NATIONAL OPEN UNIVERSITY OF NIGERIA

TPM 207: TRANSPORT AND LOGISTICS

FACULTY OF MANAGEMENT SCIENCES

COURSE GUIDE

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CONTENT

Introduction

The course Transport and Logistics (TPM207) is a semester core course which carries two credit units for Second Year level Transport Management students in the School of Management Sciences at the National Open University of Nigeria. This coursework provides the fundamentals of transport and logistics and will expose students to the interrelationship between transport and logistics and strengthen their understanding of their role in the functioning of human societies.

This course guide is prepared essentially to provide introductory information and foundation knowledge. Its simplicity will make the students assimilate faster and practice questions at the end of each unit will also prepare the students for examination. It suggests some general guidelines for the amount of time required of users on each unit in order to achieve the course aims and objectives successfully. It also provides users with some guidance on their tutor marked assignments (TMAs) as contained herein.

Course Content

The course is made up of Eight units (Six Modules) spread across lecture hours. It covers areas such as fundamentals of transport and logistics, their scope and functions, transport as framework for production, traffic management, transport rate determination and negotiation, transportation of hazardous materials and quality service in transport.

Course Aims and Objectives

The course attempts to explain the concepts of transport and logistics showing the link between them. It introduces students to traffic management and its techniques including differentiating between transport rates and costs. Simple description of hazardous materials and their classifications are provided while information on how to achieve service quality in transport are briefly discussed.

The course introduces students to the fascinating discipline of transport and logistics at the end of which they will be able to:

i. Explain the concepts of transport and logistics.
ii. Show the criticality of transport and logistics as process factors in production.
iii. Understand the traditional and modern techniques of traffic management.

iv. Establish the distinction between transport rates and costs and the role of negotiation in rate determination.

v. Explain what constitutes hazardous materials and how they are classified, packaged and transported

vi. Describe how service quality can be achieved and measured

Working through the Course

To successfully complete this course, you are required to read the study units, consult the references and other materials on the course.

Each unit contains Self-Assessment Exercises (SAE), and Tutor Marked Questions At the end of the course there is a final examination. This course should take about weeks to complete.

Course Materials

The major component of the course and what you have to do and how you should allocate your time to each unit in order to complete the course successfully on time are provided as follows:

Study Modules and Units

There are 6 Modules in this course explained in 8 Units which should be studied carefully and diligently.

Module 1: Transport: Definition, Scope and Functions.

Unit 1: Fundamentals of Transport

Unit 2: Scope and Functions of Transport

Module 2: Transport in the Framework of Production

Unit 1: Transport and Production

Module 3: Traffic Management

Unit 1: Fundamentals of Traffic Management

Module 4: Rate Determination and Negotiation

Unit 1: Transport Rate Determination and Negotiation

Module 5: Transportation of Hazardous Materials

Unit 1: Hazardous Materials and their Classification

Unit 2: Consignment Procedure and Carriage of Hazardous Materials

Module 6: Achieving Transport Quality

Unit 1: Service Quality in Transport

References and Other Resources

Every unit contains a list of references and further reading. Ensure you lay hands on as many as possible of those materials listed. The textbooks and materials are meant to deepen your knowledge of the course.

Assignments

There are assignments in this course and you are expected to do all of them by following the schedule prescribed for them in terms of when to attempt them and submit same for grading by your tutor. The marks you obtain in these assignments will count towards the final mark you obtain for this course. Further information on assignments will be provided in the course of the course programme.

Assessments

There are two types of assessments in the course. First are the tutor-marked assignments; and written examination.

In attempting the assignments, you are expected to apply information, knowledge and techniques gathered during the course. The assignments must be submitted to your tutor for formal assessment in accordance with the deadlines provided. The assignment will account for 30 % of your total course mark.

Final Examination and Grading

The final examination will be of three hours' duration and have a score of 70% of the total course grade. The examination will consist of questions which reflect the types of self-assessment practice exercises and tutor-marked problems you have previously encountered. All areas of the course will be assessed Use the time between finishing the last unit and sitting for the examination to revise the entire course material. You might find it useful to review your self-assessment exercises, tutor-marked assignments and comments on them before the examination.

How to Get the Most from This Course

In distance learning the study materials replace the university lecturers. This is one of the great advantages of distance learning. You can read and work through specially designed study materials at your own pace and at a time and place that suit you best. Think of it as reading the lectures instead of listening to a lecturer. In the same way that a lecturer might set you some reading to do, the study units tell you when to read your books or other materials, and when to embark on discussion with your colleagues. Just as a lecturer might give you an in-class exercise, your study units provide exercises for you to do at appropriate points.

Each of the study units follows a common format. The first item is an introduction to the subject matter of the unit and how a particular unit is integrated with the other units and the course as a whole. Next is a set of learning objectives. These objectives enable you know what you should be able to do by the time you have completed the unit. You should use these objectives to guide your study. When you have finished the unit you must go back and check whether you have achieved the objectives. If you make a habit of doing this you will significantly improve your chances of passing the course and getting the best grade.

The main body of the unit guides you through the required reading from other sources. This will usually be either from your text books or from other reading materials. Self-assessment exercises are mainstreamed in the units, and answers can be found in the materials. Working through these tests will help you to achieve the objectives of the unit and prepare you for the assignments and the examination. You should do each self- assessment exercises as you come to it in the study unit.

Tutors and Tutorials

There are some hours of tutorials (2-hours sessions) provided in support of this course. You will be notified of the dates, times and location of these tutorials. Together with the name and phone number of your tutor, as soon as you are allocated a tutorial group.

You should try your best to attend the tutorials. This is the only chance to have face to face contact with your tutor and to ask questions which are answered instantly. You can raise any problem encountered in the course of your study. To gain the maximum benefit from course tutorials, prepare a question list before attending them. You will learn a lot from participating in discussions actively.

Summary

This course, Transport and Logistics (TPM 207), exposes the students to the rudiments of transport and logistics and its major conceptual and operational issues On successful completion of this course, the enthusiasm of students for greater knowledge in the field would have increased while their interest in the transport and logistics industry would have been stimulated

We wish you success with the course and hope that you will find it both academically interesting and intellectually attractive and refreshing

MODULE ONE

TRANSPORT: DEFINITION, SCOPE AND FUNCTIONS.

Unit 1: Fundamentals of Transport

Unit 2: Scope and Functions of Transport

UNIT 1: FUNDAMENTALS OF TRANSPORT

CONTENTS

1.0 Introduction

This unit discusses the meaning of transport, basic concepts and terminologies used in transport and its importance to the society and economic activities. In other words, the basic features that give expression to transport as a process factor in production will be fully examined.

2.0 Objectives

At the end of this unit, students should be able to

- Define transport and know its meaning

- Understand the basis of movement and terminologies used in transport
- Explain the importance of transport

3.0 Main Contents

3.1 Definition of Transport

Generally speaking, every individual and indeed every living thing for that matter, possesses right from an early stage, an in-built ability to move though within a limited area. The need to describe and explain this movement led to the emergence of the word transport in English lexicology. The word is derived from Latin- trans ("across") and portare ("to carry"). As a consequence of this, transport was viewed as an act, process, or instance of moving or being moved It was seen as a means of conveyance or travel from one place to another. With increasing development, transport is being described as the public conveyance of passengers or goods especially as a commercial enterprise.

The following features are discernible from these views.

i. Transport implies movement. In other words, transport is movement and movement is transport.

ii. It involves the locational shift of people and goods; and

iii. It takes place from one place to another.

Based on these features, transport can be defined as the movement of things and masses of any sort from one place to another, in other words, from an origin to a destination. This origin-destination relationship also defines communication except that unlike transport, it involves the movement of intangible or non-physical things (information, messages, etc) from one place to another. Thus, while transport is the act of movement of people and goods, transportation on the other hand is the process involved in the movement

Self -Assessment Exercise

List and describe the main features of the definition of transport

3.2 Basis of Movement

In appreciating and explaining the origin – destination relationships, reference has to be made to Edward Ullman's (1956) three factor typology of complementarity, intervening opportunity and transferability. These factors usually referred to as Ullman's Triad, provide a basis and theoretical explanation for movement.

A. Complementarity

According to him, movement will take place between locations (A & B) if what is demanded for in 'A' is available and ready to be supplied in 'B, where these conditions exist, then a basis for movement between them is established and the two locations can be said to be complimentary.

B. Intervening Opportunity

Ullman postulated that even if the conditions in (a) are met, movement will only take place in the absence of an alternative location 'C' where what is demanded in A can be obtained. In other words, the buyer in location A has no other choice than to go to location B to make purchases.

C. Transferability

This is the condition of the availability of a transport route linking A to B since movement takes place on transport routes If there are no routes, movement opportunities would be hampered

Though Ullman's postulation has been criticized on a number of grounds, but the consensus is that the triad remains a sound theoretical basis and explanation for movement.

Self-Assessment Exercise

Explain Edward Ullman's three-factor typology and show how each one of them helps our understanding of transport

3.3 Importance of Transport

Transportation has so much significance in human life. Things need to move from one place to another Indeed, transportation can be called the heart of the society as it makes it possible to deliver things where they are needed at appropriate times. Transportation offers several benefits which include the following.

a. Professional Discipline

Transport has become a major area of academic study and thus a professional discipline of international recognition It has transformed to different course programmes in tertiary institutions across the world with emerging professional bodies Thus, the study of transport can be viewed from different lenses, including economics, engineering, management, geography and applicable mathematics. This has given the impression that the study of transport is multi-disciplinary. Yet transport is a distinct discipline with a theory, methodology, history of thought and registers. Indeed, transport has emerged as a profession like Accountancy, Law, Engineering and others. In Nigeria for example, to show the professional status of transport, there has been established a Council by an Act Parliament for the Registration of Transport Professionals (Transportants).

b. Movement of people

An efficient network of transport services encourages the movement of people from one place to another. Transport reduces the rigours of immobility of factors of production. Mobility of labour and capital increases with the development of transport. Labour can migrate to places where they can get better job opportunities**.**

c. Movement of resources

Moving people is one thing, but goods also need to be transported. Construction sites would need materials to function. Paper and electronic devices are required at offices. All these resources need to be delivered to them for their proper functioning. Transportation allows the resources to be taken to the places where they are needed.

d. Specialization and Division of Labour

Transport helps each region and country to make optimum and efficient use of its national resources. Each region can concentrate on production of those goods for which its resources are best suited. Thus, movement of goods and people from one place to another leads to

specialisation and division of labour which results in minimum wastage of resources and reduction in the cost of production.

e. Extensive Market:

Transport helps in the assembly of raw materials and distribution of finished goods. It makes it possible to move goods from places of production to places of consumption. In the earlier days, there were only local markets due to the absence of safe means of transport. Today, trade is not restricted to the boundaries of a nation, but has spread throughout the world. Development of efficient means of transport has knit together all the nations of the world into one big world market. Even perishable goods like fish, dairy products, meat etc. are transported to distant places of the world. Without good transport facilities, such a development in trade and commerce would not have been possible.

f. Employment opportunities

The various means of transport provide employment to millions of people throughout the world. The economic development of a country depends upon the improved means of transport. Thus, transport contributes substantially to the national income of nations. The fact that transportation has integrated well with technology, has also created employment opportunities

Transportation has also given job opportunities to people apart from vehicle drivers. Modern companies like Daewoo, Faisal Movers need people to manage their records and design their efficient digital storage. Similarly, for international travels, airports need to hire people to manage and regulate their record system. Hence, these people are employed for their skills and can earn money for themselves. In Asian countries, a large part of the working population is indirectly or directly in the transport sector. This also facilitates circulation of jobs which leads to industrial development and, therefore, to economic development.

g. Influence on economy

Each commercial activity is linked in one way or the other to transportation and directly affects its operation or performance. For a country to run properly, money must be invested on transport

infrastructure and services. Only then the industries will be able to generate revenues which will help the economy grow. Businesses, agricultural activities, and industrial development are highly dependent on transportation. It would not have been possible to make current rapid industrial development without efficient means of transport thereby increasing National Wealth.

h. National Unity, Integration and Peace:

Transport helps in maintaining internal peace and national unity of a country. It brings about national integration. Transport encourages economic and political interdependence by promoting specialization and this strengthens the need for unity and national integration. It is also essential for strengthening national defence of a country and create political awakening in the people.

Self-Assessment Exercise:
Discuss the importance of transport in the society

4.0 Conclusion

We can conclude that transport is important in both developed and developing countries given its critical role as a process factor of production and an enabler of people.

5.0 Summary

In this study unit we provided a comprehensive definition of transport, examined the theoretical basis of movement, and highlighted the importance of transport in the society.

6.0 Tutor-Marked Assignment

a) Define transport and explain its salient features
b) Attempt a theoretical explanation of the basis of transport
c) Discuss how transport is important to your country.

7.0 References/Further Readings

Bamford, C.G. (2006). Transport Economics, 4th Edition, Heinemann Press Ltd, Edingburgh Gate Harlow Essex

Coyle, J.J. (1990). Transportation (3rd Edition), St Paul West Publishing Company

Hilling, D. (1996). Transport and Developing Countries, London Routeledge

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UNIT 2: SCOPE AND FUNCTIONS OF TRANSPORT

CONTENTS

1.0 Introduction

This unit identifies and explains the main components of transport, its elements necessary for administration and operations, and examines its functions in the society and economic activities.

2.0 Objectives

At the end of this unit students should be able to

• Identify and explain the main components of Transport
• Know the elements of transport necessary for its administration and operations
• Explain the functions of transport

3.0 Main Contents

3.1 Components of Transport

Generally, the study of transport can be viewed from two perspectives namely; Transport Engineering and Technology, and Transport Planning, Operations and Management. Viewed from any of these, transport study can be divided into five major components as follows: -

(a) Modes

Transport modes refer to the transport systems such as land, air, water and pipelines. Traditionally, modal studies involve the examination of the different modes and means of transport. Modal studies are carried out to:

i) Identify the technical characteristics of transport modes,
ii) Determine their comparative advantages
iii) Examine their cost structures;
iv) Ascertain their utility and availability to the society;
v) Trace their historical evolution over time; and
vi) Determine their regional growth pattern and distribution over space.

(b) Networks

Networks relate to the layout, jointry or pattern of transport routes. Thus, a network is a collection of transport routes in a defined geographical region. An important aspect of network is the location of intersections, nodes and terminals, especially their densities. Indeed, network studies are not only interested in their structures but also in the relative accessibility of points (nodes) within the network and the linkages provided by the transport systems.

(c) Flows

Flows are regarded essentially as the real activity of transport. Flows refer to the locational shift of passengers and freight (goods) from one place to the other. Flows are studied and analyzed in terms of their direction of movement, intensity (volume), their composition, and spatio-temporal trends in growth or decline.

(d) Stock or Inventory of Transport Equipment

There are generally' two types of transport equipment. These are the mobile i.e vehicles and motive power units themselves which are technically called the rolling stock. They are means of transport namely cars, buses, lorries, aircrafts (airplanes), trains, ocean vessels and pipes. The other relates to the fixed facilities such as airports, motor parks, and sea ports among others.

Transport equipment can be studied in terms of their availability, utilization and spatial distribution.

(e) Interrelationships

This is perhaps the most important aspect of transport studies. This is simply because transport systems and modes do not occur in vacuum. Indeed, transport develops because there is a demand for it in the society, hence the argument that the demand for transport is a derived demand.

Interrelationships which involve the relationship amongst transport modes on the one hand; and between transport and the socio-economic environment on the other are studied to determine the interaction between the socio-economic activities in a particular society and the society's transport system. It could also be used to examine the degree of competition or complementarity between the modes.

Thus, looking at transport from these five components gives a functional approach to the study.

Self-Assessment Exercise

List the components of transport and describe the first two

3.2 Elements of Transport

In discussing transport, three basic elements are usually considered relevant. These are the transport unit (vehicle), the way (route), and the terminals. These are the fundamental elements of transport.

a. Transport Unit

With regard to transport unit, there are two types. The first is the type whereby the motive power or locomotive unit (Engine) is physically combined with the cargo unit (Carrier) to form a single transport unit. Examples are found in aircrafts and road vehicles; with the exception of trailers and tankers.

The other type refers to those in which the motive power or locomotive unit is physically separated from the cargo unit such as Trains, Trailers and Tankers

Thus, transport modes can be divided into these two groups and each group has its advantages in terms of the type of traffic it can carry and at what speed it can move.

b. The Way

The way refers to the highways over which different types or forms of transport move. For instance, in rudimentary form of transport, like human porterage or pack animals, the way is not elaborate. It could be bush tracks or paths which may be worn or developed. But for mechanical transport, the way is much more elaborate and there are two groups of ways.

The first are those which require specific construction and more definite development. Examples of these are Highways and Railways. They also require more capital cost and factor input than are found under the rudimentary form of transport. For example, road vehicles need roads which are constructed specifically. Such roads may either be earth-surfaced, gravel-surfaced or tarred. In the same way, trains need rail tracks while canal barges need the dredging of canals, to define Inland waterways.

The second type of ways relates to those which require no special construction. These are usually regarded as the "free way" which results largely from the gift of nature. Examples are the sea over which ocean vessels move, and the air through which aircrafts fly. Both sea and air require no specific construction. Thus, as far as the way is concerned, both air transport and ocean vessels have an advantage over roads and railways, but this advantage which stems from nature's free gift is counteracted by the necessity for the construction of terminals.

To recapitulate, the ***WAYS*** are important concepts in transport. They include those elements with which you are already familiar namely, Highways, Railways, Waterways, and Airways.

c. Terminals

Terminals are an important element in transportation. They serve as points for collection and distribution of traffic. They also facilitate the functioning of transport in the sense that they provide avenues for repairs and maintenance jobs.

The type of terminal varies with the type of mode of transport. For instance, rudimentary transport requires no specific form of terminal. In road transport, terminals are not quite important particularly with regard to the total cost of investment. This is because road transport

is ubiquitous as it can utilize any available space either for loading or unloading of traffic. In some cases, they can even do without any. However, in some organized road transport systems, the use of terminals is increasingly becoming important. For instance, in most cities, there are motor parks which act as collection and distribution points for passengers.

Terminal is slightly more important for rail transport simply because rail stations are necessary in order to be able to organize the scheduling and distribution of traffic. For sea and air transport, terminals are of great importance. Without air and sea ports, these two modes of transport cannot operate

Self-Assessment Exercise.

Explain the importance of each of the elements of Transport

3.3 Technical Characteristics and Functions of Transport

In understanding the functions of transport, it is important to examine and consider the technical characteristics of transport modes. The characteristics are also important in determining the comparative advantages of one mode of transport over the other. Thus, in analyzing the functional character of each mode, and in comparing one mode with another, five elements which relate to the technical characteristics of transport are considered important.

a. Size of the Transport Unit.

The size of the unit determines the volume and quantity of traffic a modal vehicle can carry This however depends on the nature of the routeway used and the technical means of proportions. In descending order of magnitude, transport units with respect to size can be arranged as follows: ships, canal barges, trains, aircrafts and road vehicles. For road vehicles, the size is the result of the limitations imposed by the motive power unit and the types of highways constructed. In the case of aircrafts, the size is limited because unlike other means of transport, the aircraft lifts its total weight into the air and sustains it there until it reaches its destination. This characteristic defines the functionality of each mode in terms of the volume of load it can move at a time

b. Speed

In terms of speed, air transport has no rival. The advantage of speed of air transport is the greatest for long distance travels. The worst in terms of speed are ocean vessels. Both road

vehicles and trains competed in the past but today technology has improved train speed to as high as over 300kph e.g the MAGLEV in China

c. Accessibility

In terms of operational accessibility, road transport has the greatest advantage because of its ubiquity. Indeed, its operations do not require the use of terminals as it is the case with other modes. The latest railway technology which enables tracks to be attached to trains will increase the operational accessibility of trains

d. Degree of Variability of Transport Unit

The extent to which the capacity of the transport unit can be varied especially in the face of fluctuations in demand is related to whether the cargo unit is physically combined or separated from the motive power unit. In this case, trains and trailers have the greatest advantage. Functioally, it is possible for instance to increase the number of rail coaches and wagons to enable greater load to be carried.

e. Flexibility of Operations

This depends on the degree to which transport unit can be independently operated. Here the train has the greatest disadvantage. This is because for train movement, the permanent way has to be centrally organized and coordinated if only on the grounds of safety and mechanical expediency.

In summary, each mode of transport has technical characteristics which confer both advantages and disadvantages on it. These comparative advantages determine the mode of transport that could be best used for the movement of a particular traffic. It is however important to point out that technological advancements in each mode of transport is incrementally improving the functionality of each mode. In general, railways are best suited for long haul transport of heavy commodities which are often of low value per unit load.

Road transport excels in door to door services and best suited for short-haul transport of commodities. Air transport specializes in speed and in long haul transport of high-valued goods especially those which require quick delivery e, g perishable goods. Inland waterways and ocean vessels have advantage of transporting bulk goods of low value for which time of delivery is not an important factor. Pipelines can transport liquids, semi-liquids and more recently solids in a one-way flow at reasonable speed and in a continuous flow.

In addition to these technical specialized roles, the following are key functions of transport

1. Transport is a freezer of space It has the ability to conquer distance thereby transforming the world to a global village.
2. It creates place utility by bridging the gap between production and consumption centres
3. It also creates time utility made possible mainly by virtue of the improvements in the speed of transport which helps people and goods to be moved and distributed in the minimum possible time.
4. It equalizes the supply and demand factors thereby making the prices of commodities stable as well as almost equal.
5. Transport equalizes man Transport modes are operated by all, the high, mighty, low and poor in the society

Self-Assessment Exercise.

List the technical characteristics of transport modes and describe any three functions of transport

4.0 Conclusion

We can conclude that transport is necessary for the proper functional of the society and its economic activities It is a freezer of space and a major consideration in the entire production process.

5.0 Summary

In this study unit we identified and explained the components of transport and provided a comprehensive description of the elements of transport. The technical characteristics of transport modes are examined while the functions of transport are listed.

6.0 Tutor-Marked Assignment

a) List the components of transport and describe their main features

b) Provide a detailed description of the elements of transport

c) Discuss how the technical characteristics of transport modes can be used to explain the functions of transport.

7.0 References/Further Readings

Bamford, C.G. (2006). Transport Economics, 4th Edition, Heinemann Press Ltd, Edingburgh Gate Harlow Essex

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MODULE TWO

TRANSPORT IN THE FRAMEWORK OF PRODUCTION

UNIT 1: TRANSPORT AND PRODUCTION

CONTENTS

Introduction

This unit explains the link between transport and production, the role of transport as a process factor in production, and examines its functions in the society and economic activities.

2.0 Objectives

At the end of this unit students should be able to

- Understand the link between transport and production
- Trace the emergence of logistics as a business function
- Define logistics and understand its meaning
- Know the components of logistics used to achieve production objectives

3.0 Main Contents

3.1 Transport and Production Process

Transportation is part of the process of production as well as a factor input in the production function of firms, cities, states and the country. Movement is achieved through various services

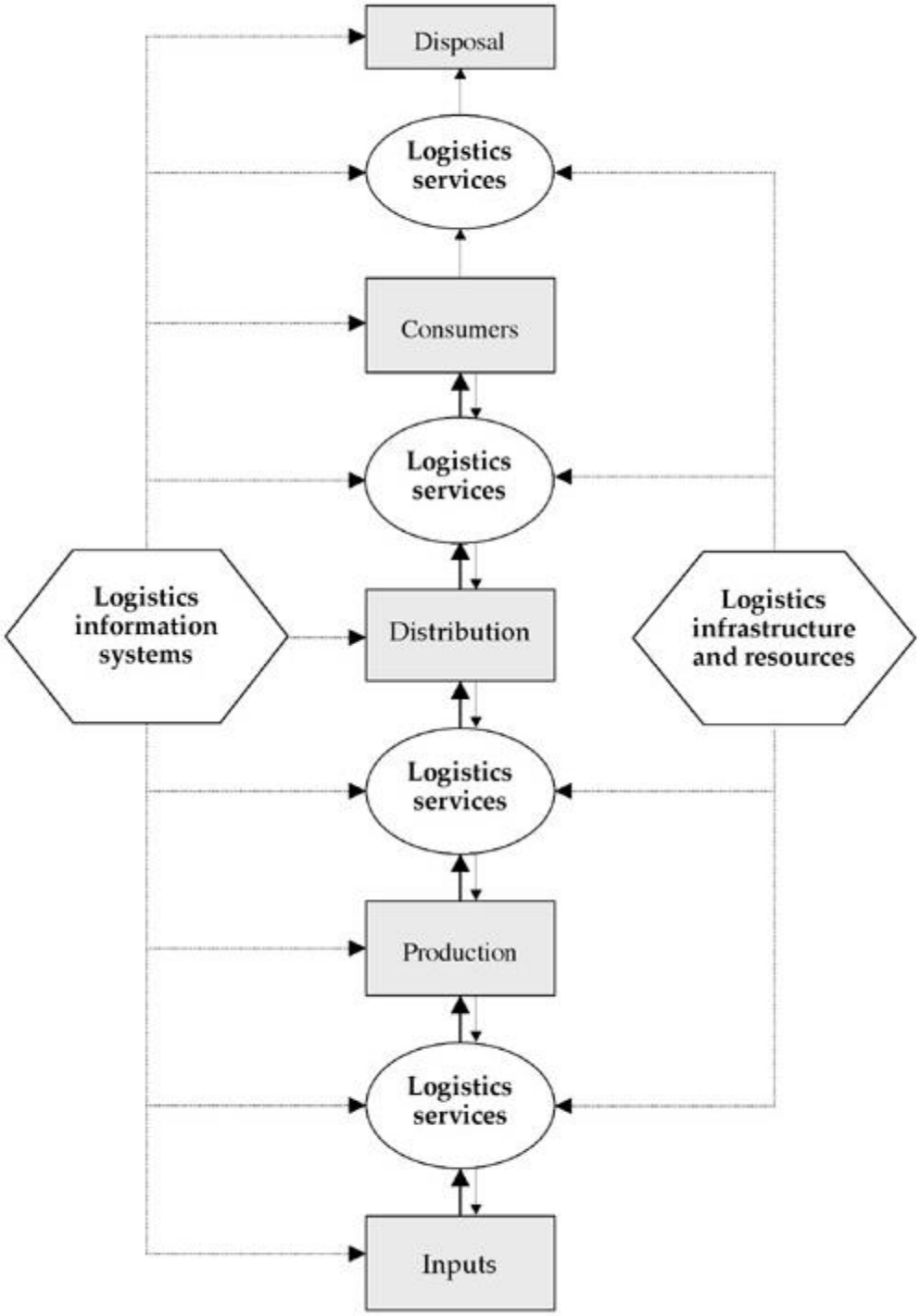
and is used in conjunction with other inputs to produce goods and services in the economy. Thus, transportation is an intermediate good and as such has a "derived demand" It plays a connecting role among the several steps that result in the conversion of resources into useful goods in the name of the ultimate consumer.

By means of well-handled transport system, goods could be sent to the right place at right time in order to satisfy customers' demands. It brings efficacy, and also builds a bridge between producers and consumers. Therefore, transportation provides the basis of economic efficiency in business and brings about not only service quality but also company competitiveness.

The operation of transportation determines the efficiency of moving products. The progress in techniques and management principles improves the moving load, delivery speed, service quality, operation costs, the usage of facilities and energy saving. Thus, the key element in the chain is transportation system which joins the separated activities. It is required in the whole production process, from manufacturing to delivery to the final consumers and returns. Only a good coordination between each component would bring the benefits to a maximum.

It is the planning of all these functions and sub-functions into a system of goods movement in order to minimize cost and maximize service to the customers that constitutes the concept of business logistics. Logistics services support the movement of materials and products from inputs through production to consumers, as well as associated waste disposal and reverse flows. The system, once put in place, must be effectively managed. as shown in Figure 1.

Figure 1. Overview of Logistics System



(Source: BTRE, 2001)

Transportation is the most important economic activity among the components of logistics systems. Between one to two thirds of the expenses of enterprise' logistics costs are spent on transportation. According to Chang (1988), the cost of transportation, on the average, accounted for 6.5% of market revenue and 44% of logistics costs. Estimates from Air Transportation Association as reported by Chang (1988) indicated that transportation was the highest percentage of 29.4% of logistics costs. The transportation cost here composed of the means of transportation, corridors, containers, pallets, terminals, labour, and time.

The value of transportation varies with different industries. For those products with small volume, low weight and high value, transportation cost simply occupies a very small part of sale and is less regarded. For those big, heavy and low-valued products, transportation occupies a very large part of sale and affects profit more, and therefore it is more regarded. What then is Logistics

Self-Assessment Exercise.

Explain the role of transport in the production process

3.2 Emergence of Business Logistics

Logistics is as old as mankind. When the early man picked up fruits from the field, harvested his farm, hunted for animals and took all of these to his home to share with his family who were the ultimate consumers and customers, he was involved in logistics in its early and raw form or stage.

The growth from subsistence farming to an exchange economy (i.e. trade by barter) also contributed to the development of logistics in its infant stage. The goods to be exchanged had to be moved to the points where the other partners were in order to carry out the exchange activities or functions.

The word 'logistics' emerged from the Greek word Logistikos, meaning skilled in calculating. Roman armies had administrative officers called Logista. Thus, the term Logistics was originally applied to the military. The earliest application of logistics in support of large- scale military operation was at the battle of Caunnae in 216 BC. In his march to Rome during the second Punic war, General Hannibal transported 30,000 men, horses, and elephants which enabled him to inflict a stunning defeat on the Romans.

Emperor Napoleon Bonaparte of France identified the word 'Logistics' as key to his various victories and losses in the war front. Baron Antoine Henry Jomini, the foremost military theorist of the 19th century in his book 'Marechal General de Logis' (Quartermaster General) explained the word 'la logistique' (meaning logistics in English) as 'the practical art of moving armies.'

General Rommel, a German Army General in the Second World War once said that' before the fighting proper, the battle is won or lost by quartermasters'. Quartermasters are military officers in charge of providing food, uniforms, and other materials. General Dwight David Eisenhower, an American Army General during the Second World War who later became the President of America between 1953 and 1961 said 'you will not find it difficult to prove that battles, campaigns and even wars, have been won or lost primarily because of logistics. Field Marshall Lord Wavell said 'the more I have seen of wars, the more I realize how it all depend upon administration and transportation (what our American Allies call Logistics).

The Commandant Nigerian Army College of Logistics in 2005, argued that from the military perspective, logistics is the science of planning and carrying out the movement and maintenance of forces in peace and in war.'

Today, logistics is well embraced and accepted by all business concerns as the process of managing the movement and storage of goods and materials from their source to the point of ultimate consumption.

3.2.1 Definitions of Logistics

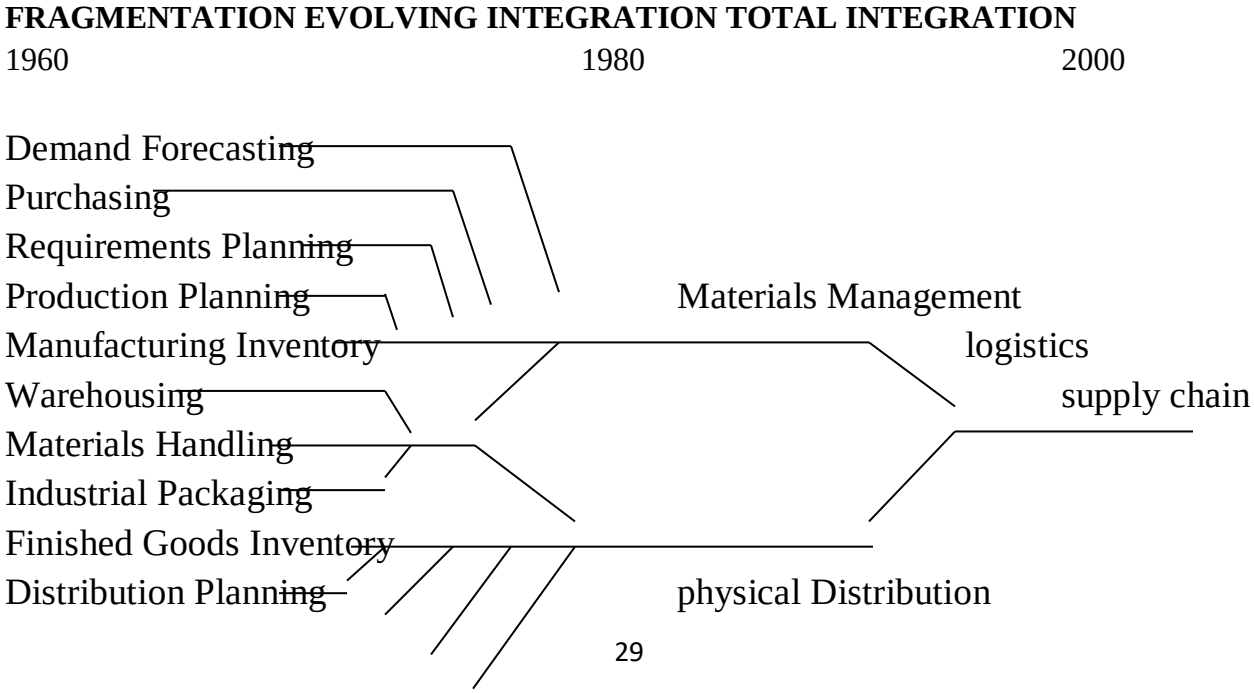
In its simplest form, logistics is the flow of materials, information, and money between consumers and suppliers. The APICS Dictionary (13th Edition), defines logistics as the art and science of obtaining, producing, and distributing materials and products in the proper place and in proper quantities. The Council of Logistics Management in 1985 defines Logistics Management as 'the process of planning, implementing and controlling the efficient, effective flow and storage of goods and services and related information from the point of origin to the point of consumption for the purpose of conforming to customer requirement.' The Chartered Institute of Logistics and Transport (UK), in 2005 sees logistics as a time related positioning of resources at the right time, in the right place, at the right cost, and at the right quality.

Rushton and Walker (2007), define logistics as the process of planning, implementing and managing the movement and storage of raw materials, work-in-progress, inventory, finished goods and the associated information from the point of origin to the point of consumption. Thus, logistics is the process of planning, implementing, coordinating, and controlling the flow and storage of goods, services and related information so as to deliver

- what is needed
- from where it is needed
- to where it is needed
- when it is needed
- at the lowest cost

3.2.2 Phases of Development of Logistics

There are distinct stages in the development of logistics, and various evolutionary models have been developed to describe them. Among the most important is the Evolutionary Logistics Model based on physical product distribution developed by Coyle, Bardi and Langley (1996). This model mirrors the flood of activities which led to the emergence and growth of physical distribution as an important management function (See Fig !). This led to the merger in 1993 between the UK Institute of Materials Management and the Institute of Logistics and Distribution Management to create the Institute of Logistics.



Order Processing
Transportation
Customer Service

Figure 1. Coyle *et al:* Logistics Evolutionary Model

Another school of thought details the evolutionary process as follows:

Early 1900s

In early 1900s, the importance of enhancing time and place utility was brought to the fore. The term, logistics, continued to be used in the military as a branch of war that pertains to movement and the supplies for armies. During World War II, military forces made effective use of logistics models and forms of systems analysis to ensure that the required materials were at the right place on time and every time.

1950s and early 1960s

In this period, distribution systems were unplanned and unformulated. Manufacturers produced, retailers retailed, and in some ways, the goods reached the shops. Distribution was broadly represented by the haulage industry and manufacturers' own-account fleets. There was little positive control and no real liaison between the various distribution-related functions. No wonder Peter Drucker, the father of American modern management, said in 1962 that physical distribution is the last Dark Continent for business to conquer.

1960s and early 1970s

During this period, the concept of physical distribution was developed with the gradual realization that the Dark Continent was indeed a valid area for managerial involvement. This consisted of the recognition that there was a series of interrelated physical activities such as transport, storage, materials handling and packaging that could be linked together and managed more effectively.

1970s

This was an important decade in the development of the distribution concept. One major change was the recognition by some companies of the need to include distribution in the functional management structure and control of the distribution chain. The decade also saw a change in the structure and control of the distribution chain.

1980s

Fairly rapid cost increases and the clearer definition of the true costs of distribution contributed to a significant increase in professionalism within distribution. With this professionalism came a move towards longer-term planning and attempts to identify and pursue cost-saving measures. These measures included centralized distribution, severe reductions in stock-holding and the use of the computers to provide improved information and control. The growth of the third-party distribution service industry was also of major significance. Thus, the concept of and need for integrated logistics systems were recognized by forward-looking companies that participated in distribution activities.

Late 1980s and early 1990s

This period linked very much to advances in information technology. Organizations began to broaden their perspectives in terms of the functions that could be integrated. In short, this covered the combining of materials management (the inbound side) with physical distribution (the outbound side). The term ‘logistics’ was used to describe this concept. Once again this led to additional opportunities to improve customer service and reduce the associated costs. One major emphasis recognized during this period was the importance of the informational aspects as well as the physical aspects of logistics.

1990s

In the early 1990s, the process was developed even further to encompass not only the key functions within an organisation’s own boundaries but also those functions outside that also contribute to the provision of a product to a final customer.

2000 and beyond

Business organizations face many challenges as they strife to maintain or improve their positions against their competitors, bring new products to market and increase the profitability of their operations. This has led to the development of many new ideas for improvement, specifically recognized in the redefinition of business goals and the re-engineering of entire systems. One business area where this has been of particular significance is that of logistics. Indeed, for many organizations, changes in logistics have provided the catalyst for major enhancement to their business. Leading organizations have recognized that there is a positive 'value added' role that logistics can offer, rather than the traditional view that the various functions within logistics are merely cost burdens that must be minimized regardless of any other implications.

Thus, the role and importance of logistics have, once again, been recognized as a key enabler for business improvement.

Self-Assessment Exercise.

Explain the emergence of logistics as a business function and describe the various stages of its evolution

3.3 Components of Logistics

Since Logistics describes the entire process of moving materials and products into, through and out of firms, it is made of the following three major components

a. Inbound or Upstream Logistics

It covers the movement of materials received from suppliers, the totality of which is called Procurement

This is the acquisition of goods and/or services at the best possible total cost of ownership, in the:

right quantity,
right quality,
at the *right time*,
in the *right place*
and from the *right source*
for the direct benefit or use of organization.

Purchasing

It's the process of ordering and receiving goods. It is a subset of the Procurement process. Generally, purchasing refers to the process involved in ordering goods such as request, approval, and creation of a purchase order, among others.

Inventory/Storage

This relates to the quantity or store of goods held for some intended purpose or use. Such inventory may be kept "in-house," meaning on the premises or nearby for immediate use; or it may be held in a distant store or distribution centre for future use.

b. Work-in-Progress or Production Logistics

This involves the whole process of Materials Management which describes the movement of materials and components within a firm during the production process.

Materials Handling

This is the handling and sorting of materials in the production arena It involve diverse operations such as hoisting tons of steel/rice/sugar with a crane; driving a truck loaded with same; carrying bags or materials manually; and stacking palletized items or other materials among others Improper handling of materials often results in costly spoilage and injuries.

Packaging

Packaging is the science, art, and technology of enclosing or protecting products for distribution, storage, sale and use. It can be described as a coordinated system of preparing goods for transport, warehousing, sales and end use.

c. Outbound or Downstream Logistics

This refers to the movement of goods outward from the end of the assembly line to the customer. It involves the following operations

Warehousing

Warehousing is that part of a firm's logistics system that stores products (raw materials, parts, goods-in-process, finished goods) at and between point of origin and point of consumption *It*

provides information to management on the status, condition and disposition of items being stored

The term Distribution Centre (DC) is sometimes used.

Transportation and Distribution

These refer to the physical movement of goods to customers and distribution to final consumers. This could be done using either company fleet or outsourced or hired vehicles from third party logistics service providers.

Customer Service

This relates to the totality of support given to customers and consumers as part of a company's business relationships This could be in the form of service support, or after-sale service support, or generally responding quickly to demands for repairs or assistance.

Reverse logistics

This refers to the management of returns of defective or damaged products for the purpose of recapturing value or proper disposal.

Self-Assessment Exercise.

Identify and explain the major components of logistics

4.0 Conclusion

There is no doubt that transport is a critical support factor in production The planning of all its functions and sub-functions into a system of goods movement in order to minimize cost and maximize service to the customers is what constitutes the concept of business logistics. Thus, logistics services support the movement of materials and products from inputs through production to consumers, as well as associated waste disposal and reverse flow.

5.0 Summary

In this study unit we showed the importance of transport in the framework of production and explained how its functions led to the emergence of business logistics. The meaning and definitions of logistics are highlighted while a comprehensive description of its components especially with regard to their roles in supporting and facilitating the production process are provided.

6.0 Tutor-Marked Assignment

a) Explain the importance of transport in the framework of production

b) Define logistics and provide a detailed description of its evolution as a distinct discipline

c) Identify the main components of logistics and describe the elements of each.

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MODULE THREE

TRAFFIC MANAGEMENT

UNIT 1: FUNDAMENTALS OF TRAFFIC MANAGEMENT

CONTENTS

1.0 Introduction

This unit explains the concept of traffic management, identifies and describes traffic management techniques and measures, and examines institutional framework for traffic management. Government organizations responsible for traffic management and control are identified.

2.0 Objectives

At the end of this unit, students should be able to

- Explain the meaning of the concept of traffic management
- Understand the techniques and measures used to manage and control traffic
- Know the goals and objectives of an institutional framework for traffic management

3.0 Main Contents

3.1 What is Traffic Management

The term traffic refers to the movement of all vehicles, aircrafts, trains, river crafts, ocean vessels and other forms of rolling stock from one place to another. It also includes people and goods being transported by road, air, train or ship. It is therefore common to talk of vehicular or goods(freight) traffic. The growth of settlements and phenomenal rate of urbanization, the complexities of economic activities have generated high movement demands and thus heavy traffic in all modes of transport across the world Thus the need to manage traffic has therefore become a necessity

Traffic Management comprises a variety of techniques for dealing with traffic-related issues. As a concept, it is a process for planning and operating a system of movement activities on any mode of transport. It arises from the need to maximize the capacity of existing modal networks with a minimum of new construction. Thus, traffic management may be considered as a means of optimizing the available modal network in accord with specified objectives as dictated by the prevailing local issues. Such issues would normally include modal network efficiency and environmental quality in their various ramifications. With the current level of developments, traffic management should be fully integrated into the design of development proposals rather than being introduced as an after-thought when problems manifest. In general terms, the principal focus of traffic management is to make the best use of what is available and optimize the benefit to the community of the resources offered by the modal network.

Globally, the focus of traffic management is narrowed principally to the road mode. Road traffic management is therefore a field of transport and logistics that concerns the planning and control of traffic from one location to another. One of the main challenges of road traffic management is accommodating traffic in a safe and efficient way to reduce or eliminate traffic congestion and accidents. More recently, the emphasis of the process has spanned beyond simple traffic controls to include the achievement of the following objectives.

i. Capacity improvements of existing roads
ii. Accident reduction measures

iii. Traffic demand restraints
iv. Greater emphasis on public transport facility and operational improvement measures
v. Improving environmental friendliness of road transport
vi. Restoring the ability to move around safely and freely on foot and by pedal cycle.

Self-Assessment Exercise

Explain the concept of traffic Management

3.2 Traffic Management Techniques and Measures

Traffic management involves a package of actions designed to control traffic and optimize the available road network in a well-focused manner. The package of actions comprises a variety of techniques for dealing with traffic and related issues. In general terms, the main features of traffic management measures may be summarized as:

- Be relatively inexpensive and be amendable to early implementation
- Improve the usefulness of existing facilities while duly accommodating the different requirements of the different categories of road users.
- Improve safety or, as a minimum, maintain the existing level of safety.
- Protect the environment, improving it where possible.

Among the relatively inexpensive techniques available for achieving comprehensive traffic controls are the following

a. Engineering Measures These include:
    i. Road capacity enhancement schemes such as increasing road lanes and widening of existing routes among others
    ii. Traffic signs (i.e. pavements markings, road signs, etc.)

    Most roadways include devices intended for traffic controls and most of them involving direct communication with the road-user, such as signs, signals and pavement markings. These assist with navigation, assign right-of-way, areas of safe passage, indicate speed limits, provide instructions, and advise of hazards among others. They are required in cites for the control, warning guidance and

information of road users. They enhance traffic discipline, encourage full usage of available road space, and add to the safety of traffic, besides improving traffic flow .

iii. Pedestrian safety measures through the creation of traffic islands, Guardrails, and provision of cross-markings, etc

iv. Traffic Calming especially speed bumps Others include kerbs, and median barriers.

v. Construction of Cycle and other Non-Motorized mode facilities

vi. Modernization of junction controls (i.e. priority control, signalization, improved signal control through coordination and computerization etc.)

vii. Pedestrianization measures

viii. Bus priority measures such as the creation of Bus lanes to allow for contra traffic

b. Traffic Regulations

i. Vehicle parking regulations and controls

Regulations are generally provided to guide and enforce both on and off – street parking.

ii. One-way streets or systems

iii. Routing and operational policies for heavy goods vehicles (HGV) and high occupancy vehicles (HOV).

iv. Speed Limit set to ensure safe speed.

v. Interference with Traffic:

It is unlawful for the operator of a vehicle to park in such a manner as to interfere with normal vehicular or pedestrian traffic. Violations of this nature could result in a fine and vehicle being towed at driver's expense.

iv. Crosswalks:

Pedestrians have the right-of-way while in a crosswalk. All crosswalks should be designated by signage and/or diagonal lines on the road surface or by brick paved sections of the roadway. Parking or loading and unloading in crosswalks are prohibited

vi. Enforcement of Traffic Laws

This involves activities at controlling road users' behaviour through preventive, persuasive, and punitive methods to achieve safe and efficient traffic flow. The objectives of traffic law enforcement are to

a. Prevent violation of traffic laws
b. Persuade road users to avoid traffic violations and offences
c. Apprehend and punish traffic law offenders

c. Application of Intelligent Traffic Systems (ITS).

i. Intelligent transportation systems (ITS) are advanced applications that provide services relating to different modes of traffic management and the 'smarter' use of transport networks. They are based on the transfer of information between transport systems to improved safety and performance, including traffic management systems, information systems, warning systems, vehicle-to-infrastructure communication and vehicle-to-vehicle communication.

ii. Traffic signal controllers are electronic devices located at intersections that control the sequence of the lights. Along with computers, communications equipment, and detectors to count and measure traffic, these controllers are frequently grouped into one system allowing the control of large numbers of traffic signals at intersections, approaches to expressways and motorways, and so on.

iii. Within the field of ITS, Advanced Traffic Management Systems (ATMS) integrate technology with a top-down management perspective that improves vehicle traffic flow and safety. The top-down perspective is achieved from a Transportation Management Centre (TMC) which receives real-time data from cameras, speed sensors, and so on. This data is processed and may inform actions such as traffic re-routing or using dynamic message signs (DMS).

iv. Active traffic management is a method of increasing peak capacity and making traffic flows more efficient and smooth-flowing on busy roadways. Common techniques include DMS, variable speed limits, hard-shoulder running, ramp-metering, and so on. In the event of incidents occurring, the control centre

operator and automatic systems can change signs to alert road users, inform emergency services, and open and close lanes to keep traffic flowing and minimise delays.

v. Traffic restraint, or calming uses traffic control devices to create impediments for traffic rather than increasing efficiency of movement. Devices often used include speed bumps, barricades, turning prohibitions, stop signs and raised pavement markers. It can also be used in conjunction with initiatives to increase bicycle and pedestrian traffic, such as lower speed limits, wider pavements, bike lanes, Odd and Even Numbers, and Park and Ride among others

Self-Assessment Exercise

What are the main features of Traffic Management Measures List the various techniques used in traffic Management?

3.3 Institutional Framework for Traffic Management

Building an appropriate institutional framework is essential for effective traffic management This can be achieved through an integrated multi-level approach to planning and decision-making This would allow the right combination of policies with defined goals to address all aspects of traffic management as shown in the table

General Traffic Management Goals.

	Element	**Management Goals**
1	Cars	Restraint and Control
2	Trucks (Lorry)	Direct and Control
3	Public Transport	Give Priority and Make Attractive
4	Bicycle	Protect and Encourage
5	Pedestrian	Protect and Aid

6	Parking	Control
7	Environment	Protect and Enhance
8	Different Modes	Coordinate and Integrate

Such a framework will enable the following measures to be introduced

i. Demand-side management measures
ii. Economic measures
iii. Regulatory measures
iv. Land-Use Management Measures

Today, a number of institutions exist for traffic management in the country They include

i. Federal and State Ministries of Transport
ii. Urban Development Boards and Agencies
iii. Road Transport Services
iv. Federal Road Safety Commission, among others

Self-Assessment Exercise.

What do you understand by institutional framework for traffic management?

4.0 Conclusion

Managing traffic on roads has become a major administrative activity in all countries of the world It is in response to the hydra-headed traffic problems of congestion and accidents bedeviling many countries A number of traffic management techniques have been devised and adopted while institutions have been built to handle the problem in both developed and developing countries

5.0 Summary

In this study unit we have explained the concept of traffic management its objectives and practice. The various techniques used and scope of applications are identified and discussed while the need to build an institutional framework for traffic management with defined goals and operational strategies are discussed.

6.0 Tutor-Marked Assignment

a) Explain the concept of traffic management and discuss its goals and objectives

b) Identify and describe the major traffic management techniques generally in use

c) Describe the existing institutional framework for traffic management in Nigeria.

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MODULE FOUR

RATE DETERMINATION AND NEGOTIATION

UNIT 1: TRANSPORT RATE DETERMINATION AND NEGOTIATION

CONTENTS

1.0 Introduction

This unit explains transport rates, identifies and discusses the factors determining transport rates and examines the concept and practice of rate negotiation Practical examples of rate determination and negotiation are provided.

2.0 Objectives

At the end of this unit, students should be able to

• Understand what constitutes transport rates
• Know how transport rates are determined
• Demonstrate negotiation skills for achieving competitive prices

3.0 Main Contents

3.1 What are Transport Rates

Transport systems face the challenge to increase their capacity and to reduce the costs of mobility. All users (e.g. individuals, corporations, institutions, governments, etc.) must **negotiate** or **bid** for the mobility of passengers and freight because supplies, distribution systems, tariffs, salaries, locations, marketing techniques as well as fuel costs are constantly changing. There are also costs involved in gathering information, negotiating, and enforcing contracts and transactions, which are often referred to as the cost of doing business. In a competitive environment where transportation is a service that can be bid on, transport costs are influenced by the respective **rates** of transport companies, and the portion of transport costs charged to users.

Rates *are the prices of transportation services paid by their* ***users****. They are the negotiated monetary cost of moving a passenger or a unit of freight between a specific origin and destination. Rates are often visible to the consumers since transport service providers must provide this information to secure transactions. They may not necessarily express the real transport costs.*

Transport costs on the other hand *are a monetary measure of what the transport provider must pay to produce transportation services. They* are costs internally assumed by the providers of transport services. They come as fixed (infrastructure) and variable (operating) costs, depending on a variety of conditions related to geography, infrastructure, administrative barriers, energy, and on how passengers and freight are carried. Three major components, related to transactions, shipments and the friction of distance, impact on transport costs.

The difference between costs and rates either results in a loss or a profit to the service provider. Considering the components of transport costs indicated earlier, the rate-setting is a complex undertaking subject to constant change. For public transit, rates are often fixed and the result of a political decision where a share of the total costs is subsidized by society. The goal is to provide affordable mobility to the largest possible segment of the population even if this implies a recurring deficit (public transit systems rarely make any profit). It is thus common for public

transit systems to have rates that are lower than costs and targeted at subsidizing the mobility of social groups such as students, the elderly or people on welfare.

For many forms of passenger transportation (e.g. air transportation) rates are subject to **competitive pressure**. This means that the rate will be adjusted according to the complex interactions between supply and demand. They either reflect costs directly involved with movement (cost-of-service) or are determined by the value of the commodity (value-of-service).

With regard to movement of goods(freight), *freight rate* which is the cost of transporting goods is a price at which a certain cargo is delivered from one point to another. The price depends on the form of the cargo, the mode of transport (truck, ship, train, aircraft), the weight of the cargo, and the distance to the delivery destination. Many shipping services, especially air carriers, use dimensional weight for calculating the price, which takes into account both weight and volume of the cargo. Since many actors involved in freight transportation are private, rates tend to vary, often significantly, but profitability is paramount.

Self-Assessment Exercise

Differentiate between transport rates and transport costs

3.2 Determination of Transport Rates

Transportation rates normally reflect the interaction of various factors associated with the costs of various modes of conveyance They may be Product or Market related factors as follows

a. Service Costs

Transportation offers a spectrum of costs and level of services, which results in substantial differences across the world. The price of a transport service does not only include the direct out-of-the-pocket money costs to the user but also includes time costs and costs related to possible inefficiencies, discomfort, and risk (e.g. unexpected delays). However, economic actors often base their choice of transport mode or route on only part of the total transport price. For example, motorists are biased by short-run marginal costs. They might narrow down the price of a specific

trip by car to fuel costs only, thereby excluding fixed costs such as depreciation, insurance, and vehicle tax.

Many shippers or freight forwarders are primarily guided by direct money costs when considering the price factor in the modal choice. The narrow focus on direct money costs is to some extent attributable to the fact that time costs and costs related to possible inefficiencies are harder to calculate and often can only be fully assessed after the cargo has arrived. There are significant conditions affecting transport costs and thus transport rates.

b. Distance and time

The impacts of geography mainly involve distance and accessibility. Distance is commonly the most basic condition affecting transport costs. The more it is difficult to trade space for a cost, the more the friction of distance is important. It can be expressed in terms of length, time, economic costs or the amount of energy used. It varies greatly according to the type of transportation mode involved and the efficiency of specific transport routes. Landlocked countries tend to have higher transport costs, often twice as much, as they do not have direct access to maritime transportation. The impact of geography on the cost structure can be expanded to include several rate zones, such as local, state, and, national.

The transport time component is also an important consideration as it is associated with the service factor of transportation. They include the transport time, the order time, the timing, the punctuality, and the frequency.

c. Type of product

Many products require packaging, special handling, which are bulky or perishable. Coal is obviously a commodity that is easier to transport than fruits or fresh flowers as it requires rudimentary storage facilities and can be transshipped using rudimentary equipment. Insurance costs are also to be considered and are commonly a function of the value to weight ratio and the risk associated with the movement. As such, different economic sectors incur different transport costs as they each have their own transport intensity. With containerization, the type of product

plays little in the transport cost since rates are set per container, but products still need to be loaded or unloaded from the container. For passengers, comfort and amenities must be provided, especially if long-distance travel is involved. These amenities have a cost.

d. Economies of scale and energy

The larger the quantities transported, the lower the unit transport cost. Economies of scale or the possibilities to apply them are particularly suitable for bulk commodities such as energy (coal, oil), minerals and grains if they are transported in large quantities. A similar trend also applies to container shipping with larger containerships involving lower unit costs. For the transportation of passengers, economies of scale are salient for public transit systems. They are however limited by the demand as the maximum sized transport unit that can be assigned on a route cannot exceed the available demand without impairing its profitability.

Transport activities are large consumers of energy, especially oil. About 60% of all global oil consumption is attributed to transport activities. Transport typically accounts for about 25% of all the energy consumption of an economy. The costs of several energy-intensive transport modes, such as maritime and air transport, are particularly susceptible to fluctuations in energy prices since energy accounts to close to half their operating costs.

e. Empty backhauls

Many transport interactions involve empty backhauls since it is uncommon to have a perfect match between an inbound and a return trip. Commuting patterns involve imbalanced flows and empty return trips. For international trade, imbalances between imports and exports have an impact on transport costs. This is especially the case for container transportation since trade imbalances imply the repositioning of empty containers that must be taken into account in the total transport costs. Consequently, if a trade balance is strongly negative (more imports than exports), transport costs for imports tend to be higher than for exports. Significant transport rate imbalances have emerged along major trade routes. The same condition applies at the national and local levels where freight flows are often unidirectional, implying empty backhaul movements.

f. Infrastructures and modes

The efficiency and capacity of transport modes and terminals have a direct impact on transport costs. Poor infrastructures imply higher transport costs, delays, and negative economic consequences. More developed transport systems tend to have lower transport costs since they are more reliable, connected and can handle more movements.

Different modes are characterized by different transport costs since each has its own capacity limitations and operational conditions. A core aspect concerns the suitability of modes according to the distance involved and the nature of what is being carried. When two or more modes are directly competing for the same market, the outcome often results in lower transport costs and the development of niches. Containerized transportation permitted a significant reduction in freight transport rates around the world by allowing relatively small transport units (containers) to be carried in massified loads.

g. Competition, regulation, and subsidies

These relate to the complex competitive and regulatory environment in which transportation takes place. Transport services taking place over highly competitive segments tend to be of lower cost than on segments with limited competition (oligopoly or monopoly). International competition has favored concentration in many segments of the transport industry, namely maritime and air modes. Regulations, such as tariffs, cabotage laws, labor, security, and safety impose additional transport costs, particularly in developing economies.

If the infrastructure is expensive to develop and maintain, this cost should be reflected in fares to cover the amortization of the asset. Publicly available roads are a form of cross-subsidy since they offer their users free infrastructure Taxes and tolls are commonly used to cross-subsidize public transit.

h. Surcharges, taxes and tolls

Surcharges refer to an array of fees, often set in an arbitrary fashion, to reflect temporary conditions that may impact on the costs assumed by the transporter. They also take place when fares are regulated, leaving the operator to find alternative sources of revenue. The most common are fuel surcharges, security fees, geopolitical risk premiums and additional baggage fees. The passenger transport industry, particularly airlines, has become dependent on a wide array of surcharges as a source of revenue for operators. Yield management is another form of surcharge where a transport service provider changes its rate according to fluctuations in the demand.

Transport activities are often taxed, such as vehicle sales taxes and registration fees. Fuel taxes are the most significant form of taxation levied by governments with revenues often used to cover maintenance and infrastructure investment costs. Tolls are also commonly levied on the usage of transportation assets, particularly at bottlenecks such as bridges and tunnels All these affect transport rates.

Self-Assessment Exercise

List the factors determining transport rates and explain any two of them

3.3 Rate Negotiation

The reality of global competition requires companies to find new ways of cutting operating costs and moving their products. Both factors are crucial elements of negotiating with logistics providers, whose main task is to track and transport people and goods. Both sides define their relationship through the logistics-services agreement. The agreement's value depends on how well both sides define their needs, the legal and operational framework that governs their working relationship, as well as the level of negotiations carried out. The following are major considerations in negotiation.

Analysis of Transport Procedures

Transport procedures must be analysed before negotiating with any logistics provider. Issues to consider include the shipment volume, the distance both physical and time. Whether goods move by air, ocean or truck also makes a difference. For example, management may have to review if ocean shipments sail as container loads or break-bulk freight, which refers to goods packed in small, separable units. Answering those questions will help the shipper determine his needs and thus the basis for negotiation.

Define Expectations

Successful relationships depend on defined expectations. With so many functions and services being outsourced, it is vital that logistics bidders know exactly what the customer requires. The transport Agent must lay out his terms for dealing with customs brokerage, fleet management, freight payment or forwarding, transportation and warehouse management. Greater advanced planning during the bidding process pays off in a better contract.

Establish the Terms

Resolving confidentiality, intellectual property and liability rights are only some of the aspects of negotiating a logistics-services agreement, However, defining the operational relationship between both parties is equally important, which is the logistics manager's task. The operating side's definition must include a description of both parties' responsibilities to each other, along with the ordering process, payment and pricing terms, specific scope of services, and warranties or performance levels.

Manage the Relationship

Once a logistics-services agreement is signed, an effective governance process must be established. Governance refers to the methods and processes of managing the relationship to ensure that the provider performs at an acceptable level. The logistics manager is responsible for incorporating key performance measures for the provider into the agreement. These measures

can include a description of services, monthly operational reviews, and quarterly executive-business reviews.

Scope of Services

Describing the scope of services is among the most critical elements of any contract and a major area of negotiation. Failing to fully describe these services may allow the logistics provider to meet its contract responsibilities without satisfying the client's expectations. Other complications arise from differing interpretations of how material is put away, received, stocked and tracked during the process. For those reasons, it is essential to create a comprehensive service description that makes up for any shortcomings noted in the bid process.

Self-Assessment Exercise.

What do you understand by rate negotiation in transport?

4.0 Conclusion

Defining the rates or prices customers pay for transport services is critical in the transportation process. Its determination which is based on the interplay of a multiplicity of factors is a key role of transport and logistics managers Negotiation which is the process of arriving at acceptable agreements is a major activity in the rate determination process Thus, rate definition and negotiation procedures underlie not only the basis but also the success of transport and logistics business

5.0 Summary

In this study unit we have explained the concept of transport rates, its determination and negotiation procedures. The importance and interplay of various factors which determine transport rates are identified and discussed while negotiation which is a major activity in the determination process is also x-rayed and examined

6.0 Tutor-Marked Assignment

a) Explain the concept of transport rates and describe its components

b) Identify and describe the major det6ermining factors of transport rates

c) List and explain the main factors which must be considered in negotiating transport rates.

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MODULE FIVE

TRANSPORTATION OF HAZARDOUS MATERIALS

Unit 1: Hazardous Materials and their Classification

Unit 2: Consignment Procedure and Carriage of Hazardous Materials

UNIT 1: HAZARDOUS MATERIALS AND THEIR CLASSIFICATION

CONTENTS

1.0 Introduction

This unit provides an overview of the transportation of hazardous materials, the universal classification of hazardous materials and describes the various classes in terms of their main constituents and sub-divisions Examples of the materials are provided.

2.0 Objectives

At the end of this unit, students should be able to

- Understand what constitutes hazardous materials in transportation
- Know how hazardous materials are classified
- Describe the various classes and their sub-divisions

3.0 Main Contents

3.1 Overview of transportation of hazardous materials

The transport of dangerous goods covers the activities involved with the movement of dangerous goods from a consignor to a consignee. Dangerous goods include those chemicals and articles considered to have sufficiently hazardous properties that need to be subjected to restrictions and controls during transportation (or "carriage") by the mode of transport in question. Indeed, to transport dangerous goods by air, sea, road, rail or inland waterway, they must be packed and transported according to international regulations.

The UN Model Regulations put the rules on the different transportation methods into a classification system. This system assigns each dangerous substance or article a class that defines the type of danger the substance presents. The packing group (PG) then further classifies the level of danger according to PG I, PG II or PG III. Together, class and PG dictate how you must package, label and carry dangerous goods, including inner and outer packaging, the suitability of packaging materials, and the marks and label they must bear.

In similar fashion, hazardous chemicals must be stored and transported carefully according to specific regulatory requirements covered by transport legislation, and work health and safety (WHS) legislation This is because many chemicals are both hazardous chemicals under the WHS regulations and dangerous goods under the transport regulations, particularly those with acute physical hazards. For instance, the Australian dangerous goods code provides the necessary information on transporting hazardous chemicals and dangerous goods for all states and territories in Australia (except the Northern Territory).

Other regulations define the training and qualifications that dangerous goods drivers and safety advisors must hold, and when you must use one. Indeed, employees and employers must understand these regulatory requirements, as they are both responsible for storing and transporting chemicals safely. These guides bring together the various requirements for moving dangerous goods.

Self – Assessment Exercise

Define hazardous materials

3.2 Classification of dangerous goods

The carriage of dangerous goods by road, rail, inland waterway, sea and air is regulated internationally by European agreements, directives and regulations, and parallel legislation in the UK. If you're involved in the processing, packing or transporting of dangerous goods, you will first need to classify them correctly so that all organisations in the supply chain, including the emergency authorities, know and understand exactly what the hazard is.

Goods dangerous for transport are grouped into nine main United Nations (UN) Hazard Classes according to their properties, as shown in *Table 1*.

Table 1: Dangerous Goods Classification

Class 1 Explosives

Class 2 Gases

Class 3 Flammable liquids and liquid desensitised explosives

Class 4 Other flammables

Class 5 Oxidisers

Class 6 Toxics

Class 7 Radioactive materials

Class 8 Corrosives

Class 9 Miscellaneous

No matter how cargo is being transported, it must comply with The United Nations (UN) **nine hazard classes** for dangerous goods.

Explosive.png

Explosive materials (Class 1)

Class 1 items are not usually shipped by air and are divided into 6 subdivisions. They cover substances that have an explosion hazard, explosions that may project fragments and firebrands, and fire hazards.

FlammableGas.png

Gases (Class 2)

This class is divided into three subdivisions that include flammable gases, toxic gases and gases that are neither flammable or toxic such as helium and oxygen.

FlammableLiquid.png

Flammable Liquids (Class 3)

Class 3 comprises liquids or mixtures of liquids that will give off flammable vapours at specific temperatures and have a flash point of not more than 60.5 degrees Celsius / 140.9 degrees Fahrenheit.

DangerousWhenWet.png

Flammable Solids (Class 4)

Flammable solids are divided into 3 subdivisions that include highly flammable solids, solids that are likely to spontaneously and substances that, if they come into contact with water, emit flammable gases.

Oxidizer.png

Oxidising Substances and Organic Pesticides (Class 5)

This class is divided into two subdivisions and covers agents that react with oxygen and organic pesticides.

Toxic.png

Toxic and Infections Substances (Class 6)

Class 6 is divided into two subdivisions and includes substances such as cyanide, arsenic, vaccines and pathology specimens.

Radioactive.png

Radioactive Materials (Class 7)

Class 7 covers materials that have a specific activity greater than 70 kilobecquerels per kilogram.

Corrosive.png

Corrosive Materials (Class 8)

Class 8 does not have any subdivisions and comprises corrosive liquids and solids that will cause severe damage when in contact with living tissue; or, in the case of leakage, will materially damage or even destroy other goods or the aircraft itself. Corrosive items include battery acids, sulfuric acid and mercury.

Miscellaneous.png

Miscellaneous (Class 9)

Class 9 is for miscellaneous dangerous items. The class does not have any subdivisions but comprises any substance that may pose a danger during air transport that isn't covered by the other classes. This includes items with anesthetic properties, solid dry ice, asbestos, life rafts and chain saws

Self – Assessment Exercise

List and describe the different classes of hazardous materials

3.3 Classes of Hazardous Materials and their Divisions

Some of the Classes are broken into divisions. These are shown by the Class number followed by a point, followed by the Division, eg 1.4. Some simply use Class to also apply to Division, eg ADR. **Note** that a compatibility group letter coding is also applied and normally shown after the reference, eg 1.4S.

- Class 1 is divided into size divisions 1.1 to 1.6 for different types of explosives.
- Class 2 is divided into:
    - 2.1 Flammable gases
    - 2.2 Non toxic non-flammable gases
    - 2.3 Toxic gases (including corrosive gases).
- Class 4 is divided into:
    - 4.1 Flammable solids, self reactive substances and solid desensitised explosives
    - 4.2 Pyrophoric and self heating substances
    - 4.3 Substances which, in contact with water, emit flammable gases.
- Class 5 is divided into:
    - 5.1 Oxidising
    - 5.2 Organic peroxides.
- Class 6 is divided into:
    - 6.1 Toxic substances
    - 6.2 Infections substances.

These Classes and divisions have characteristic danger labels (aka warning diamonds) as shown in Figure 1 below.

Some classes and divisions split dangerous goods into one of three packing groups (PG) shown as I, II, or III according to the level of danger, with PG I assigned to those of greatest danger for that Class, PG II of lesser danger and PG III of minor danger.

The nine UN classes and their divisions are listed below.

Class 1: Explosives — Substances that, by chemical reaction, are capable of generating gases at such a temperature and pressure and at such speed that they cause damage. The class also includes pyrotechnic substances and articles.

Substances that, by chemical reaction, are capable of generating gases at such a temperature and pressure and at such speed that they cause damage. The class also includes pyrotechnic substances and articles.

Class 2: Gases — Divided into three divisions:

- 2.1 Flammable gases
- 2.2 Non-flammable, non-toxic gases

- 2.3 Toxic gases.

Classification is largely based on substances' physical characteristics, though toxicity testing may be required for Division 2.3 goods.

Class 3: Flammable Liquids and Liquid Desensitised Explosives — Classification is generally determined by the flashpoint of the material, i.e the lowest temperature at which just sufficient vapour is given off to be ignitable when a flame is introduced into the vapour.

The UN classifies goods as flammable liquids when the flashpoint is below 60°C (by closed cup flashpoint test), but also makes provision that above 35°C the goods must also support combustion (i.e be able to catch fire and continue to burn).

Also included in Class 3 are liquid goods with flashpoints >60°C, where those goods are offered for carriage at a temperature exceeding their flashpoint.

ADR/RID follows the UN recommendations except for diesel, gas oil and light heating oil, which are still considered as Class 3 even if their flashpoint exceeds 60°C (but does not exceed 100°C).

The PG is allocated on the basis of flashpoint and boiling point — PG I if it boils below 35°C, PG II if it boils at 35°C or above and the flashpoint is below 23°C, and PG III if it boils above 35°C and the flashpoint is 23°C to 60°C, or in the case of some viscous materials meeting additional criteria.

Class 4: Other Flammables

Division 4.1: Flammable Solids — These include solids which, under transport conditions, are likely to be readily combustible or to contribute to fire when subjected to friction. It also includes self-reactive and related substances that are liable to undergo strongly exothermic reactions, and solid-desensitised explosives that may explode if not properly "diluted".

Test methods involve either a fire train test or, in the case of those solids likely to cause fire through friction, by analogy with substances classified by the UN. For self-reactive substances, a series of tests and a complicated flow chart process is used to evaluate the substance.

Division 4.2: Substances Liable to Spontaneous Combustion — These are substances which under normal transport conditions are liable to spontaneous heating, or to heating in contact with air, and then are liable to catch fire.

Tests for pyrophoric substances consist of exposing a controlled amount to the air and observing the results. The speed at which combustion occurs determines the substance as being of Division 4.2 and the applicable PG. Tests for self-heating substances involve making a cube of the substance of prescribed sizes, keeping it in a constant temperature environment, and seeing if the temperature in the sample rises to above 200°C. PG I is assigned to pyrophoric substances, PG II to self-heating substances that exceed 200°C when in a small cube, and PG III when exceeding 200°C in the large cube only.

Division 4.3: Substances which in Contact with Water Emit Flammable Gases — The test method for these substances involves adding water to a measured amount of the substance and checking the rate of issue of flammable gases given off. PG I is ascribed to any substance that gives off gas and immediately ignites or where the rate of evolution of gas exceeds a set amount (10 litres per kg of substance in any one minute). PG II or III are ascribed when the evolution rates exceed pre-set limit values.

Liquid-desensitised explosives (whether flammable or not) and liquids with a flashpoint exceeding 60ºC (but which are carried at a temperature exceeding their flashpoint) are also assigned to Class 3.

Class 5: Oxidising and Organic Peroxide Substances

Division 5.1: Oxidising — These are substances which, while not necessarily combustible, can assist the combustion of other materials by generating oxygen.

Test methods involve mixing the substance with softwood sawdust and observing the rate of burning when ignited.

The classification and PG are obtained by comparing the rate of burning of the substance with sawdust against the rate of burning of the sawdust with certain reference chemicals.

Division 5.2: Organic Peroxides — These are substances that are liable to exothermic decomposition, which can be initiated by heat, impurities, friction or impact.

They are recognised by their chemical property, in that they contain two oxygen molecules in the bivalent –O–O– structure.

PGs are not allocated, but organic peroxides are classified into one of seven types (A–G) (items of Group G are not considered dangerous for transport).

Class 6: Toxic and Infectious Substances

Division 6.1: Toxic — These substances are liable to cause death or serious harm to health.

Classification should be made on the basis of known human health effects that have been proven by experience, but in the absence of human experience, animal tests should be considered, using exposure through the three traditional routes (eg oral, dermal and inhalation) in order to determine the LD_{50}, which is the calculated dose necessary to kill half the population of the test animals.

The classification and PG assignment is based on the results of the tests.

Division 6.2: Infectious Substances — These substances contain viable micro-organisms that are known or reasonably believed to cause disease in humans or animals.

Tests and allocation of PGs are not applicable to this division.

Class 7: Radioactive Materials

Radioactive materials are those whose activity concentration and total activity in the consignment exceed values specified for each radionuclide, and consequently are deemed to pose a risk to humans. PGs are not used, but there is a special system of sub-classification of radioactive substances laid down by the International Atomic Energy Agency (IAEA) in its regulations covering the transport of radioactive materials

Class 8: Corrosive Substances

These are substances that cause severe damage by chemical action when in contact with living tissue, or if leaked in transport will materially damage or destroy other freight or the means of transport.

Tests for tissue effects, if necessary, to determine the classification and PG involve leaving the substance on the skin of a test animal for set periods of time (three minutes, one hour and four hours) and then observing whether necrosis (death of one or more cells) has occurred.

If there are no observable effects on animal tissues the substance should still be considered for its effects on aluminium or steel to see if there is any corrosion exceeding 6.25mm a year at a temperature of 55°C. If so, the substance is ascribed to PG III.

The classification system for corrosives will change in ADR 2019 to bring it into alignment with the Globally Harmonised System (GHS) classification for supply.

Class 9: Miscellaneous Dangerous Substances

These are substances and articles that present a danger during transport but which are not covered by the other classes.

This class also covers those chemicals not assigned any other transport classification, but which are considered to be dangerous goods because of their environmental hazards.

Self – Assessment Exercise

Provide a comprehensive classification of hazardous materials and their divisions

4.0 Conclusion

The transportation of hazardous materials has for many years gripped the attention of policy makers and service providers alike in all parts of the world The international standards provided by the United Nations have been adopted by all nations and compliance is being enforced across nations The standards have classified dangerous goods into nine each with its sub-divisions for the purpose of packing and labelling These efforts have defined the transportation of such goods and thus reduced the potential hazards that could arise from their movement

5.0 Summary

In this study unit we have explained what hazardous materials are and why they should be transported with utmost care and caution The UN classification of hazardous materials is provided while detailed description of their sub-divisions and characteristics are provided These are to guide the packing, labelling and transportation of such materials

6.0 Tutor-Marked Assignment

a) Define hazardous materials and explain why they are labelled so

b) Identify and describe the major classes of hazardous materials

c) Describe the sub-divisions of each class of hazardous materials.

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UNIT 2: CONSIGNMENT PROCEDURE AND CARRIAGE OF HAZARDOUS GOODS

CONTENTS

1.0 Introduction

This unit describes the consignment procedures and modal regulations for transporting hazardous materials, the basic requirements for transporting such goods, and the authorities responsible for enforcing the regulations. The qualifications and training requirements of Dangerous Goods Safety Advisors are also specified and described

2.0 Objectives

At the end of this unit, students should be able to

- Explain the consignment procedures and list the various modal regulations for transporting hazardous materials
- Know the requirements for transporting hazardous materials
- List the authorizes responsible for enforcing regulations and describe how radiation is screened at sea and air ports

3.0 Main Contents

3.1 Consignment Procedures and Regulations

Undertakings preparing and offering dangerous goods for transport (consignors) must ensure that the goods are not prohibited from being transported and are properly classified, packed, marked and labelled and that sufficient information is provided to agents, forwarders, carriers, etc to enable them to fulfil their duties under the transport of dangerous goods regulations.

Manufacturers, suppliers and consignors should consider the entire supply chain when preparing goods for distribution. For example, goods packed to meet the packaging requirements of sea transport may not be acceptable for air transport. Goods marked and labelled for road transport may not be acceptable for carriage by sea.

While national and international transport regulations are based on the UN Orange Book recommendations, each mode of transport will necessarily have its own additional requirements related to that mode. Thus, the relevant regulations and modal agreements and codes must always be consulted. However, there are a number of key common basic provisions and principles that apply across all or most of the modes of national and international transport.

3.1.1 Transport category (TC)

The Transport Category (TC) is a hazard- based system used in road, rail and inland waterway transport to indicate the degree of danger of any substance or article:

- TC0: extremely dangerous
- TC1: very dangerous (often these are Packing Group I)
- TC2: medium danger (often these are Packing Group II)
- TC3: low danger (often these are Packing Group III)
- TC4: very low danger.

3.1.2 Regulations for transporting dangerous goods by different modes of transport

With regard to International regulations governing the carriage of dangerous goods by road, rail, inland waterway, sea and air, the consignor - the person or business shipping the goods - is responsible for classifying, marking and packaging the dangerous goods. The following are the regulations guiding the various modes of transport.

a. International carriage of dangerous goods by road

In Europe, regulation is via the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR). It sets out the requirements for the classification, packaging, labelling and certification of dangerous goods. It also includes specific vehicle and tank requirements and other operational requirements. The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 (as amended) apply in Great Britain - England, Wales and Scotland

b. Carriage by rail

The carriage of dangerous goods by rail is governed by Appendix C of the Convention Covering International Carriage by Rail - International Carriage of Dangerous Goods by Rail. The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 apply in Great Britain.

c. Transport by inland waterway

In the European Union, the International Carriage of Dangerous Goods by Inland Navigation (ADN) came into force on 28 February 2009. ADN only applies in the UK in relation to the training and examination system for safety advisers and the connected issuing and renewal of vocational training certificates. It does not apply to the carriage of dangerous goods by inland waterways in the UK given that there is no physical connection between them and European inland waterways.

d. Transport by sea

The International Maritime Dangerous Goods (IMDG) code provides guidance on transporting dangerous goods by sea. Find information about the IMDG code on the International Maritime Organization (IMO) website.

The IMDG code is used by operators transporting dangerous goods on journeys involving a sea crossing which includes ferry services. In the UK, the Merchant Shipping (Dangerous Goods and Marine Pollutant) Regulations 1997 and the Dangerous Substances in Harbour Areas Regulations 1987 also apply.

e. Transport by air

The International Civil Aviation Organization's (ICAO) Technical Instructions are an internationally agreed set of provisions governing the requirements for transporting dangerous goods by air. The International Air Transport Association (IATA) publishes the Dangerous Goods Regulations in accordance with the ICAO technical instructions. Dangerous goods training is a mandatory requirement for anyone involved in the transport of dangerous goods by air.

Some airlines and countries have their own derogations, known as State and Operator Variations. Some of these are contained in the IATA Dangerous Goods Regulations for more information.

Self-Assessment Exercise

Explain consignment procedures for transporting hazardous materials and list the regulations guiding each mode of transport

3.2. Requirements for Transporting Dangerous Goods

a. Documentation when moving dangerous goods

When dangerous goods are transported, the consignment must be accompanied by a transport document declaring the description and nature of the goods. Documentation must be in

accordance with the specifications set by the dangerous goods regulations applicable to the chosen mode of transport.

The transport document must be completed by the consignor (the person or firm from whom the goods have been received for transport). Legislation contains an example of a multimodal dangerous goods transport document and describes occasions when the document may not be required, for example for limited quantities.

To move air cargo that is classified as dangerous, a dedicated air transport document such as the IATA Shipper's Declaration of Dangerous Goods must be used.

b. Marking and labelling of dangerous goods - suppliers' responsibilities

As well as the requirements specific to their transportation, suppliers of dangerous goods are required by law to label their hazardous products and packaged chemicals with hazard symbols, warnings and safety advice. A range of internationally recognised symbols has been developed so that people handling the goods know the nature of the hazard they present.

Manufacturers must also include instructions for use, either on the label or on a leaflet supplied with the product. Suppliers must provide material safety data sheets for dangerous products used in the workplace.

For chemicals, the general principles of classification and labelling for supply are explained by the Chemicals (Hazard Information and Packaging for Supply) Regulations 2009 (the CHIP 4 rules). The European Regulation on Classification, Labelling and Packaging of Substances and Mixtures (CLP Regulation) will over a 5years period commencing on 1 December 2010 gradually replace CHIP 4.

Safety labelling requirements may vary between third world countries so you are advised to check requirements in destination countries before you move your goods. For example, the USA has different requirements from most European countries, so although dangerous goods from America can be moved with their labelling, it is likely that you will have to relabel them before you can supply them in the European Union.

c. Packaging of dangerous goods for transport

If you trade in dangerous goods, you must comply with packaging requirements contained in the relevant legislation in order to transport goods safely. Packaging (other than for limited and excepted quantities) has to be designed and constructed to UN specification standards and must pass practical transport related tests such as being dropped, held in a stack and subjected to pressure demands. It must also meet the needs of the substance it is to contain. Packaging must be certified by a national competent authority.

UN approved packaging is marked with the prefix 'UN' and followed by codes that are listed in the relevant regulations relating to the national and international carriage of dangerous goods by road, rail, air and sea.

The Vehicle Certification Agency (VCA) Dangerous Goods Office has responsibility for the certification of dangerous goods packaging within the UK. Packaging must also bear the correct labels and markings appropriate for the substance and package.

d. Checklist for transporting hazardous chemicals

When transporting chemicals:

- avoid transporting with food, water or other reactive chemicals
- follow the separation and segregation rules for transporting mixed classes of hazardous chemicals (those classified as dangerous goods)
- secure hazardous chemicals on the vehicle so they can't move or fall
- keep a record of the chemicals you are carrying
- separate foodstuffs from chemicals
- make sure you have the required signs and equipment for the vehicle
- make sure the driver of the vehicle has the correct licence and is trained in emergency procedures.

Self-Assessment Exercise

Describe the requirements for transporting hazardous materials

3.3 Enforcement of dangerous goods transportation regulations

3.3.1 Modal Authorities

Different authorities are responsible for enforcing the regulations for transporting by road, air and sea.

Road

For international road movements, under the ADR European Agreement concerning the International Carriage of Dangerous Goods by Road, each national authority en-route enforces its own requirements.

The HSE, the Office for Nuclear Regulation and the Department for Transport, in conjunction with the police and the Driver and Vehicle Standards Agency (DVSA), are the enforcement authorities in respect of compliance with the Carriage of Dangerous Goods and use of Transportable Pressure Equipment Regulations 2009 (as amended) covering road transport in Great Britain.

Air

The Civil Aviation Authority (CAA) is the agency responsible for matters related to compliance for goods offered to airlines for carriage by air. The CAA currently receives around 600 dangerous goods incident reports a year.

Sea

The Maritime and Coastguard Agency is the agency responsible for matters related to compliance for goods moving by sea.

Rail

The HSE, the Office of Rail Regulation, the Office for Nuclear Regulation and the Department for Transport are the enforcement authorities in respect of compliance with the Carriage of Dangerous Goods and use of Transportable Pressure Equipment Regulations 2009 (as amended) covering rail transport in Great Britain.

3.3.2 Radiation screening at Seaports and Airports

Programme Cyclamen forms a key part of the government's counter-terrorism strategy. It involves the screening of incoming freight, vehicles, passengers and pedestrians to detect and deter the illicit importation of radioactive and nuclear material by terrorists or criminals.

The programme is jointly managed by the Home Office and UK Borders Agency (UKBA). The Home Office has the lead responsibility for implementing the programme at ports and airports whilst UKBA is responsible for operating the equipment and for the initial detection of any imported radiological or nuclear material. Countries including Finland, Russia and the USA use similar equipment and procedures.

Fixed radiation detection equipment has been installed at ports and airports. There is also mobile capability supporting the fixed portals ensuring that air, sea and Channel Tunnel traffic entering the UK is subject to screening.

The equipment is entirely passive and is able to detect radiation emitted from the vehicle or object being examined. The equipment doesn't emit radiation and there is no effect on any object or person passing through the detection system. If an illicit source is suspected or found, specialist authorities will ensure that these incidents are dealt with quickly and safely, minimising the risk and inconvenience to the public.

Some radioactive materials may be carried legally by approved operators, whilst some foodstuffs, ceramics, and other items naturally emit radiation. In addition, a number of medical treatments emit radiation. The screening equipment can identify a wide variety of radioactive sources and action is taken to ensure that legitimate importations can pass through quickly.

Generally speaking, dangerous items are usually moved by surface transport rather than by air. However, regulations are in place to allow safe air transport if required, which enables dangerous goods to be carried on commercial airlines, private charters and cargo flights. In order to carry dangerous goods safely, certain principles must be adopted that prevent the aircraft and its occupants from being put at risk. Developing countries including Nigeria rely on these regulations which they endeavor to comply with

3.3.3 Dangerous Goods Safety Advisers qualifications and training

Businesses that handle, process or transport dangerous goods on a regular basis must appoint a Dangerous Goods Safety Adviser (DGSA) in order to comply with the Health and Safety at Work Act 1974.

The DGSA's duties and responsibilities include:

- monitoring compliance with rules governing transport of dangerous goods
- advising their business on the transport of dangerous goods
- preparing an annual report to management on the business' activities in the transport of dangerous goods
- monitoring procedures and safety measures
- investigating and compiling reports on any accidents or emergencies
- advising on the potential security aspects of transport

These regulations can apply to anyone who allows dangerous goods to be carried, not just the transport operator. This could include cargo consignors, freight forwarders, warehouse workers and manufacturers producing goods that will be collected from their factory.

With regard to training, DGSAs must:

- obtain a vocational training certificate after receiving appropriate training
- pass a written examination

The Department for Transport approves the mandatory DGSA exams. It has appointed the Scottish Qualification Authority (SQA) as its agent. SQA sets, marks and organises the exams, and issues the vocational training certificates for the whole of the UK, and the certificates are recognised in all European Union member states Training courses for DGSAs are run by independent providers and by the trade associations for each mode of transport. Course lengths vary from 2 to 5 days, depending on the modes of transport covered.

Self-Assessment Exercise

List the modal authorities responsible for enforcing the regulations for transporting hazardous materials and explain how radiation screening is carried out at sea and air ports

4.0 Conclusion

The transportation of hazardous materials requires good knowledge of the consignment procedures and the regulations guiding them at the modal level Such knowledge should also include the basic requirements for their transportation and the authorities responsible for enforcing their regulations The need to appoint competent Dangerous Goods Safety Advisors by Logistics Service Providers is being encouraged across the world as a way of reducing the hazards arising from the movement of such goods

5.0 Summary

In this study unit we have described the consignment procedures and modal regulations guiding the transportation of hazardous materials. The requirements for their transportation and the authorities for enforcing the regulations are comprehensively described The qualifications and training required for the appointment of a Dangerous Goods Safety Advisor are specified and detailed in the Unit

6.0 Tutor-Marked Assignment

a) Explain consignment procedures for hazardous materials and the regulations guiding their transportation

b) Identify and describe the major requirements for transporting dangerous goods

c) Describe the duties of Dangerous Goods Safety Advisors.

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MODULE SIX

ACHIEVING TRANSPORT QUALITY

UNIT 1: SERVICE QUALITY IN TRANSPORT

CONTENTS

1.0 Introduction

This unit provides an overview of the trends in service quality in transport and the stages involved in the analysis of transport service quality. The identification and explanation of the key measures of transport service quality are comprehensively provided.

2.0 Objectives

At the end of this unit, students should be able to

- Explain the trends in the development of service quality in transport
- Describe the stages involved in the analysis of service quality in transport
- Know how to measure service quality in transport

3.0 Main Contents

3.1 Overview of Service Quality in Transport

The 1980s saw many service industries placing increased emphasis on managing quality. Traditional ideas of quality, which had evolved from manufacturing industries and had been based on the conformance to standards defined by operations management, began to be replaced by customer-focused notions. This required close consideration of what the customers wanted and how their needs could be met.

Different dimensions of service were defined and customer satisfaction, considered to be the gap between perceived and expected service was assessed. Quality management began to be viewed as an overall process which involved everybody from top management down to junior staff rather than just to do with concentrating on the employee - customer interaction. New approaches such as total quality management and continuous improvement programmes began to be applied by an increasing number of service industries (Lockwood and Wright, 1999).

The transport industry was not immune to this 'quality revolution' which was taking place although it was rather late in adopting some of the principles. This is because the main problems encountered in the movement of persons and goods are reliability, flexibility, punctuality, information management, and the average traffic speed. All these factors affect the prospective customers in the determination of the mode of transportation they use. Moreover, structural changes such as commercialization, privatization, and globalization, together with increased competition between modes, encouraged the management of transport modes to place more emphasis on quality.

Thus, in recent years, the attention of most public transport companies (PTCs) has shifted from the supply side, which focuses on service provision, to the demand side, in which one of the goals is the improvement of service quality. This change has been primarily motivated by governments seeking to privatize services in order to reduce public subsidies. Because service quality is a key factor for all stakeholders in the transit industry, the new interest in this field is stimulating further research into an old concept — the user's perspective — in order to increase the use of public transport and, in the long term, reduce the use of private transportation. The implementation of worldwide public transportation quality management programs is also a

response to the introduction of tendering processes and performance-based contracts in the early 1990s.

Quality of transport services can therefore be perceived as consistently doing the right thing right. To buttress this, quality of service deals with efficiency (doing the right thing at the right time, in a right condition, through the right means, and for the right purpose). It can be seen as an evaluation of how efficiently a service delivered measures up to the expectations of consumers. Hence, for the purpose of this lecture, service quality can be referred to as an expectation of customers about the service to be offered while customers' satisfaction is referred to as perception of customers about services offered. It was observed by scholars that if customers' perceptions exceed their expectations, then there is service quality delivery and vice versa. Also, passengers compare the perceived service with the expected service.

Self-Assessment Exercise

Describe the trends in the development of transport service quality

3.2. Stages in Transport Service Quality

Quality of transit services is not a new topic. Its major stages are the following;

a. Characterization

Service quality in public transportation has been defined in several ways. Generally speaking, service quality can be defined as the capability of transit operators to provide a service based on current and potential user desires. The efficient monitoring of quality involves the assessment of a service according to specific aspects, parameters, and possible sub-parameters. The definition of these service aspects and parameters is called “characterization”.

b. Measurement

The measurement of the quality of transit service is the crucial step in the quality-monitoring process, because using poor measures is worse than making no measures. It is a drain on valuable resources, which could have been allocated elsewhere.

In evaluating transit quality, an exhaustive measurement process accounts for service desires, targets, deliveries, and perceptions, which can be viewed as quality components linked in a loop. This loop was introduced to include the following four dimensions of service quality:

(i) desired quality, based on customer expectations;

(ii) targeted quality set by Public Transit Companies (PTCs);

(iii) delivered quality, that is, the quality of service provided by PTCs; and

(iv) perceived quality, that is, customers' subjective perception of service quality.

These dimensions should be considered jointly on customer needs rather than on PTC requirements.

c. Management

The management of the quality of transit service represents the last step in the entire quality-monitoring process and provides PTCs with indications of critical events and information about where and how to address quality issues. Accordingly, the management can be carried out by linking quality components through the following four links, each of which is associated with a difference (or gap).

i. the difference between targeted and desired quality and measured service providers' ability to meet the needs of their users.
ii. the difference between delivered and targeted quality and measured service providers' ability to meet predefined targets.
iii. the difference between perceived and delivered quality and measured extent to which users' perception is aligned with objective measures of quality.
iv. the difference between perceived and desired quality and captured users' satisfaction with service quality.

Three major activities must be undertaken in this phase: determining critical factors, prioritizing interventions, and making corrective actions to improve the service (or the route).

Self-Assessment Exercise

Describe the stages in transport service quality

3.3 Key Quality Measures of Transport

Quality is the most synthetic, essential, and comprehensive attribute for the performance of a transport system. There are various descriptions of the quality derived from service quality which are based on customers' demand for satisfaction. These descriptions emphasize aspects outside the transport system framework especially the connections of the transport system with the natural and socio-economic environment.

Over the years, measuring transport service quality has become the subject of increased scrutiny. Consequently, quality measurement is generally structured around these three phases of action:

1. Logistics prior to departure
2. Journey Management
3. Logistics (mode-terminal interface)

Viewed within the context of these phases and with increased use of various modes of transport, it is especially important to identify and evaluate key quality indicators of transport to include the following;

a. Service infrastructure

Transport service as opposed to goods, which are firstly produced, stocked, sold and then consumed, a transport service is firstly sold, and then produced and consumed at the same time, and the same place. This implies that the quality of service cannot be separated from the quality of its "servers" – infrastructures, equipment, and transport means including the passenger or the customer's consignment (freight transport case). For instance, travel time changes substantially in the case of a road trip when traffic flow tends to reach the capacity of that infrastructure. Similarly, the safety and security of the trip varies with the number of users of the respective infrastructure. The increase in number of passengers holding unreserved seats over a certain limit on a train will affect the comfort of the trip.

b Service availability.

The attributes of service availability are represented by characteristics of transport routes especially in terms of path and coverage, such as for instance, number of bus stops, distance

between bus stops, location of the bus stops, and characteristics of the service, like service frequency, span of service, travel time, and need for transfers among others. Thus, service availability is a major determinant of transport quality

c. Service reliability.

Service reliability is one of the most investigated transit service aspects and it is considered as a very important aspect for the transit users. It is regarded as the ability of the transit system to adhere to schedule or maintain regular headways and a consistent travel time.

d. Comfort.

Comfort during the journey is important for transit users, both the physical comfort regarding vehicles and comfort regarding ambient conditions on board or at stops. Comfort on board means having soft and clean seats, comfortable temperature, not many people on board, smoothness of the bus ride, low levels of noise and vibrations, not nasty odours. These factors are differently evaluated across different groups of users. For instance, it is found that habitual public transport users consider the new vehicles with air-conditioning and lower floor as "very good and very comfortable", but the overcrowding on board at peak hours is considered a problem. On the other hand, car users and occasional public transport users usually see buses as uncomfortable, overcrowded, smelly and airless. It is argued that vehicle comfort is less important to the traveler's decision process than other service aspects. Comfort at bus stops can be considered as a function of the passenger amenities provided at the stops.

e. Cleanliness.

The indicators regarding cleanliness refer to the physical condition of vehicles and facilities, and specifically the cleanliness of the bus interior and exterior, having buses and shelters clean of graffiti, cleanliness of seating and windows, and so on. Clean buses tend to promote a good public image and help to attract and maintain ridership

f. Safety and security.

The aspect linked to safety indicates the degree of safety from crime or accidents and the feeling of security resulting from psychological factors. This aspect refers not only to safety from crimes

while riding or at bus stops and from accidents, but also to safety related to the behaviour of other persons and to the bus operation. Generally, the term “safety” is used to indicate the possibility of being involved in a road accident, while the term “security” refers to the possibility of becoming the victim of a crime.

g. Fare.

The service aspect regarding fare includes characteristics of the monetary cost of the journey say by bus, like the cost of a one-way ride, the cost of a transfer, the availability of discounted fares (e.g. for students), the availability of volume discounts (e.g. for monthly passes), the cost of parking at bus stops. There is an extensive literature supporting the thesis that costs affect quality of service

h. Information.

Another service aspect affecting transit service quality is linked to the availability of information pertinent to the planning and execution of a journey. Passengers need to know how to use transit service, where the access is located, where to get off in the proximity of their destination, whether any transfers are required, and when transit services are scheduled to depart and arrive. Without this information, potential passengers will not be able to use transit service In recent years, many transit agencies have taken steps for increasing and improving transit service information

i. Customer care.

Customer care includes those elements needed to make easier and more pleasant the journey, like courtesy and knowledge of drivers, courtesy and helpfulness of ticket agents, personnel appearance, together with elements linked to the easiness of purchasing tickets or paying fare, presence and condition of the ticket issuing and validation machines, and effectiveness of the ticket selling network. Personnel appearance was evaluated by means of trained checkers who verified if personnel use the uniform, while an indicator aiming to access the sufficiency and effectiveness of the ticket selling network and the easiness to purchase tickets has been introduced.

j. Environmental impacts.

The service aspect regarding the impacts of the bus systems on the environment includes effects in terms of emissions, noise, visual pollution, vibration, dust and dirt, odour, waste, but also effect of vibrations on road and natural resources consumption in terms of energy or space. In the scientific literature, there is a considerable amount of models and procedures which allow the effects of the transport systems to be quantified, especially in terms of pollution and noise

Self-Assessment Exercise

Explain any five quality measures of transport service

4.0 Conclusion

The transport industry has since joined the 'quality revolution' which has been trending in the service business. This is because the main problems encountered in the movement of persons and goods are reliability, flexibility, punctuality, information management, and the average traffic speed which affect the prospective customers in the determination of the mode of transportation they use. Moreover, structural changes such as commercialization, privatization, and globalization, together with increased competition between modes, encouraged the management of transport modes to place more emphasis on quality.

Thus, in recent years, the attention of most public transport companies (PTCs) has shifted from the supply side, which focuses on service provision, to the demand side, in which one of the goals is the improvement of service quality. This change has been primarily motivated in order to increase the use of public as against private transportation. Knowledge of the stages in transport service quality and the key measures of service quality is required to improve service delivery and increase customer satisfaction

5.0 Summary

In this study unit we have provided an overview of the development trends in the quality of transport service, and detailed description of the stages in quality service Identification and explanation of the key measures of service quality in transport have also been detailed

6.0 Tutor-Marked Assignment

a) Provide a brief description of the developmental trends in transport service quality

b) Describe the main stages in the analysis of transport service quality

c) List and explain any five measures of service quality in transport.

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