functions or divisions in the business.

    a. Interdependence

    b. Exchange of expertise

    c. Communication

    d. Independence

    e. Contravention

7. An organization's control requirements vary depending on the phase of its life-cycle in which it is operating. Match the given phases of the organization life-cycle with their respective features.

    Phases

    i. Creativity phase

    ii. Direction phase

    iii. Coordination phase

    Features

    p. Organizations adopt a functional organizational structure.

    q. Organizations focus on developing products/services to compete with the existing players in the market, and on getting orders from customers.

    r. Organizations implement a decentralized structure such as geographical structure.

    s. Organizations adopt a divisional or product based structure.

    a. i/p, ii/q, iii/r

    b. i/q, ii/p, iii/s

    c. i/s, ii/r, iii/p

    d. i/p, ii/r, iii/q

    e. i/r, ii/s, iii/p

8. When in the phase of its life-cycle, an organization usually tries to increase motivation levels by introducing the concept of profit centres and by giving incentives.

    a. Coordination

    b. Direction

    c. Decentralization

    d. Creativity

    e. Centralization

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9. Emphasis is placed on social controls and self-discipline in the phase of the organizational life-cycle. Identify the phase.

    a. Collaboration phase

    b. Coordination phase

    c. Decentralization phase

    d. Direction phase

    e. Centralization phase

10. A condition in which a substantial, absolute decrease in an organization's resource base occurs over a period of time has been defined. Identify the term.

    a. Organizational change

    b. Organizational decline

    c. Organizational turnaround

    d. Organizational maturity

    e. Organizational restructuring

19.10   Summary

- According to the COSO framework, management control has five components − control environment, risk assessment, control activities, information and communication, and monitoring the control system.

- Control activities refer to the policies and procedures used in an organization to provide a reasonable assurance that the directions and instructions given by the management are followed appropriately. These activities differ depending on the business environment, organizational objectives, complexity in business operations, the people involved in the implementation of these activities, and organizational structure and culture.

- Conducting meetings helps in improving decision making and in reducing the time taken for the decision-making process. The daily check-in, the weekly tactical, the monthly strategic, and the quarterly off-site review are the four different types of meetings.

- Communication is not only required to pass on the information but is also necessary for coordination of work, assigning responsibilities, etc. Internal communication and external communication takes place in any organization.

- Management controls are designed in such a way that the control activities involved are monitored on a continuous basis or separately. This helps the organization by offering feedback on whether the control components are effective or in effective.

- The most important factor while implementing control systems is that the organizations should have proper processes in place to identify, communicate, follow up, and rectify discrepancies (if any) in the set plans and objectives.

- Management control is implemented by a number of people both internal and external to the organization. The entities internal to the organization are the management, the board of directors, the internal auditors, and most of the employees; the entities external to the organization include external auditors, regulatory bodies, customers, suppliers, and financial analysts.

- The issues faced in implementation can be those which hinder the management control process or dysfunctional consequences of implementing the MCS. Some issues that hinder the management control process are: lack of proper organizational structure, management style, well-defined hierarchy, etc.; lack of proper person-job and person-reward fit; deficiencies in training and developing employees; collusion between the controlled person and the controlling person; illegitimate use of management authority; and lack of proper communication.

- The implementation and administration of MCS can lead to consequences that are counterproductive to the achievement of organizational objectives. Some dysfunctional consequences of management control systems are excessive quantification and attempt to measure all possible measures, presence of standard operating procedures curbing innovation, and data manipulation.

- Organizations usually go through five phases of development and growth - the creativity phase, the direction phase, the decentralization phase, the coordination phase, and the collaboration phase - in their life cycle. The control requirements change depending on which stage of its life cycle the organization is in.

- In addition to organizational growth, decline, or turnaround, change can also take place when an existing control system used by an organization is modified or a new control system is implemented.

19.11   Glossary

Ad hoc Strategic Meetings: The meeting should be called for to sort out exceptional strategic issues that require to be addressed urgently.

Control Activities: Control activities refer to the policies and procedures that are used in an organization to provide a reasonable assurance that the directions and instructions given by the management are followed appropriately. These policies and procedures are present at all hierarchical levels and in all functions of an organization.

Control: It is a process that is executed by people, and the relevant procedures should be practiced thoughtfully, rather than mechanically.

Daily Check-in Meetings: The meeting wherein the employees stand and discuss the tasks and activities, such employees will handle that day and clarifies the priorities to be set and how they have to be tackled.

Enterprise Risk Management (ERM): About understanding and interpreting the risks and opportunities of a business entity. It is about managing risks within the given risk appetite, as to achieve the entity's objectives.

Financial Analysts: The analysts who assess whether the organization's effectiveness-current performance as well as potential for future performance - is good enough from the perspective so investors and /or lenders.

Monthly Strategic Meetings: The meetings that are conducted regularly to discuss key strategic issues that arise during the weekly tactical meetings.

Organizational Decline: Organizational decline is defined as a condition in which a substantial, absolute decrease in an organization's resource base occurs over a period of time. Organizational decline can set in due to a number of reasons - the age of the organization (old), excessive bureaucracy, inability to adapt to the changing environment, lack of availability of resources for the functioning of the organization, etc.

Quarterly Off-site Review Meeting: The meeting that focuses upon the discussion on long-term strategies, employees, teams, the industry, and the competitors.

Weekly Tactical Meetings: The meetings that are conducted to discuss problems that needs to be handled immediately.

19.12   Self-Assessment Test

1. Management controls will be effective if they are integrated into the organization's activities. What are the components of management control? Explain the implementation of a management control system.

2. People, both internal and external to an organization, implement the management control system. Identify the entities involved in the implementation process, and describe their respective roles and responsibilities.

3. State briefly the external entities that play a vital role in an organization's control systems.

4. The issues faced in the implementation of a management control system can be of two types: hindrances to the management control process, and dysfunctional consequences of implementing the management control system. Explain these hindrances and dysfunctional consequences with suitable examples.

5. Every organization has a life cycle and the control requirements change depending on the stage of the lifecycle in which the organization is in. Elaborate.

6. Explain ERM and types of risks classified under its framework.

19.13   Suggested Readings/Reference Material

1. Stephen P Robbins, David A. De Cenzo and Mary Coulter (2022). *Fundamentals of Management: Essential Concepts and Applications,* Fifteenth Edition| Pearson Paperback, 30 June 2022.

2. Subhash Chandra Das (2019). Management Control Systems – Principles and Practices, PHI Learning Pvt. Limited, Paperback – 15 July 2019.

3. Pravin Durai (2019). Principles of Management: Text and Cases, First edition, Pearson India Education Services Pvt. Ltd.; Second edition (31 August 2019).

4. Merchant, Kenneth A (2017). "Management Control System: Text and Cases", Pearson Education Asia.

5. Saravanavel, P (2022). Management Control Systems – Principles and Practices. First edition, Himalaya Publishing House.

19.14 Answers to Check Your Progress Questions

1. **(c)   Corporate governance**

    There are five components of management control according to the 'Internal Control-Integrated Framework' as proposed by the Committee of Sponsoring Organizations of the Tread way Commission (COSO). They are: control environment, risk assessment, control activities, information and communication, and monitoring the control system.

2. **(a)   i/q, ii/p, iii/s, iv/r**

    The four types of meetings recommended by Patrick Lencioni are: the daily check-in, the weekly tactical, the monthly strategic, and the quarterly off-site review.

3. **(b)   Weekly tactical**

    A weekly tactical meeting lasts 45-90 minutes. It is conducted to discuss problems which have to be handled immediately. It consists of three parts: the lightning round, progress review and real-time agenda. In the lightning round, everyone attempts to bring out two or three of their most important priorities for the week. In the progress review, the team tries to compare the progress of activities with the specific critical metrics that have been decided by the organization. In real-time agenda, the agenda of that tactical meeting is decided depending on the outcomes of the lightning round and the progress review.

4. **(e)   i, ii, iii, and iv**

    The entities internal to the organization that are responsible for the implementation of management control are: the management, the board of directors, the internal auditors, and the employees of the organization.

The entities external to the organization that are responsible for the implementation of management control are: external auditors, regulatory bodies, customers, suppliers, and financial analysts.

5. **(c) Only i, ii, and iv**

   Internal auditors are responsible for evaluating the controls and suggesting improvements in them. They are responsible for: assessing whether the financial and operating information is reliable and the methods used for obtaining information are appropriate; assessing whether the control systems conform to the set standards and regulations; protecting the assets; ensuring the proper utilization of resources; and assessing the operations to check whether the outcomes of the operations match with the set objectives of the organization. Guiding the organization in making certain critical decisions regarding objectives and strategies is the responsibility of the board of directors.

6. **(a) Interdependence**

   When there is interdependence between different functions or divisions in the business, the optimization of the performance of an individual function or division may not result in the optimal performance of the entire organization. This is one of the dysfunctional consequences of management control systems.

7. **(b) i/q, ii/p, iii/s**

   The five different phases of development and growth that organizations go through are: the creativity phase, the direction phase, the decentralization phase, the coordination phase, and the collaboration phase. The creativity phase is characterized by a high focus on developing products/services to compete with the existing players in the market, and on getting orders from customers. During the direction phase, organizations adopt a functional organizational structure. During the decentralization phase, they adopt a decentralized structure such as a geographical structure. During the coordination phase, they adopt a divisional or product-based structure. During the collaboration phase, organizations adopt a matrix structure.

8. **(c) Decentralization**

   The decentralization phase of an organization's life cycle is characterized by the implementation of a decentralized structure (such as a geographical structure), wherein the lower level managers are given the authority to take decisions and the responsibility for growing the business. The organization tries to increase motivation levels by introducing the concept of profit centers and by giving incentives. Greater autonomy and higher incentives motivate managers to perform better.

9. **(a) Collaboration phase**

   The collaboration phase of the organizational lifecycle is characterized by increased levels of collaboration between the line and staff functions. Social contracts and self-discipline are emphasized more than formal control mechanisms in this phase.

10. **(b) Decline**

    Organizational decline is defined by Kim S. Cameron, Myung Kim, and David A. Whitten as a condition in which a substantial, absolute decrease occurs in an organization's resource base over a period of time. Organizational decline can set in due to a number of reasons like the organization becoming old, excessive bureaucracy, the organization's inability to adapt to the changing environment, and unavailability of resources for its functioning.

Management Control Systems

Course Structure

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