Progress in Nonlinear Dynamics and Chaos
Vol. 7, No. 1 & 2, 2019, 37-41
ISSN: 2321 – 9238 *(online)*
Published on 22 August 2019
www.researchmathsci.org
DOI: http://dx.doi.org/10.22457/pindac.78v7n1a2

Companies, Technicalities and the Queue Systems

Adebisi Sunday Adesina

Faculty of Science, Department of Mathematics, University of Lagos
Akoka, Nigeria, West Africa
Email: adesinasunday71@gmail.com

Received 12 July 2019; accepted 21 August 2019

Abstract. The concepts dynamisms in the world in general and the entire universe has created a lot of vacuums due to the various day to day activities of the creations. For things to remain normal as expected and exist the way it ought, these vacuums need to be filled. In this paper, such kinds of elements which are to be put in place are considered, even though, in an abstract sense of it. Here, concepts of queuing and logistics are considered as inseparable entities in order to achieve the bests in our companies and establishments.

Keywords*:* Logistics managements, queue, companies, technology

AMS Mathematics Subject Classification (2010): 60K30, 90B20, 90B06, 90B50

1. Introduction

Our age is that of fast-moving and fast-growing one in almost every facet of life; technological-wise, astronomically, in transportations, general productions, warehousing, telecommunications, general health and wellbeing systems, agriculture and food productions, mining, tourisms, academics, marketing, and so on. Notwithstanding, the seemly vacuum or challenges arising as a result of such developments and advancements must need be addressed so that life can flow as expected and that, without an hitch.

2. logistics and technicalities

According to Chandrasekaran (see [2]), the scope and influence of logistics has evolved in the late 1940s. In the 1950s, and 60s, military was the only organization which used logistics. The scope of logistics has been extended beyond the army, as it has been recognized as one of the important tools for developing competitiveness. Competitive advantage means the company has the ability to differentiate itself, in the customer's eyes, and also is operating at a lower cost and greater profit. Logistics facilitates in getting products and services as and when they are needed and desired to the customer. It also helps in economic transactions, serving as a major enabler of growth of trade and commerce in an economy. Logistics has come to be recognized as a distinct function with the rise of mass production systems. Production and distribution were earlier viewed as a sequential chain of extremely specialized activities. The role of logistics is to ensure availability of all the required materials before every step in this chain. Obviously inventory of raw materials, semi-finished and finished goods is a must across this chain to

ensure its smooth functioning. The concept of logistics has its base upon the systems approach. There is a single chain, with flow of materials starting from the supplier, then to the plant and finally to the end customer, and also these activities are done sequentially in order to achieve customer satisfaction at low cost. For this to be successful there has to be co-ordination in the activities of the department. With reference to an organization, an organization gets a concrete shape due to its structure. In the earlier times, the suppliers in distribution activities were spread across the entire structure, thus resulting in an overlapping of activities and finally in unaccountable authority and responsibility. In today's process driven organization, where the focus has shifted from functions to process, logistics has become an essential part of the process.

3. Preliminaries (see [2])

The American Council of Logistics Management defines logistics as "the process of planning, implementing and controlling the efficient, cost effective flow and storage of raw materials, in-process inventory, finished goods and related information from point of origin to point of consumption for the purpose of conforming to customers' requirements". Philip Kotler defines logistics as "planning, implementing, and controlling the physical flows of materials and finished goods from point of origin to point of use to meet the customer's need at a profit". Logistics is all pervasive.

The various functions of logistics are as follows as narrated by Chandrasekaran (see [2]).

(i) **Order Processing:** Processing the orders received from the customers is an activity, which is very important by itself and also consumes a lot of time and paperwork. It involves steps like checking the order for any deviations in the agreed or negotiated terms, price, payment and delivery terms, checking if the materials is available in stock, producing and scheduling the material for shortages, and also giving acknowledgement to the owner, by indicating any deviations.

(ii) **Inventory Planning and management:** Planning the inventory can help an organization in maintaining an optimal level of inventory which will also help in satisfying the customer. Activities like inventory forecasting, engineering the order quantity, optimization the level of service, proper deployment of inventory etc. are involved in this.

(iii) **Warehousing**: This serves as the place where the finished goods are stored before they are sold to the customers finally. This is a major cost center and improper warehouse management will create a host of problems.

(iv) **Transportation**: Helps in physical movement of the goods to the customers place. This is done through various modes like rail, road, air, sea etc.

(v) **Packaging**: A critical element in the physical distribution of the product, which also influences the efficiency of the logistical system. [2]

4. Queue systems and companies

The globalization of world economy has transformed the traditional manufacturing system into a distributed manufacturing and supply chain system (Narayan (see [4])), Most of the companies no longer manufacture their products completely in a single location and totally by themselves. Outsourcing and offshoring have been popular for a couple of decades already as companies have been looking for ways to reduce their cost and innovate their products in order to gain financial and technological edge in their competitive markets. In a distributed manufacturing environment supported by supply chains, lead time and uncertainty in and between operations typically are of concern more than in a stand-alone environment. This trend is evidenced by the high volume of research in the area of supply chain, including the application of queueing theory. The majority of articles that can be found in the literature related to the application of queueing theory in supply chain can be categorized as follows: supply chain design, supply chain planning and control, inventory control in supply chain, design, supply chain planning and control, inventory control in supply chain, supply chain performance, product and process design for supply chain, logistics and transportation, and maintenance and spare parts management.

Kerbache and Smith (2004) (see [4]), develop a methodology based on analytical queueing network coupled with nonlinear optimization to design supply chain topologies and evaluate various performance measures. Their approach has proved useful for analyzing congestion problems and evaluating the performance of supply chains. Most of the applications of queueing theory are found in the area of supply chain planning and control, including inventory control. Bhaskar and Lallement (2010) (see [4]), look at a supply chain as a two-input, three-stage queueing network. Orders to the supply chain are modeled as two stochastic variables, one for the order arrival time and the other for the order quantity. The objective of the study is to obtain the minimum response time for the delivery of the orders along the three stages of the network. Thus, the optimum capacity of the queueing network can be obtained as the average number of order quantity that can be delivered within this minimum response time. Vericourt *et al.* (2002) study a capacitated supply chain that produces a single product demanded by several classes of customers with different backorder costs. The supply system is modeled as a multi-customer make-to-stock queue with stock allocation as a key decision problem. The most important issue for inventory-queues is the behavior of their departure processes that are triggered either by a new job arrival when the output buffer is not empty or when a service completion occurs. Their objective is to obtain the probability distribution and squared coefficient of variation of inter-departure times. Liu *et al.* (2004)(see [4]), develop a multistage inventory-queue model with an approach of a job-queue decomposition that evaluates the performance of serial manufacturing and supply systems with inventory control at each stage. The objective of their research is to find an efficient procedure to minimize the overall inventory in the system while meeting the required service level. the customer order arrival time and supplier delivery time are random. In addition to design, planning, and inventory control, the applications of queueing theory can also be found in performance evaluation and improvement, logistics and transportation, and other areas of supply chain. [4]

5. Inventory control

Inventory is a stock of goods. An inventory is an idle but usable resource. It includes; labour, raw materials, finished goods and equipment stock is reserved to provide a flow of supply.

6. Time consideration

Time is another important factor in queue system. This is in two parts :

(i) The average time in queue (before service is rendered) This is defined as :

$$\bar{w} = \frac{\rho}{1-\rho} \text{ x } \frac{1}{\mu}\left\{or\ \frac{\bar{s}}{\mu}\right\}, \text{ where } \bar{s} = \frac{\rho}{1-\rho}$$

(ii) The average time in system (on queue ad receiving service). This can be defined as :

$$\bar{t} = \frac{1}{1-\rho} \text{ x } \frac{1}{\mu}\left\{or\ \frac{\bar{\bar{n}}}{\mu}\right\} \quad \text{where } \bar{\bar{n}} = \frac{1}{1-\rho}, \quad \rho \text{ is the traffic intensity.}$$

Take the following case for instance (from [5]) :

An applicant got to a taxi park @ 8.00 am. The park which is operating a simple queue system has an arrival rate of $4min^{-1}$ and service rate of $5min^{-1}$. The applicant boarded a taxi speeding @ $30kmh^{-1}$ to a company, 10km away to attend an interview. The interview which is also based on simple queue system has a service rate of$10h^{-1}$and an arrivalrateof$8h^{-1}$He joined the queue and was interviewed when it came to his turn. From calculations, observe that the total time spent from arrival @ the taxi park to the time his interview was conducted can be estimated to be 1+20+30 = 51mins.

Now, since he got to the taxi park @ 8.00am, his interview was conducted around 8.51 am. In the process of getting reasonable solutions, assumption of a more appropriate distribution such as the symmetrical normal distribution (see [1]) may be necessary in cases involving the analysis of complex and multidimensional situations.

7. Case studies

Case one: Consider for example, factories such as the bottling companies where products that need covers such as the soft drinks and drinkable water have to be crowned. The entire process of the productions requires queuing systems. Starting from the time when the marketing vehicle offloads the empty bottles till the time they are placed on the conveyor belts, leading to the washing machines and then followed by crowning each bottle after being filled with the contents. Here, logistics as well as technicalities are undoubtedly involved in order to obtain the best outcomes.

Case two: In transportation, we have garages for taxis, cabs, tricycles, as well as the motor-bikes(okada). Even in aircraft operations in our various airports, orderliness is well required so as to get the best productive and advancing operations.

Case three: In our various academic establishments like our institutions of higher learning, almost all aspects , sections and departments require queuing systems because technicalities as well as logistics are undoubtedly involved and in place. (see [3])

8. Conclusion

Without any iota of doubt, the concepts of logistics and technicalities can neither be overemphasized nor underestimated whenever or wherever any well-established, well-developed companies are in place where queuing paving ways for orderliness and proper presentations are allowed and comprehensively practiced.

REFERENCES

1. S.A.Adebisi and M.Eni Oluwafe, Exhibition of Normal Distribution in Finite p-groups, *American Journal of Mathematics and Statistics*, 7(4) (2017) 166-168. doi: 10.5923/j.ajms.20170704.04.
2. N.Chandrasekaran, *Fundamentals of Logistics*, CII Institute of Logistics, Website: www.ciilogistics.com
3. O.Ayodele Oluwaseun and A.S.Adesina, Queuing in the university system, *Applied Mathematics*, 8(2) (2018) 30-32. DOI: 10.5923/j.am.20180802.03
4. U.Narayan Bhat, *An Introduction to Queueing Theory Modeling and Analysis in Applications*, 2nd ed (2015).
5. Y.Omotoso, *Operations Research Project*, Yosod Book Publishers, (2006).