Impact of Store Design and Materials Handling on Efficiency of Storehouse Operation in Nigeria Bottling Company

By

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Declaration

This project work is an authentic product of my own effort under the supervision of Mallam. Hassan Muhammad of the Department of Procurement and Supply Chain Management Kaduna Polytechnic. The project has never been submitted for any other type of award. All authors whose works were cited have been fully and duly acknowledge.

…… **……**

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Approval

This is to certify that this research work has been read and approved as meeting the requirements for the award of Higher National Diploma in the Department of Procurement and Supply Chain Management, Kaduna Polytechnic.

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Dedication

My thanks go to Almighty Allah for his infinite wisdom and mercies.

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Thanks be to Almighty Allah the excited in power the most compassionate and the most merciful. May his blessings showered upon our noble prophet (S.A.W and his entire progeny, Amen. I am grateful to Almighty Allah for giving me the privileges. Opportunity and assistance through this course successfully without problems.

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Abstract

The research work is an attempt to examine the impact of store design and materials handling on efficiency of store house operation with emphasis to Nigeria Bottling Company Kaduna. The purpose of this research work is to investigate store design and materials handling contributes to the development of an organization especially in Nigeria Bottling Company Kaduna as the case study. This research start with introduction of the subject matter, it's observed the statement of the problem, and then the research objectives were designed where both research questions and purpose of the study were developed in order to generate data for this exercise. Specific objectives are; to examine the factor in stores design, to identify the types of material handling equipment; and research questions among which be; what are the factors in stores design?, what are the types of material handling equipment? Opinions and research work of various scholars were reviewed in chapter two. Methodology of the research is survey which was used to collect data. The population of study is 100 out of which a sample size of 80 was drawn; within the material department, Procurement, and HRM Department using Krejcie and Morgan (1970) for decision rule. In order to have a dependable result from the research, the researcher makes use of simple mean and four point like of scale for accepting or rejecting any item above or below 2.5. Finally the study recommends that: proper coordination of store design and materials handling on efficiency of store house operation to Nigeria Bottling Company Kaduna.

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CHAPTER I: Introduction

1.1 Background of the Study

Handling and storing materials involves diverse operation such as hoisting tons of steel with crane, driving a truck loaded with concrete blocks carrying bags or materials manually, and stacking palletized or other materials such as drums, barrels, kegs, and lumber (Morrison, 2010).

According to Morrison, (2010), the efficient handling and storing of materials are vital to industry. In addition to raw materials, these operations provide continuous flow of parts and assemblies through the work place and ensure that materials are available and when needed. Unfortunately, the improper handling and storing of materials often result in costly injuries. This is where the importance of store design and materials handling and their impact on storehouse operation will be needed. Therefore, store design and materials handling should be well planned and co-ordinate in such a way that materials will easily flow and to facilitate their movement or storage.

Store design it is the setting up of the store which involves planning so that stocks are conveniently grouped and placed for the efficient operation. Materials handling is the movement and storage of material at the lowest possible cost through the use of proper method and equipment.

The store should also be designed in such a way that easy flow of items or material held will be ensured without hindrances cause by the choosing of gang ways or blocking to access. Store location system is also important for ensuring proper storage of materials or stores. This is to ensure that stores can be found when they are wanted with the minimum waste of time.

The location system to be adopted for certain store house must be decided. For example, it may be fixed or random. All goods location system therefore must not only locate them but also conjure up a mental picture of its precise position within the store house. In many organizations both public and private sector, much emphasis has been laid on procurement and less storage and its associated functions.

This research work is to review the storage procedure and its impact on stores efficiency and in doing this; the storage procedure adopted by Nigeria Bottling Company Kaduna shall be looked into to ascertain its effect on stores efficiency.

According to Carter, (1996) emphasis the importance of material in an organization to the extent that most of organizations are on material. This material when acquired are kept in the store and properly documented. The issuance of this material has to follow official issuing regulations.

Since stock of materials represent money, it is important to research into how this material are received, kept and issued with the aim of comparing

the practical administration with the theoretical knowledge acquired in school over the years. It is also hoped that suggestions and recommendations will be made regarding modern, scientific and better systems of storage and material handling.

1.2 Statement of Problems

Due to the varieties of materials in store house of and its increase, varieties lead to advancement in technology innovation and renovation. These brought about a careful and important role to be played by the store as appropriately as expected.

So many damages has been caused to materials in the store and which has led significant losses, the material handling, improper store design, location system, storage procedures etc. Many materials have lost their ability due to poor storage facilities, many other materials that should be stored or kept in cold place are exposed to light in different forms have deteriorated due to this poor storage procedure and lack of qualified or experienced and adequate staff to manage the store efficiency.

These problems do not just arise but as a result of poor storage procedures. Bad management and financial constraints which hinder the purchase of adequate handling equipment of qualified manpower.

1.3 Objective of the Study

The general objectives of the research are to examine the impact of store design and materials handling on efficiency of storehouse operation. The specific objectives are as follows

1. To examine the factors affecting stores design.
2. To identify the differences types of materials handling equipment.
3. To identify differences methods of designing store house.
4. To investigate the relationship between store design and materials handling.

1.4 Significance of the Study

The research exercise is conducted primary to meet the requirement for the award of Higher National Diploma in Procurement and Supply Chain Management of Kaduna polytechnic.

The aim is also to express my conceptual knowledge in the areas of storage and materials handling efficiency and to know how materials are being stored and handling in Nigeria Bottling Company Kaduna.

The researcher choose this topic order to highlight the inherent danger and consequence of adopting in proper storage and handling of material in Nigeria Bottling Company Kaduna from suppliers to the finished product with a view of providing solution or making the industry to take

necessary corrective realistic measure of storage and handling of material and employ services of skilful, honest, qualified and intelligent personnel to handle the store. If the solutions to be provided in the research work are applied to store and handling of material of the company Nigeria Bottling Company Kaduna it will show the impact in an organization efficiency and performance.

Another vital reason of the study is to contribute to the existing literature in the area of storage and handling of material in store house for future references. It will enable a lay man in the profession to have first hand information on how proper storage and handling of material is carried out in store. Also the students of the department and other department will find this project as an important and relevant source of literature review in the area of handling material. Further, the study will suggest ways that the company can handle material on store efficiency.

1.5 Scope of the Study

This research work will cover the areas in which storage and material handling is based on most especially the place under study which is 17A. Inuwa Abdulkabir Road, Kakuri Kaduna, Nigeria Bottling Company Kaduna) how its produce and the objective of material handling in their organization, store efficiency and the way the storage corporate with organization and the techniques used in store efficacy and how to store

material in order to achieve the desired goals and objectives of the organization.

1.6 Research Question

To carry out a good research work, the researcher will focus on the following research questions. The researcher is sure that these questions raised will measure the impact of store design and materials handling on storehouse operation.

1. What is the factors affecting stores design?
2. What are the differences types of materials handling equipment?
3. What are the store design methods applicable to your organization?
4. What are the relationship between store design and materials handling?

1.7 Historical Background of Nigeria Bottling Company Kaduna

Coca-Cola first came to Nigeria in 1953 when Nigerian bottling company set up its first plant in Lagos. It marked the beginning of an existing store of growth and development particularly during the past years.

Nigeria bottling company plc is today Nigeria's number one bottle of soft drink as claimed by the company and from the research finding, selling more than eight million bottle per day, a figure which is still growing with the expansion of the existing, twelve (12) plants and the opening of brand new plants in various part of the federation. The company

established three departments under Kaduna plant VIZ-(a) Minna, (b) Zaria, (c) Abuja. Coca-cola is the number one best seller in the coca-cola segment, Fanta is the orange segment and sprite most widely sold lemon drink in Nigeria

Nigeria Bottling Company is a subsidiary of Leventis which serve as its parent company. The company has two section namely:- soft drink section and agricultural section. The company now operates on a large scale agricultural programme with two farms situated at Zaria in Kaduna state and Agenobode in Edo state apart from production of soft drinks.

Product Line

The following are Nigeria bottling plc product line Coke, Fanta, Sprite, Ginger A/c, Fanta tonic, Fanta club Soda andKrest, bitter lemon

Location

Kaduna plant which is the area of study of the research is situated at Inuwa Abdul-kadir Road behind Kaduna Transport Authority (K.S.T.A) and a stone throw from Peugeot automobile Nigeria limited (PAN). The company is headed by a manager with department head taking control and the general supervisor of the company

Objectives of the Company

1 To produce soft drinks to the consuming population

2 To make profit

3 To re-profit with the purpose of expansion

4 To provide employment opportunities

5 To carry out the distribution activities of its production by supplying direct to customer.

6 To penetrate and dominate the Nigerian soft drink market

7 To assist in the economic development of the nation.

Management

In order to achieve the above objective, the company requires sound and effective organizational structure. The company's drawn-up structure, kaduna plant is headed by a plant manager to whom five (5) sectional head report. The sections that make up the plant are:-

Engineering, Accounting, Production, Sales, Clinic.

The day to day administration of the company's activities is under the leadership and supervision of the plant manager.

1.8 Definition of Terms

Deterioration: means the material that is damaged in their original quality or value.

Efficiency: Something that can be trusted or depended on.

Impact: having an effect upon something.

Inspection: Involves the examining of critical components that could indicate the need for repairs or replacement well in advance of any breakdown or failure.

Material: these are components, spare parts, raw materials that are kept, pending the time they are needed.

Materials handling: is that operational activity involving manual or automated movement of materials and other goods from one location to another within an organization on time, in good condition and efficiency.

Materials Handling Equipments: Hand Power equipment**,** Conveyors Industrial Trucks, Cranes and Hoists, Tractor transfer system, Forklift truck, Underground system

Materials Handling System: There are mainly three type materials handling systems. They manual, mechanized and automated system,

The nature of operation, size of the organization and the physical structure of the building usually determine the system to be adopted

Obsolesce: this is a situation where materials bought are getting useless but not yet useless.

Quality: Is the totality of features and characteristics of a product and services that bears on its ability to satisfy a given need.

Quantity: refers to the value or amount of a commodity required for a particular purpose or that can be more economically purchased at a particular time.

Racks: Are use for items which are too big or heavy for bin accommodation.

Stock: the quality of goods available or supplied into the store house.

Storage: the management of store houses and stock yard operation of handling of storage equipment, the safe custody and protection of stock.

Store design: is the planning and structuring of the location of an organization store/warehouse, its physical layout and building, other facilities outside and within the store that allows for effective and efficient storage of items and smooth operations.

Store house: A building where items of stores are kept, pending the time they are needed.

Stores: Is a place where item may be accumulated or routinely kept. It is set up in order to receive, inspect, hold and issue all assets of an organization while helping to maintain its original quality and balance flow of materials as well as achieving the very important roles of store function.

CHAPTER II: Literature Review

In this chapter the researcher attempts to review related literatures, articles and papers as presented by other scholars, writers, and business executive with the aim of comparing the different authority in order to have a broaden perspective of the topic under study which is "Impact of store design and material handling on efficiency of store house operation" and to make comparison with existing knowledge. And these will be discussed under the following subheadings; conceptual definition of store, material handling system, storehouse location system, storage facilities/equipment, store design layout.

2.1 Concept of Store

The store in most organization is an area in which all kinds of material needed for production, maintenance, packaging are stored, received and issued. A store is any space reserved and equipped for holding stock waiting for dispatch to customers for further processing for future use. Also, the word "store" can be used to refer to inventory (materials). Therefore, responsibility of physical situation and condition of materials and issuing as at when required belongs to the store person/store men and his department Dangana (2015).

Study guide for module one of Cambridge international college UK (2012) defined store as "an area set aside in which all the items and

materials required for production and/or for sale/distribution are received, where they are housed for safekeeping and from which they will be issued as required.

Jain and Aggarwal (2012) defined store as an unworked material.

Waters (2013) stated that "stores take care of materials held in stock until they are needed. Stores makes sure that materials have the right condition, treatment and packaging to keep them in good condition, and are available quickly when needed.

2.1.1 Types of Stores

Jain and Aggarwal (2012) suggested the following as a types of stores:

- **Raw Material:** As required from outside through this may be the finished product of another managements e.g. cement, casting, aluminum tubes etc.
- **Materials in Process:** Which have been changed for part assembled and now are in process.
- **Finished Products:** After passing final inspection.
- **Supplies Used:** In production process but which do not become part of the product e.g. grinding wheels, oils, paper forms etc.
- **Equipment:** Hand tools, gauges, machine parts which could be closed as expendable e.g. chuks, jigs, gears etc.

2.1.2 Types of Store Facilities

Organizations design their store to reflect their operation or situation. Generally, the store can be a store house stock yard, floating stores (Hassan 2009).

Store house (could storage) it is purpose-built structure that is designed to house all inventory belonging to an organization in one building. The building is restructured to be fully covered so that all items are kept inside.

Stock Yard: By virtue of their operations or the nature items they use or consume organizations may option for keeping items in secure open spaces. A stock yard is an open space within (sometime outside) the organization.

Floating Storage: An organization that uses the floating storage system uses any available space to store goods. These types of organizations don't have a particular area or building that is recognized or allocated for storage of goods. Wherever they can find specie, whether in a free space, an office, a room (occupied or un-occupied) they keep the items.

Point-of-Usage (Decentralization Store): This is simply a store house in a small way. As opposed to having a central store house, the organization may decide for small consist store in various areas, so that whenever there is a need for items users will move to a close by store and pick the item. (Hassan 2009).

2.1.3 Functions of Stores

According to Jain (2013), the following are the main functions of stores:

- **Identification:** Identification is the process of system defining and describing all items of stock. It includes the preparation of a store, code or vocabulary, the adoption of materials specifications and the introduction of a degree of standardization.
- **Receipt:** Receipt is the process of accepting from all source, all materials and parts which are used in the organization, including, supplies for manufacturing or operating process, plant maintenance, offices.
- **Inspection:** Inspection means the examination of incoming consignments for quality. Very often there is a separate inspection department which undertakes this works for most, it not all, material but otherwise goods are inspected by store personnel.
- **Issue and Dispatch:** This is the process of receiving demands, selecting the items required and handling from over to users. It also includes, wherever necessary, the packing of issues and the loading of vehicle with goods for delivery.
- **Stock Records:** There are the documents which record from day to day full particulars of individual receipts, issue and balances of stock.
- **Stores Accounting:** Store accounting is the process of recording details of stock movements and balance in value. It is sometimes undertaken by

the finance department, but there is much to be said for it being handled by the store function.

- **Stock Control:** Stock control is the operation of continuously arranging receipts and issues in such a way to ensure that stock balance in quantity and/or value are adequate to support the current rate of consumption at all times, with due regard to economy.
- **Storage:** Storage comprises the management of store-houses and stock yards the operation handling and storage equipments and the safe custody and protection of stock.

2.2 Store Design

Study guide for module one of Cambridge international college UK (2009) defined store as "an area set aside in which all the items and materials required for production and/or for sale/distribution are received, where they are housed for safekeeping and from which they will be issued as required.

Jain and Aggarwal (2008) defined store as an unworked material.

Waters (2003) stated that "stores take care of materials held in stock until they are needed. Stores makes sure that materials have the right condition, treatment and packaging to keep them in good condition, and are available quickly when needed.

2.2.1 Factors Influencing Store Design

From architectural point of view stores design may be described as the planning and ultimate drawing of store layout to facilitate better construction and usefulness of the building for it intended purpose but to an expert or professionals in the field of stores management or purchasing and supply stores design could be described as the planning and layout of storehouse structure to operate smooth handling and storage of store at the lowest cost possible Dangana (2015).

Dangana (2015) suggested the following militating for store design:

- **Minimum Handling:** Transportation of materials and economic use space.
- Calculation of the light involved in supporting conveyor from carting.
- The structure of floor in order to support machinery adequately.

2.2.2 Objectives of Store Design

Beyond just creating a good-looking store with aesthetically pleasing displays, store design is a well-thought-out strategy to set up a store in a certain way to optimize space and sales. Imaga (2014)

Storedesign is a creative and commercial discipline that combines several different areas of expertise together in the design and construction of retail space. Storedesign is primarily a specialized practice of architecture

and interior design, however it also incorporates elements of industrial design, graphic design, ergonomics, and advertising. Here are the objectives of store design:

Customer Experience

Ann walked into the new grocery store that had just opened around the block. Everything looked nice and clean. Her eyes immediately turned towards the sale items displayed prominently at the stores entrance. Here she was excited to find her favourite salt crackers and a box of blueberries.

She then ran to find her favourite drink and there it was in the aisle labelled ‘Juices and Drinks’. She walked around every aisle looking for things she would commonly buy pasta, cookies, mayonnaise and she found them all. The aisles were correctly labelled and easy to navigate.

She found a display with jellies that could taste and pick the one she liked. She went through her shopping list in a much shorter time compared to the time she would otherwise take grocery shopping, and she learned about many new products.

Increased sales per visit

Greg planned to increase sales by strategically placing attractive items at the door to lure the customer in. Other items inside entice them to walk through areas and make more purchases.

For example, a display of organic blueberries on sale can lead them towards the produce section where they'll find other items not on their shopping list.

Or he could strategically place preferred products next to sale items so that someone browsing through the sales rack would be tempted to purchase another appealing product.

Cost Control

Cost control is the process of identifying business costs and reducing expenses. Design should keep future costs down.

Greg's layout should allow for reorganizing the aisles and displays (say for holiday themes) without too much effort that can increase labor costs.

Some other ideas to consider are:

Automating tasks for payroll, invoicing and shipping.

Using energy efficient light bulbs and motion detector lights to save on energy.

Installing technology to reduce freezer glass condensation and other utility costs.

Using surveillance systems to discourage theft and shop lifting.

Invite Customer Participation

Good visual communication invites customers to participate actively in their shopping experience for example, by ensuring that staff members

are available and clearly visible as such, and providing the opportunity for the customer to have different types of experiences within the store. With the massive shift that online shopping has brought, this part of the store design process is also about offering experiences that the customer can't get online, whether it's one-on-one help and advice from staff, or the opportunity to try products out before purchasing.

Offer a Sequential Experience

Successful stores deliberately plan the customer experience, both figuratively and literally. Literally, it's about planning the store's layout for the optimal customer experience; figuratively, it's more about the chronological path a customer takes to get there awareness through advertising that encourages them to stop by (whether print, online or a store-front window), the visit to the store itself, exploring the store and browsing products, and finally, making a purchase.

Define your Space

First things first, defining your space is all about your brand and image, how it gets people into your store, and what they do once they're there. This is the big picture what are you selling, and who are you selling to? There needs to be a consistency of style and function in your store that reflect all of these different factors, to tie the whole shopping experience together.

A good example of this is Starbucks, a brand that has built its empire by focusing not so much on coffee, but on the experience of drinking it, by providing customers with cosy, comfortable chairs and free wifi, to encourage them to linger for long periods of time, and potentially make multiple purchases in a single visit.

Provide Visual Communication

Visual information includes signage, branding, and other written and graphical information that communicates essential information to customers. It should be clearly legible, and provide only important information that will actually enhance the customer's experience, and ideally, each element should conform with the store's visual branding design.

This is a good place to take inspiration from the world of exhibition design, where the focus is on providing information quickly and succinctly, to people whose attention is typically divided between multiple different brands at once. Visual communication needs to be immediately recognizable, and provide information that can be interpreted and used quickly.

Organizing the Space

When a customer shops online, they have an entire store at their fingertips, with the ability to look at multiple different types of products

at essentially the same time. This isn't the case for the in-store shopping experience, so it's important that the space is well-organized, and as intuitive and easy to use, as possible. A customer who enters a store should have a clear path to follow, with different categories of products clearly sign-posted, logical and clear product groupings, and a means of quickly finding help if they need it. A well-organized store is one that makes customers feel safe and comfortable, and is structured so that they can get what they need without wasting time.

2.2.3 Design and Location in Store house

It means physical location or special arrangement of the organization resource like equipment, work centers, offices, conveyor belt canteens etc. in such a way to ensure smooth and efficient production of goods and service desired by the organization Imaga (2014).

According to Imaga (2014) the following are criteria for effective layout.

Ease of future expansion: This refers to the extent at which the current layout is susceptible to further modification.

Material handling equipment as conveyor belt hand and forklift and to use them for it uses safety and housekeeping.

Fitness into effective layout must minimize, total material handling and movement cost.

The Basic Design

Layout design is to a large measure, determine by the nature of the product or the physical layout design the product layout, process layout and layout and fixed position layout (Imaga, 2014).

Product Layout: The unique characteristics of the product layout design is that work centre and equipment follow a specialized segmented order as required by the nature of the product being manufacturing.

Condition Favouring Product Layout Design

- Very limited product variety
- High product standardization
- Mass production
- There is relatively shorter total production line

Process Layout: This types are something referred to as functional layout department or work center are group together according to their function, all operations activities which are similar in nature are grouped together in the same department or part of the factory.

Condition Favoring Process Layout

The products are largely understood in most cases interpreted manufacturing situation.

A job situation exist where product or services very in nature and size according to customer specification.

There must be better and maximum use of machine.

Fixed position layout at a unique it the sense the product remain in one location while all production and support facilitates are brought to this central location for example for ship or craft building all tools, raw materials and other essential equipment are brought to the ship yard or where the cur craft is being constricted, (Imaga 2014).

Base on views of various authors the researcher believed that stores and material handling has claimed an increasing amount of attention in the constant drive for greater productivity. Assessment of such factors as the correct amount of stock of hold, the method of receipt and issue, space utilization and handling methods are all being given more careful consideration with this end, in view the points are set down with comment which may be of help to those contemplating either a new or modification to an existing store layout.

Stores layout can be considered from the aspect of (i) materials flow and (ii) materials identification and location and space utilization. Two fundamental influences in stores layout are the shape of the stores bulling and the type of flow throughout the building.

Formerly the emphasis of storage was in the efficient holding of stocks to meet internal or external customers' requirements and avoid losses

through wastages, deterioration, theft and obsolescence. Current emphasis is on the movement of stocks. This change is due to the following factor:

Recognition of the need to reduce expenditure on providing storage facilities and handling costs.

The widespread use of computer based inventory systems and stores automation.

2.2.4 Store House Location System

Stores can be classified according to their location, purpose, operation and the characteristics of the stocks held, (Lysons and Gillingham, 2003).

The location of the stores can affect work-flow and thus productivity and profitability – even in a small works. The sitting of stores at the center of gravity of demand appears an attractive solution.

Location

(Lysons and Gillingham, 2013) stated that outdoor stores (stockyards) are used to store such items as steel sections, tubes, large castings, timber, bricks, sand, gravel and some finished products, e.g. cars and, in general, items which do not incur short or medium term deterioration from outdoor exposure.

Indoor stores may be single or multi-storey and either purpose built or adapted. The relative advantages of single and multi-storey buildings respectively include.

Single story

Building costs per cubic metre are lower

Extensions are easier and cheaper.

Stores layout can be more flexible

Handling cost of materials are lower except when upper floors permits the use of gravity.

Fire risks are reduced.

Multi-storey

Storage capacity on a given site is greater

Restricted site spare can be better utilized.

Reduced heat loss since floors provide insulation.

Gravity can be utilized for delivery of stores to lower levels.

Apart from architectural considerations that arise in relation to the sitting and design of new stores building the sitting of stores as a logistical issue-centralized or decentralized can be approached from the stand point of materials management or physical distribution management.

Physical distribution management is concerned with the location of store or warehouses to which consolidated stocks of finished goods can be delivered to decentralized regional depots for later distribution in smaller quantities to retailers or the point of use.

Materials management includes the issue of stock from stores to production.

“ABC” analysis is a good starting point for location and layout. However it must be noted that factors such as “frequency of demand” and “volume and weights” of suppliers are often very different from the results of “ABC” analysis of variety against value. If statistics are to be used in this manner then a separate “ABC” analysis is needed for each set of data.

Lysons and Gillingham (2013) above defines store house location system as the location of the stores which affects workflow and thus productivity and profitability even in a small works.

2.2.5 Storage Facilities/Equipment

Aggarwal (2012) defines storage of materials, parts and supplies as an integral part of the process by which a supply of department maintains a non-stop flow of these things from things from their points of origin outside the organization of their point of use inside the organization.

Lysons and Gillingham (2013) defines “storage as the physical holding in stores of stocks or supplies awaiting issue or transport to customers.

In the above definition, the terms “stocks”, “supplies” and “customers” are used as follows.

Stocks are defined by the Chartered Institute of Management Accountant (CIMA) as goods of inventory held comprising goods or other assets purchased for resale consumable stores.

Raw materials and components purchased for incorporation into products for resale. Products and services in intermediate stages of completion (work in progress).

Long term contract balances finished goods

Supplies are defined by Compton and Jessop[2] as “ all the materials, goods and services used in an enterprise regardless of whether they are purchased outside, transferred from another branch or manufactured in-house: customers is a term applied to internal (i.e. manufacturing departments) or external (i.e. purchasers) users of stocks or supplies.

Lysons and Farrington (2014) states that “storage activities involve stores location. Layout and equipment, mechanical handling stores classification, coding and cataloguing, receipt of purchased items, inspection, storage of return, protection of stores, issuing to production, providing cost, stock records, disposal of obsolete, surplus or scrap materials.

Storage Method

Storage equipment can be categorized under three headings storage methods, handling and picking. Storage as distinct from handling equipment is concerned with (1) storage methods and (ii) the forms in which materials is moved and stored. (Lyson and Gillingham, 2013) two important items equipment of storage equipment are pallets pallets and racking.

Pallets

Ode (2014).Define pallet as one of the most basic items of any material handling system employing the principles of forks. The main function of the pallet is to maintain a gap between the floor and the load to be handled.

Types of Pallet

There are various types of pallet in use with a fairly specialized application.

Standard two- way wooden pallet: this is the most common of all pallets; that can be found in most organizations. The two way design of the pallet means that the fork-lift can approach the pallets from two side.

Wood still age: these are not produced to a standard specification and are normally used in connection with small loads and pallets trucks, or hand operated trucks.

Box pallets: These are usually standard size pallets with box structures added. They can be used to handle or store goods. In some situation they are used as a form of "immediate access" storage for certain items that may be required i-n the factory and are or "free-issue".

Post pallets: these are pallets that have a frame work around them based on various posts. This enables the pallet to handle goods which would normally be suitable for palletized handling.

Universal Steel Pallets: These large pallets are made of steel and are able therefore to cope with extremely heavy loads, without damage. Steel pallets are often employed in heavy industrial environments such as steel works, engineering works, ships yards etc (Ode, 2004).

Racking

Racks are frameworks designed to facilitate the storage of loads and usually comprise upright columns and horizontal members of supporting loads which are diagonally braced for security (Lysons and Gillingham, 2013).

Racking system is the storage facility that allows for storage of materials like timbers, piping, metal sheets etc it increases the capacity of the storage areas in the warehouse. (Ode, 2014).

2.2.6 Aims of Storage Formerly the emphasis of storage or warehousing was in the efficient holding of stocks to meet internal or external customers' requirements and avoid losses through wastages, deterioration, theft and obsolescence. Current emphasis is on the movement of stocks. This change is due to the following factors:

Recognition of the need to reduce expenditure on providing storage facilities and handling costs.

The widespread use of computer based inventory systems and stores automation.

The value based supply chain concept aimed at balancing or optimizing such conflicting goals as high customers' service, low inventory investment and low operating costs.

Change in manufacturing philosophy especially the Japanese Kanban (just-in-time) concept.

The development of logistics systems designed to integrate purchasing, transportation, inventory management and warehouse activities to provide

the most effective means of meeting the requirements of internal and external customers.

The time compression concept, which aims to reduce the time consumed by business processes through the elimination of non-value adding processes. Time is accounted as non-value-adding (Lysons and Gillingham, 2013).

2.3 Materials Handling

Jain and Aggarwal (2008) define material handling as "the handling of raw materials, semi-finished materials and finished goods through production as well as storage area. All materials handling is transport and all transport is materials handling.

These authors also said materials handling activities can be broadly classify into two groups:-

Plant Movement: materials are moved from one point to another within the factory materials are received in the factory, stored and later moved to the first operation and through succeeding operations until the product is completed, packed and shipped.

Process: Certain process such as painting, drying, baking etc are performed as materials moves through the process.

In addition to the above mentioned groups, the material handling will also cover the areas that are outside the factory or plant (examples are raw materials, transportation and finished goods shipping).

Lyson and Gillingham (2003) states that "materials handling has three main aspects).

Physical: the movement, handling and storage of materials considered as materials flow into, through and away from an enterprise.

Management: the effective planning, control review and improvement of the movement, handling and storage of materials and the associated management information.

Technology: the techniques of movement, handling and storage of materials and the associated management and information systems. Lysons and Gillingham (2003), states further that "the main Principles of materials handling are as follows:

Planning principle: all handling activities should be planned.

System principle: integrating as many handling activities as possible and coordinating the full scope of operations covering suppliers, receiving Storage, production, inspection packaging, warehousing, dispatch, transportation and customer.

Materials flow principle: plan as operation sequence and equipment arrangement to optimize material flow.

Simplification principle: reduce combine or elimination necessary movement and equipment.

Gravity principle: utilize gravity to move materials whenever possible.

Space utilization principle: make optimum use of building cubes.

Unit size principle: increase quantity size, weight of load handled. A unit load may be defined as: a number of items, or bulk material so arranged or restrained that the mass can be picked up and moved as a single project, too large for manual handling, and upon being released, will retain its initial arrangement for subsequent movement.

Equipment selection principle: in selecting handling equipment, consider all aspects of the material to be handled, the move to be made and the methods to be utilized.

Standardization principle: standardize method as well as types and sizes of handling equipment.

Adaptability principle: use methods and equipment that can perform a variety of tasks and applications.

Dead-weight principle: reduce the ratio of dead weight of mobile handling equipment to load carrier.

Utilization principle: reduce idle or unproductive time of both handling equipment and labour.

Maintenance principle: Plan for preventive maintenance and scheduled repair of all handling equipment.

Obsolescence principle: replace obsolete handling methods and equipment when more efficient methods or equipment will improve operations.

Control principle: use materials handling equipment to improve production control, inventory control and order handling.

Capacity principle: use handling equipment to achieve full production capacity.

Performance principle: determine efficiency of handling performance per unit.

Safety principle: provide suitable methods and equipment for safe handling.

Waters (2003) states that "material handling moves materials from receiving and puts them into stores, it is responsible for all movements of materials within an organization, so it also removes materials from stores, take them to the place they are needed and generally moves materials

between operations. Its aim is to provide efficient movements, with short journeys, using appropriate equipment with little damage and using special packaging and handling where needed.

2.3.1 Material Handling System: According to Hassan (2009) there are mainly three types of materials handling system. These include manual, mechanized and automated systems. The nature of operations, size of the organization and the physical structure of the building usually determine the system to be adopted:-

Manual Handling System: This is a manually operated device such as wheel barrows, trolleys, drawers, pallets et lift stores and move items from one point to another.

- **Mechanized Handling System:** This is a mechanically powered device and or equipment such as cranes, forklift, pallet, hoist, industrial trucks, riders etc, that usually use to move from one point to another.
- **Automated Handling System:** This is the most sophisticated, modern and most expensive types of materials handling system. The system uses modern technology such as carousels automatic storage. Base on views, opinion of author, I defined store design as an appropriate ways and procedure of arranging the store house and facilities in order to improve the operation.

According to Jain and Aggarwal defined as the handling of raw materials, semi-finished materials and finished goods through production as well as storage area. All materials handling is transport and all transport is materials handling.

2.3.2 Objectives of Materials Handling Sytem

Smriti Chand (2008) stated that the following are the objectives of materials handling.

1) Cost reduction:

(i) Decreasing Inventory level

(ii) Utilizing space to better advantage

(iii) Increasing productivity.

2) Waste Reduction:

(i) Eliminating damage to material during handling

(ii) Being flexible to meet specific handling requirements of different nature.

(iii) Making proper control over stock during in and out handling.

3) Improve Working Conditions:

(i) Increasing productivity per man-hour

(ii) Increase in machine efficiency through reduction of machine down time.

(iii) Smoothing out workflow

(iv) Improving production control.

(4) Improve Working Conditions:

(i) Providing safe working conditions

(ii) Reducing worker's fatigue

(iii) Improving personal comfort

(iv) Upgrading employees/workers to productive work.

(5) Improve Distribution:

(i) Decreasing damage to products during handling and shipping.

(ii) Improving location of storage facilities.

(iii) Increasing the efficiency of shipping and receiving.

The value based supply chain concept aimed at balancing or optimizing such conflicting goals as high customers' service, low inventory investment and low operating costs.

2.3.3 Types of Material Handling Equipment

Material handling equipment is a category within the material-handling industry. The equipment that falls under this description is usually non-automated storage equipment. Products such as pallet racking, shelving, casters and carts, among others, belong to storage and handling.

Imaga (2014) suggested the following material as holding tools.

- **Drill Press:** Use bond drills and as the holes to be drilled become longer the handle of drill can be replace with breast plates.
- **Cutting Fluid:** These one sometimes called contents or cutting lubricant, they are important on marching tools as their functions are:
    - To cool works and pool and to less dysfunctions
    - To lubricate there and tools
    - To prevent holding of chip to tool
    - To wash away dip and dwarf
    - To improve surface finish
- **Cavity Conveyor:** This limited in that they will work only on a down ward machine and they are not suitable for moving certain types of good for example power and liquid without subsidiary conformers.
- **Live Roller Conveyor:** These consist of a set of process to which some drilling mechanism has been added given conveyor speed of u to 18 meters per minute.
- **Lift:** These are many types from large closed door good lift to continuous moving all are of fixed location and their position are determined at the layout of the plant.
- **Packaged Load:** Conveyors in general can be used for the continuous movement of goods and the convey or itself can be allowed to in whether

it is carrying material or not an alternative method of prove material is by means of devices.

- **Hoist and Cranes:** These are flexible in use crones in particular, being capable useful in stores and receiving and dispatch departments, where it can be used to load and unload lorries.
- **Lifting Truck:** These are rapidly replacing ordinary fixed bed trucks. They are either hand or power propelled. The most common being driven by better operation and their use has revolutionized storage and handling of material.
- **Motor Transport:** Delivery value are used extensionally rout within large complex and for location and delivery of good.
- **Handling Material:** The reduction cost of residual movement can be considered under the following of material:
  - Identification of Material
  - Method of packing
  - Capacity of equipment
  - Size of load
  - Weight of container

In material handling equipment practices that require a custom approach of design, material handling experts evaluate many factors to determine the most efficient manner for the transport, retrieval, stock and life cycle

of the goods or products involved in the business operations. Custom applications include: free standing mezzanines, pallet rack systems, shelving systems, order pick modules, conveyor systems and the like. Universal manufacturing standards and safety regulations for finished goods of material handling equipment have been in practice since the 1950's and generally are based on factors such as: strength of steel, evenly distributed loads, pin point stress loads and other engineered criteria to determine physical forces in static and vibratory load conditions. Several areas of the United States have mandated regulations for seismic conditions (also known as earthquake zones), which as result will enable storage structures and components to withstand torsional resistance during a seismic phenomenon.

2.3.4 Importance of Materials Handling

Materials handling is an inevitable part of every manufacturing plant. The magnitude of the problem is indicated by the fact that the cost of materials handling in all forms accounts far from 20 to 25 percent of the total cost of converting the raw materials into the finished product. It is not uncommon for each part to be handled as many as 50 to 60 times before it is final form and shipped. The cost of materials handling arises from two sources the cost owing and maintaining equipment and the cost of operating the system. In general, higher investments in mechanical

semi-automatic, or automatic handling equipment are justified by the reduction of operating cost resulting from the better equipment. (Jain and Aggarwal 2012).

Jain and Aggarwal (2012) defined store as meant holding in custody all kinds of store and materials, semi-processed and fully processed products.

Store Keeping: It may be defined as that aspect of materials concerned with physical storage of goods.

Jain and Aggarwal (2012) suggested the following as objective of store keeping.

- To level out irregularities in purchasing.
- To offset delays in transportation.
- To provide maintenance materials, spare parts and general store as required.
- To add flexibility to production schedule.
- To ensure right time delivery to customers.

2.4 Store Design and Material Handling

A comprehensive study of the basic knowledge required for detailed understanding of the ways and means of planning a storehouse or stockyard to enhance smooth and efficient storage and the inherent

movement of store items with store consideration to investment cost, operation cost and company profit (Dangana 2015).

Storage and material handling captivities account for one forth of logistics expense excluding the cost of carrying inventory this expenses, approximately and one-half is for lab our, one-forth is for space and the remaining is for energy, equipment, material and other. Neglecting to manage these activities effectively can result in inefficiencies that can weight gain in good management of such key activities as transportation, inventory maintenance and information flow. Many storage and handling activities are respective customer services improvement over time Ballou (2014).

2.4.1 Material Handling and Maintenance

- The British standard institute has published a glossary of general terms used in maintenance organization. This glossary service as effective means of carrying up some of the confusion, which has arisen in the past through using words with more than meaning from the document. (Dangana 2015)
- Maintenance is the workk undertaken to keep (or restore) organization facilities in good condition. (Hassan 2008).
- Planned Maintenance: Planned maintenance are organized and carried out with fore though, control and records it therefore, the

examination of all possible means of repairing lubricating, serving and over hauling machinery so that in the long term the machinery has minimum down time due to failure.

- Shut Down Maintenance: Work which can be carried out only when the facility is out of services or taken out of service for the purpose of maintenance.
- Break Down Maintenance: Work which is carried out after failure but for which advance provision has been making in form of spares, materials, labour and equipment.

After revising all the works, opinion and ideas of scholars, the researcher now getting to the standing point as follow, the store operation involve a great different activities and system, the real role of the literature is to seeking out the area that can be improved and therefore reducing the overall cost of storage and increasing the level of services forward to the rest of the organization in order to increase the profit margin.

Thus aim can be achieved by concentrating in the area of store operation outline below:

- Material handling
- Labour utilization
- Utilization of spare
- Store layout
- Feasibility study

Base on views of various authors the researcher believed that material handlings are the equipment use to convey stores from point to another. Material handling can be manual, mechanical or automated.

2.5 Theoretical Framework on Store Design and Material Handling

According to Chandra,(2017). Modern day storesdesign are managed by sophisticated system applications that are designed to manage complex stores plans and to a large extent contain processes that initiate and streamline the operations and stores management. Quite often one can find that the system setup and process defined in the system is not user friendly and cumbersome. An efficient system should define and guide the physical process as well as documentation process. The system process should in turn be developed based on the business process requirement. In many cases the operations are made to suit the system setup, which already exists in some basic form and not suited to the particular business process on hand. Poor system setup that does not match with the shop floor warehouse set up renders operations in efficient. It is very common to come across complaints from users with regard to non-availability of features to work around the processes; at times processes are lengthy and cumbersome leading to operational delays. Non availability of different reports and loops and bugs in the system can often push the operations teams to find shortcut methods to

by-pass the system processes and carry on with the work, resulting in stores inefficiencies as well as inefficient operations.

According to Johson, (2016), store design is a function of materials management in an organization. Hence it is generally found that stores function reports to the materials manager. But in some situations stores function reports to the production function. The earlier type of arrangement is based on the concept that stores along with other functions of materials management can be integrated into the materials organization. This will stream line all materials management functions effectively. The other arrangement is leaning on the fact that production function is very closely linked to stores and a common command can reduce cost and increase effectiveness and also keep material accounting outside the scope of procurement function.

Mitra, (2016), said that stores design operations management is a process-oriented operation. Every task and action required to be carried out by the operatives will impact the stores as well as the delivery lead times and other parameters. Therefore knowledge of what one is required to do and the effect of the action should be known to the operatives who are on the shop floor.

Any inventory of Raw materials, finished goods as well as intermediate in process inventory has an economic value and is considered an asset in the books of the company. Accordingly any asset needs to be managed to

ensure it is maintained properly and is stored in secure environment to avoid pilferage, loss or thefts etc. Inventory control assumes significance on account of many factors. First of all inventory of raw materials as well as finished goods can run in thousands of varieties. Secondly inventory can be in one location or spread over many locations. Thirdly inventory may be with the company or may be under the custody of a third party logistics provider. These factors necessitate inventory maintenance mechanisms to be devised to ensure inventory control. Inventory control is also required as an operational process requirement. Inventory is has two different dimensions to it. On one level it is physical and involves physical transactions and movement of inventory. While on the other hand, inventory is recognizable by the book stock and the system stocks maintained. This necessitates inventory control mechanism to be implemented to ensure the book stocks and the physical stocks match at all times.

Thirdly the inventory always moves through supply chain and goes through various transactions at various places. The number of transactions and handling that it goes through from the point of origin to the point of destination is numerous. Therefore it becomes essential to control inventory and have visibility through the pipeline including transit inventory.

Inventory control is exercised through inventory audits and cycle counts. An inventory audit essentially comprises of auditing the books stocks and transactions and matching physical stocks with the book stock. Cycle count refers to the process of counting inventory items available in physical locations. Depending upon the nature of inventory, number of transactions and the value of items, cycle count can be carried on periodically or perpetually.

2.6 Empirical Research on Store Design and Material Handling

According to Mitral (2018), storedesign function as an element of materials department, has an interface with many user departments in its daily operations. The basic purpose served by store design is the provision of uninterrupted service to manufacturing divisions. Store design act as a cushion between purchase and manufacturing on one hand and manufacturing and marketing on the other. The inherent limitations of forecasts make the stores function a necessity. Store design function is an inseparable part of all business and non – business concerns, whether they are industrial or service oriented, public or private, small or large. The task of store design keeping relates to safe custody and stocking of materials, their receipts, issues, and accounting with the objective of efficiently and economically providing the right material at the right time whenever

required in the right condition to all user departments. The financial view considers store design as an overhead i.e. A cost with no return. This all the more highlights the need for economic operation and efficient store design management.

The cost of stores can be categorized into a capital cost component and revenue expenditure component. The capital cost consist of the sunk cost in land building, roads, yards, material handling equipment and related facilities. Because of the very irreversible nature of this cost, proper planning of stores can go long way in reducing this capital expenditure that may also have a bearing on the revenue expenditure in the stores. The revenue component of stores expenditure consists of salaries and wages of store personnel, maintenance cost, stationary cost, communication expenses, and inventory carrying cost.

One must always remember that efficiency in stores operations cannot be built overnight but has to be thought of right from the initial planning stage. Store must be visualized as an integral part of the purchasing – manufacturing – marketing link. Unfortunately, stores management is looked down upon by many as an operational clerical function and fails to attract appropriate talent because of its underdog nature. One has to bear in mind that the stores manager

heads the single largest group of current assets and his performance is the key to smooth production and subsequent marketing. Many decisions related to stores have a dramatic impact on the operational efficiency of the production department and profitability of the entire organization. Even seemingly routine decisions such as selection of racks, shells, bins, material handling equipment, safety practices, inspection procedures etc. are reflected in the operational efficiency.

According to Ameetdub (2016) stores design function is a vital part of organizations whether they are industrial concerns, public or private utility undertakings, agriculture enterprise, municipal authorities or armed services of Government departments. There are many varieties of materials stored – chemicals, metals, liquids, gases, spare parts, equipment, or finished goods, ranging from engineering components to drugs and pharmaceuticals. Each of these items will require a specific type of storage. And their handling and preservation methods will vary accordingly. There is high degree of specialization of degree required to store and handle these products and in many cases special storage licenses need to be obtained from the government, e.g., the storage of petroleum products.

The relative importance of the function of stores design depends upon the nature and size of the industry or activity concerned, and in all cases it has to be designed to suit the particular needs of the organization it serves. There is, therefore, no standard system, which can be universally recommended or applied, but in the course of time, certain principles and practices of general application have been evolved. The understanding of these principles is most important in the practice of the art of store keeping.

According to Chandra (2017) inventory Management is concerned with the determination of optimum level of investment for each components of inventory and the operation of an effective control and review of mechanism. The main objectives of inventory management are operational and financial. The operational objective mean that the materials and spares should be available in sufficient quantity so that work is not disrupted for want of inventory. The financial objective means that inventory should not remain idle and minimum working capital should be locked in it. Every industry on average spends 70% on raw materials (inventory). Therefore there is a need to know the raw material cost and also there is great importance to understand the inventory management system of this industry. In this competitive business world each and every business organization need inventory management system for determining

what to order, when to order, where and how much to order so that purchasing and storing costs are the lowest possible without affecting production and sales. Thus, inventory management control incorporates the determination of the optimum size of the inventory-how much to be order and when after taking into consideration the minimum inventory cost. The overall inventory management includes design and inventory control organization with proper accountability establishing procedure for inventory handling disposal of scrap, simplification, standardization and codification of inventories, determining the size of inventory holdings, maintaining record points and safety stocks.

Chapter Summary

The chapter presents a review of different literature in the areas of warehousing, materials handling systems, objectives of materials handling systems, stores design and layout, materials handling equipment, etc. Materials handling equipment are electronic, automated, machine powered and hand powered devices that are used in loading, moving and unloading materials within the storehouse and stockyard and unto the production area and other points of consumption. Materials handling systems provide transportation and storage of materials, components and assemblies. Material handling activities start with unloading of goods from delivery transportation, the goods then pass into

storage, onto machining, assembly, testing, storage, packaging, storage, and finally loading onto transport. Each of these stages of the production process requires a slightly different design of handling equipment, and some processes require integration of multiple items of handling equipment.

It is also important to understand at this point that materials handling decisions cannot be taken independent of the design of the facility in which they will be put to use. This fact cannot be ignored by logistics managers who wish to realize the contributions of materials handling to logistics performance.

Chapter III: Research Methodology

This chapter centers on the various techniques and methods used in carrying out this study. It explains the justification for the method used, research population and sample size. It is also discussed the procedure employed and the statistical technique used in the data collection and analysis.

3.1 Area of the Study

The research study was conducted at 17A. Inuwa Abdulkadir Road, Kakuri Kaduna, Nigeria Bottling Company (N.B.C) , Kaduna South LGA Kaduna.

3.2 Research Design

This refers to the framework, which specifics how data has been collected and analyzed in this research work.

The research design used in this work is a descriptive design. A descriptive design is concerned with the collection of data for the purpose of describing and interpreting existing condition, prevailing practices, attitudes and ongoing process.

The case study research design enables the investigator to have on in-depth study on the existing practices in Nigeria Bottling Company Kaduna State and the possibility of introducing the principle of impact of storage and material handling on store efficiency on the activities of Nigeria Bottling Company.

3.3 Population and Simple Size

Research population can be said to mean the observation elements of particular characteristics, which could be people, group or organization etc, that present the same characteristics in a research. The research case study is the Nigeria Bottling Company.

However, the survey is conducted in the Material related Departments which covered all the staff of the organization. The survey population is 100, out of which the sample size of 80, is drawn base on Krejcie, & Morgan, table (1970) and respondents consist of Purchasing 20, Stores 20, Accounting 15, and Production 25.

3.4 Sample and Sampling Procedure

Sample size on the other hand refers to the subject of the population drawn to a true representation of the entire population. The sample size for this research is 80 personnel, out of 100 which is the population of the study. Thus, believed to be adequate representation of the overall population.

In the course of the research, random sampling which is part of the probability sampling was used as a procedure of conducting the study. The probability sampling is one in which all units for the target population has been known as well as a positive chance of being selected.

In this case there is unbiased selection of sampling units. The non probability sample on the other hand is where the researcher employs a

biased procedure in selecting the sampling unit. A part from the distribution of questionnaire, documentary sources was also used strictly along the chosen sampling techniques.

3.5 Instrument for Data Collection

For complete converge and acute comprehension on the research work the researcher used two (2) main instruments: retrieve data and information from appropriate quarters. The instruments are validated using questionnaire, documentary sources.

3.6 Administration of the Instrument

The questionnaires were administered personally by the researcher without employing the service of any research assistants. All the questionnaires were distributed at random to respondents directly on site. No airmail or postal services were used for the administration or collection of the questionnaires.

3.7 Statistical Techniques Used In Analyzing Data

The researcher uses mean deviation in analyzing the data using Likert four scale approaches with a mean score of 2.50. The researcher is using this because it is among the techniques that can be used to get response from the respondent.

The analysis involves the uses of values allocated to the four point scale. The acronym the four points strongly agreed, agreed, disagreed, strongly disagreed. The cutoff point for the four point scale is arrived by using the following:

$$X = \frac{\Sigma xi}{\mathrm{N}} = \frac{4+3+2+1}{4} = \frac{10}{4} = 2.5$$

Decision Rule: The cut off point of 2.50 is derived by: thus, the mean score of 2.50 above will be considered adequate and accepted while 2.49 below will be considered inadequate and rejected.

The mean used in the next chapter of this research work is tabulated with summary analyze of every question, in the questionnaire received in effect all the responses from the respondents were first selected according to their relative class group and further converted.

CHAPTER IV: Data Presentation and Analysis

This chapter focuses on the presentation and analysis of data collected from the management staff of Nigeria Bottling Company Kaduna.

4.1 Presentation of Results

The information collected are presented in tabular form and form the basis for data analysis

The analysis involves the uses of values allocated to the four point scale. The acronyms on the four point scale are represented as follows: strongly agreed, agree, strongly disagree and disagree. The cutoff point for the four point scale is arrived at using the arithmetic mean formula.

$$X = \frac{\sum xi}{N} = \frac{4+3+2+1}{4} = \frac{10}{4}$$

$$= 2.5$$

Where $\sum$ = summation

X = distribution figure

i = element in the table

n = sample size of the study.

Question formulated for the study.

Answering Research Questions:

Question 1: What are the factors affecting stores design?

Table 1: The mean score for factors affecting stores design

S/N	Variables	SA	A	D	SD	Mean	Remark
1.	Total space available.	30	25	20	5	3.0	Accepted
2.	Methods of Productions	48	15	10	7	3.3	Accepted
3.	Number of department in the organization.	36	30	10	4	3.4	Accepted
4.	Volume and variety ratio of the product	32	28	12	8	3.3	Accepted
5.	Types of the product	44	24	10	2	3.3	Accepted
6.	Modes of transportation	51	15	8	6	3.3	Accepted

Grand Mean = 3.2

Source: Field Survey, 2022.

Table 1 above, indicated that variable 1 has a mean score of 3.0 which is above the cut off point with the total space available in the store. Variable 2 with mean score of 3.1 indicates that the Methods of Productions. Variable 3 with mean score of 3.3 which shows that the Number of department in the organization.Variable 4 with mean score of 3.3 which also shows that the Volume and variety ratio of the product. Variable 5 with mean score of 3.3 shows that the Types of the product while variable 6 with a mean score of 3.3 indicated that Modes of transportation.

Question 2: What are the types of material handling equipment use in your organization?

Table 2: The mean score for the types of material handling equipment

S/N	Variables	SA	A	D	SD	Mean	Remark
7.	Pallet and forklift	30	23	20	6	3.0	Accepted
8.	Containers	28	27	18	7	3.0	Accepted
9.	Industrial trucks and Containers	40	30	6	4	3.2	Accepted
10.	Crane and trolling	28	33	16	3	3.0	Accepted
11.	Conveyors and wheelbarrow	48	21	6	5	3.4	Accepted

Grand Mean = 3.2

Source: Field Survey, 2022.

From the table 2 above, variable 7 with the mean score of 3.0 which is above the cut off mark of 2.5, indicates that the Organization under study, agree that Pallet and forklift are among the materials handling equipment they use.Variable 8 with a mean score of 3.0 shows that the company use Containers as part of their material handling. Also, variables 9,10, &11 with a mean scores of 3.2,3.0, & 3.4 respectively indicates that Industrial Trucks, Crane, Trolley, Conveyors and Wheelbarrow, are also part of the material handling equipment that are used in the organization. The respondent's responses show that the variables points are above the cut off mark of 2.5.

Question 3: What method of store house design adapted by your organization?

Table 3: The mean score for the method of store house design adapted by your organization

S/N	Variables	SA	A	D	SD	Mean	Remark
12.	Single story method	48	18	8	6	3.3	Accepted
13.	Double story methods	24	21	20	15	2.6	Accepted
14.	Store hand methods	28	30	12	10	2.9	Accepted
15.	Ware house system	52	20	6	2	3.5	Accepted

Grand mean = 3.1

Source: Field Survey, 2022.

Table 3, above shows that variable 12 with the mean score of 3.3 is accepted by the respondent's that Single story method, is been applicable in the organization since the point is above the decision rule cut off point of 2.5. Variable 13, with the mean score of 2.6 which is above the cutoff point also, indicates that Double story method is another method which is applied in the organisation. Variable 14 &15 with a mean score of 2.9 & 3.5, all of which are above the cutoff point of 2.5, indicates that Store hand methods and Ware house system are also accepted by the respondent's as part of store design method used by the organization. The

grand mean of 3.1 is also highlighted to show that all the method of store design are adopted in the company.

Question 4: What are the relationship between store design and materials handling?

Table 4: The mean score for the relationship between store design and materials handling

S/N	Variables	SA	A	D	SD	Mean	Remark
16.	Collaborative relationship	30	23	20	30	3.2	Accepted
17.	Partnership relationship	28	27	18	40	3.3	Accepted
18.	Insource and outsource relationship	40	30	6	52	3.9	Accepted
19.	Time relationship	28	33	16	28	3.3	Accepted

Grand mean = 3.2

Source: Field Survey, 2022.

Table 4 above, analysis indicates that variable 16 with the mean score of 3.2 is agreed by the respondent's that Collaborative relationship is among the approach used in the organization. Variable 17, with the mean score of 3.3 is accepted by the respondents since it is above the cutoff mark of

2.5, this indicates that Partnership relationship is also applied in the organization. While variable 18, with a mean score of 3.9 shows that In source and outsource relationship also exist, this is consistent to the views and opinions of most scholars as highlighted in chapter two of this research. Variable 19 with mean score of 3.3 indicates that the respondents are of the opinion that Time management relationship is also been observed in the case study organization i.e. Nigeria Bottling Company Kaduna Depot.

CHAPTER V: Summary, Discussion, Conclusion and Recommendations

This chapter comprises of the summary of proceedings, conclusions based on the outcome of the research, findings and recommendation were made.

5.1 Summary

The research is title “Impact of Store Design and Materials Handling on Efficiency of Storehouse Operation “A case study of Nigeria Bottling Company Kaduna”.

The first chapter of the research work contains a brief introduction of the subject under study. Statement of the problem objective of the study, significance of the study, scope of the study and the definition of term used in the research work.

Chapter two discussed the views of scholars, authors as contained in books, journals and other publication.

In chapter three the research methodology was discussed, method and procedures of which data is obtained.

In chapter four Data collected from field study, was analysed and presented in tabular form, with a mean cut of point of 2.5 accept and any mean below 2.5 reject.

5.2 Discussion of Findings

Based on the data collected and analyzed above, the following are the major findings. It was discovered that store design contributes to store efficiency.

Variable 1 has the 1respondents which talks about Total space available. Variable 2 Agree that methods of production.. According to Jain and Aggarwal states that stock design is to store materials with regards to count kind, quality and conditions of the item.

Another finding is on variable 13 which have 20 respondents who agreed that there is need for storage and handling equipment to be maintained in the store.

Under variable 7 in the researcher's findings 9 respondents strongly agreed that industrial trucks and container.

Under variable 3 with 14 respondents strongly disagree that to ensure that in source and outsource relationship. Also variable 15 respondents agree that time management relationship.

Under variable 4 respondents agreed to ensure that single storey method and variable 4 with the respondents of 18 agreed on stores hand methods.

Finally in every organization storage and material handling should be efficiency and effectiveness in stock regulation.

5.3 Implications of the Findings

In reference to the findings of the researcher obtained through the use of questionnaires include the following: -

It was discovered that material handling contributes immensely on the efficiency of store house operation in Nigeria Bottling Company.

Also the findings revealed that for material to be steadily available at all times in the organization, factors that affect store design, such as Total space available, Method of productions, Number of Departments in the organization, Volume and variety ratio of the product, types of the product to be kept, as well as Mode of transportation needs to be considered when designing a store or warehouse for smooth inflow and out flow of material and of the product. Setting an established maximum and minimum reorder levels, operational need, capital available, delivery period, storage capacity if not strictly adhered to and implement will result to stock-out, loss of goodwill, machines downtime and affect income of Nigeria Bottling Company Kaduna.

There is need for the organization to set up a formal mechanism for scanning its environment for opportunities and give earlier sign of future problems, this course of action will improve the system of store house operation and enhance efficiency.

There is also need to develop, prepare and present credible information for legitimate accountability and to permit correct performance evaluation.

However, the researcher, wish to state that successful implementation of the implication contained in the organization store design and material handling assessment report is a challenge to all the stake holders in material related departments in the organization.

5.4 Conclusion

The success and efficient running of stores operation in any organization, require a very good store design,

From the research, the methods of store design used by Kaduna Electricity Distribution Company Main Store are very effective which results in quality of incoming materials.

Also from the research finding, the quality of incoming material to the organization is dependent on quality determinants (i.e. performance, conformance, reliability/durability, customer's specification, price/cost etc).

In the light of the above findings, the followings were made, that activities surround operation in Nigeria Bottling Company Kaduna Main Store should be coordinated with more interest so that material handling can be guaranteed in the organization.

That store design and material handling is done with a multiple intension i.e. quality assurance, quality ascertainment, conformance to specification etc. that the organization can be more driven when adequate operation method are in motion as well as maintain focus as a result of it production outcome.

5.5 Recommendations

As a result of the above findings, the following recommendation are made.

On the Impact of Store Design and Material Handling on Store house Operation in Nigeria Bottling Company.

i The management should review occasionally the stock level within the organizations in order to identify the obsolete items, so as to keep an up to date records of stock materials.

ii There should be a deliberate effort on the part of the management to introduce effective strategy for stock control and material handling towards ensuring steady flow of materials to production department.

iii Coding system should be adopted for ease of identification of materials in the store and to;

iv Initiate and sustain measure that will further sustain the impact of store design and materials handling.

v The organization should initiate computerization of the store.

vi Establish a post operation unit to carryout inspection of materials.

vii Discourage emergency and panic purchase as it has the capacity to undermine the role played by inspection. With panic purchase, materials are forwarded straight to production line without necessary inspection.

ix Should organized training programmes, seminars and workshops for all staff that carry out one responsibility or the other that relates to material handling on the organization.

x The management of Nigeria Bottling Company plc should employ the services of qualified purchasing personnel to handle all the key operations concerning store design and material handling.

5.6 Suggestion forFurther Studies.

This research work or the scopes of the research cover the area of storeand material handling.

There are other areas which are not touched under this topic "impact of storage and material handling on store efficiency", which are mechanical handling, equipment selection, automated storage, handling and retrieved systems, conditions favouring automated storage and handling physical verification, issue of materials, classification and coding of materials,

investigation and analysis of discrepancies according to causes for corrective action.

Therefore, other researcher should go into this area of study or they should continue to research in this area so that to contribute positively in the profitability of the organization because the field of research is wide and this present research work cannot be the end of this research in the topic “impact of storage and material handling on store efficiency”.

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QUESTIONNAIRE

Instruction: Kindly respond to the following statement by ticking in the appropriate column.

SA: Strongly agree
A: Agreed
D: Disagree
SD: Strongly disagree

Question 1: What are the factors affecting stores design?

S/N	Variables	SA	A	D	SD
1.	Total space available.				
2.	Methods of Productions				
3.	Number of department in the organization.				
4.	Volume and variety ratio of the product				
5.	Types of the product				
6.	Modes of transportation				

Question 2: What are the types of materials handling equipment use in your organization?

S/N	Variables	SA	A	D	SD
7.	Pallet and forklift				
8.	Containers				
9.	Industrial trucks and Containers				
10.	Crane and trolling				
11.	Conveyors and wheelbarrow				

Question 3: What method of store house design adapted by your organization?

S/N	Variables	SA	A	D	SD
12.	Single storey method				
13.	Double story methods				
14.	Store hand methods				
15	Ware house system				

Question 4: What are the relationship between store design and materials handling?

S/N	Variables	SA	A	D	SD
16.	Collaborative relationship				
17.	Partnership relationship				
18.	In source and outsource relationship				
19.	Time management relationship				