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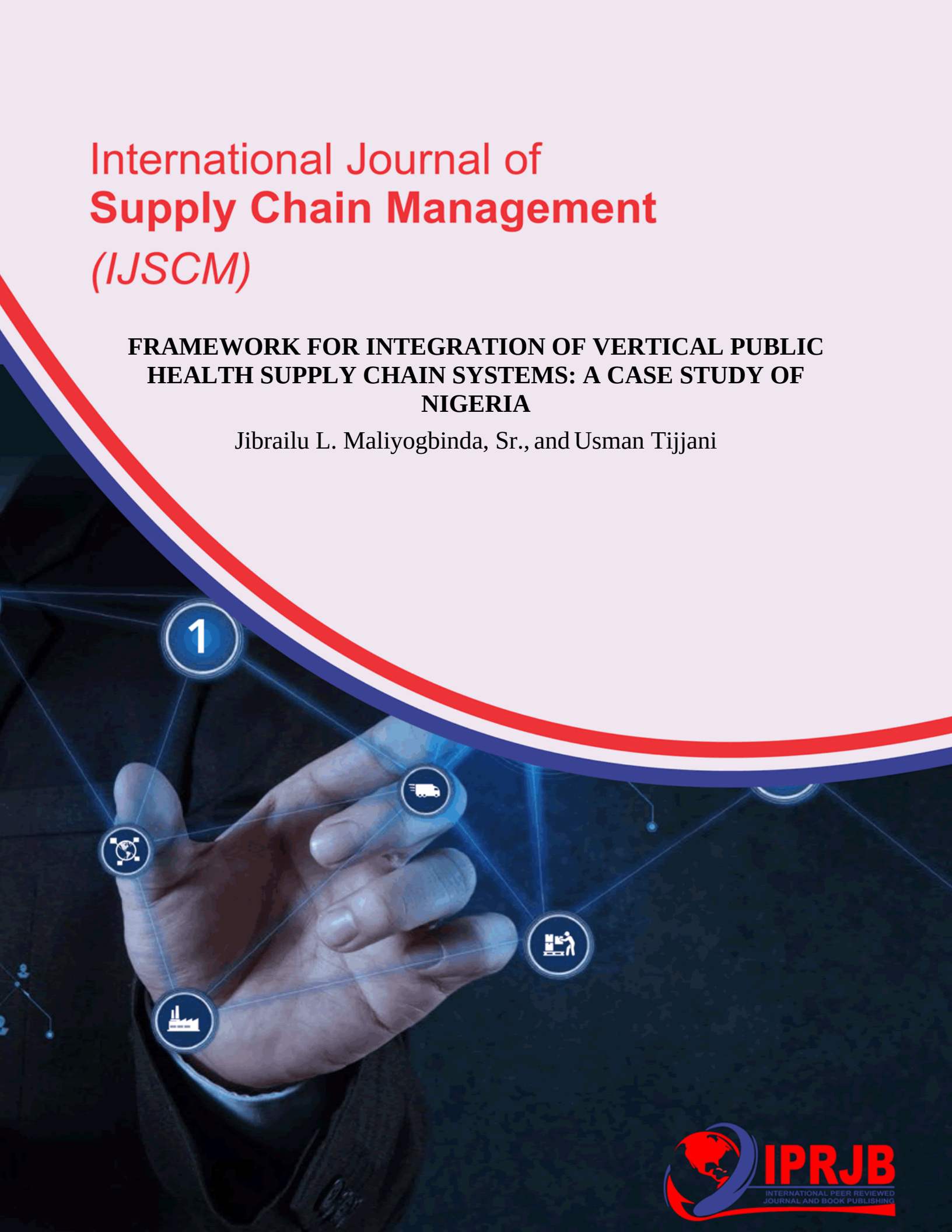

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FRAMEWORK FOR INTEGRATION OF VERTICAL PUBLIC HEALTH SUPPLY CHAIN SYSTEMS: A CASE STUDY OF NIGERIA

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Abstract

Purpose: The purpose of this research study is to explore the opinion of public health supply chain experts in Nigeria on the modalities for the integration of vertical public health supply chain systems and to proffer a practical and systematic contextual framework for achieving a seamless integration of vertical supply chain systems in the public health sector.

Methodology: This research study was a qualitative thematic content analysis of the views of fifteen respondents from the six geopolitical zones of Nigeria using an interpretive philosophical approach through the theoretical lens of constructivism. Respondents in this study had at least three years' experience in the management of pharmaceuticals and other health products in one or more public health intervention programs including HIV/AIDS, Tuberculosis & Leprosy, Malaria, Reproductive Health and Family Planning, Vaccines and Immunisation, Neglected Tropical Diseases and Essential Medicines Programmes.

Findings: The findings of the research study were based on a holistic and comprehensive approach that included cost benefit analysis, justifications, and circumstances for viable integration of vertical public health supply chain systems, which are relationship management, information integration, product integration and coordination called the four modalities/dimensions/practices of supply chain integration and need to exist in a continuum driven by purposeful leadership. Even though the data collected through semi-structured interviews did not allow for differing views among respondents, the opportunity to freely express one's opinion resulted in a rich data. Going forward, the government and its development partners need to demonstrate political and financial commitment to the course of integrating vertical public health supply chain systems in the country. The research study for the first time presented a practical and contextual framework for the seamless integration of public health supply chain systems, especially for low- and medium-income countries.

Unique contribution to theory, practice, and policy: This research study contributes to the integration of vertical public health supply chain system in Nigeria and proffer practical and systematic contextual framework for achieving a seamless integration of vertical supply chain systems in the public health.

Keywords: *Supply Chain system, Integration of vertical supply chain system, public health supply chain*

1.0 INTRODUCTION

The concept of supply chain integration is held by many as the zenith and 'gold standard' of supply chain management excellence and a means for an improved performance and customer service (cf. Lee, 2000 and Christopher, 2005). It is this kind of notion about integration that is serving as a motivation for organisations to embrace integration in their supply chain systems in order to demonstrate effectiveness, efficiency, and sustainability. It is not surprising therefore the drive by donors and countries to achieve integration of vertical supply chain systems for public health commodities with the view to eliminate complexities, reduced redundancies and deliver the six (6) 'rights' of the customer.

Supply chain integration has been accepted and practiced in the for-profit commercial sector where it is associated with increased performance and customer service and served as a means of competitive edge among organisations. As a matter fact, competition among organisations has shifted to competition between supply chain systems (cf. Lee, 2000 and Christopher, 2005). However, public health supply chain systems are still struggling to achieve integration, especially in the low- and medium-income countries.

Furthermore, a lot of literature abound for supply chain integration mainly for the for-profit commercial sector and little independent scholarly studies have been done in the area of public health supply chain systems except for technical reports written by implementers and donors in the area of foreign aid.

Within a single country, there are many programs handling different diseases and/or health intervention areas such as HIV/AIDS, Tuberculosis and Leprosy, Malaria, Reproductive health and family planning and Vaccines (ATM-RV), just to mention a few (USAID|DELIVER PROJECT, 2011). These vertical programs manage their supplies and distribute their products individually This is not minding the fact that all these public health programs aimed at the same front line health facilities (FLHFs) or service delivery point (SDP) as a final destination for their health commodities, nonetheless, every single one of those still operates vertical public health supply chain systems.

The national council of health in Nigeria has formulated a policy encouraging states to establish a logistic management coordinating unit that will be responsible for coordinating supply chain activities (NSCIP, 2016). The states logistics management coordinating units (LMCUs) are to take a lead in fostering ownership and integration of vertical public health commodities supply chain systems in a way to guarantee sustainability in the event of donor activities' withdrawal. The Nigeria Supply Chain Integration Project (NSCIP) was created as a temporary entity to help achieve the above mandate.

According to Childerhouse and Towill (2011), the discussion about supply chain integration is not about either to integrate or not to integrate, however, is it about 'how much integration is justified?' and 'under what circumstances?' should integration of vertical supply chain systems happen.

Therefore, this research study seeks to examine the modalities to achieve seamless integration of vertical public health supply chain systems and to develop a practical contextual framework for integration.

1.1 AIM OF THE STUDY

The aim of this study is to examine the modalities for integration of vertical public health supply chain systems in Nigeria and to develop a practical contextual framework for integration.

1.2 OBJECTIVES OF THE STUDY

The following objectives were defined for this study:

- To identify the benefits and challenges of integrating vertical public health supply chain systems in Nigeria.
- To examine what degree of integration of vertical public health supply chain systems is justified.
- To examine the circumstances for viable integration of vertical public health supply chain systems.
- To identify modalities to achieve seamless integration of vertical public health supply chain systems.

1.3 RESEARCH QUESTIONS

The following research questions was used to focus this study. They are strategic and shall serve as the carrier of data that shall drive the findings in this study.

- What are the benefits and challenges of integration of vertical public health supply chain systems in Nigeria?
- What is the degree of integration of vertical public health supply chain systems is justified?
- What are the circumstances for viable integration of vertical public health supply chain systems in Nigeria?

What are the modalities to achieve seamless integration of vertical public health supply chain systems in Nigeria?

2.0 LITERATURE REVIEW

Different interpretations for the term ‘integration’ exist in the field of public health supply chain. Many of the experts in the field of public health supply chain used the term to mean merging of vertical (programmatically separate) supply chains for different public health programs or product categories (USAID|DELIVER PROJECT, 2010).

Again, supply chain integration in the for-profit commercial sector, where it is characterized by competition among different organisations in the same market niche, has a different philosophy and may be governed by ‘different strategic objectives and operating rules’ than supply chain integration in the public health sector (WHO & PATH, 2013). In the commercial sector, supply chain integration mostly refers to integration across functions within a supply chain for a single product category as against integration of vertical supply chains for different product categories (WHO & PATH, 2013).

This chapter reviews existing literature and technical reports focusing on public health supply chains and to some extent the commercial sector, with the view to uncover and gain a better

understanding of the benefits and challenges, justifications and circumstances for integration and the modalities to achieve seamless integration in the public health supply chain in low- and medium-income countries like Nigeria. The literature review was used to develop the data gathering instrument for this study with the view to address existing gaps in the published literature in the field of public health supply chain.

2.1 DIFFERENCES BETWEEN COMMERCIAL SECTOR AND PUBLIC HEALTH SUPPLY CHAINS

"A supply chain is a set of three or more organisations linked directly by one or more of the upstream or downstream flows of products, services, finances and information from a source to a customer" (Monczka et al., 2012). This definition underscores the basic principles of any supply chain systems; however, their applications may be different depending on the sector. The for-profit commercial sector supply chain is not exactly the same in operation as the public health supply chain. For instance, while finances, products and services and information flows in both direction in a typical for-profit commercial sector supply chain, in the public health supply chain, information flows in opposite (except for feedback from higher levels) direction with finances, products and services and is generated mostly from service delivery points (SDPs).

The Supply chain in the public health sector of a particular country is government driven and is majorly concerned with the management of donated pharmaceutical and other health products. Therefore, it is the responsibility of the government or their partners to deliver these products to the last mile. Whereas the commercial sector supply chain is profit driven with a return on investment at every value chain.

Therefore, for-profit commercial sector supply chain, incentives drive the supply chain while for the public health supply chain, we talk about value for money to the donors of these health products. Also, consumer products are highly substitutable. For instance, a customer who desires Pepsi-Cola can do with a Coca-Cola in the absence of the former. However, in public health supply chain, you cannot give a customer Oral Polio Vaccine in place of Hepatitis-B vaccine. Therefore, products in public health are specific to an individual and must be provided as such. Again, public health products are more expensive to afford compared to consumer products such as Pepsi-Cola or Aerial detergent; and the people who need them most are the poor masses who cannot afford them except they are subsidized or donated free as the case is most of the time. The most distinct difference, however, is that: will the customer who desires a Pepsi-Cola dies because he or she cannot find it? Certainly not. But with public health products, a customer's life depends on the timely availability of these products (Wright, 2016)

Furthermore, the term 'organisations' as entities of a supply chain has a different feature than that found in the commercial sector supply chains. Organisations or 'actors' in public health supply chains refer mostly to government and its ministries, departments and agencies; central, zonal, state and local warehousing facilities; donors; implementing partners (NGOs); service delivery points (SDPs); health workers; third-party logistics providers (3PL), manufacturers, distributors, and private service providers (JSI, 2012).

According to Monczka et al. (2012) "supply chain management is the management of the two-way linkages and coordination of activities and the flows (i.e., of products, services, information and funds) from raw materials through to the end user both within and outside the organisation".

Again, while this definition can be applied in its entirety to the for-profit commercial sector supply chains, it is not so with the public health supply chains. In public health supply chains, collaboration and coordination of activities and flows is handled outside of the vertical supply chains systems by federal Ministry of health and its subsidiaries at the state Ministries of health. "This network of organisations or actors is nested within a country's health system and the operational and contextual environments" (JSI, 2012).

2.2 AN OVERVIEW OF PUBLIC HEALTH SUPPLY CHAIN IN NIGERIA

The Federal Government through its ministries, departments, and agencies (MDAs) is responsible for policy formulations that regulates and control health services in the country while its counterpart at the State level implement national programs and run State health institutions and the Local Governments ensures the delivery of primary health care to the masses. The pharmaceutical sector comprises of different stakeholders that include government, national regulatory agencies, manufacturers, distributors, wholesalers, retailers, and the final consumer of the health products.

The funding for the provision of pharmaceuticals and other health products is contributed by the government, donor agencies and the private sector, with the bulk of the funding for public health programs being donor-funded. These organisations include the World Bank, United States Agency for International Development (USAID), World Health Organisation (WHO), United Nations Population Fund (UNFPA), and Department for International Development (DFID), Global Alliance for Vaccines and Immunisation (GAVI), Bill and Melinda Gates foundation and others.

Nigeria is a top priority country within the Global Fund to Fight HIV/AIDS, Tuberculosis & Malaria (GFTAM) portfolio with current projected funding to exceed US$ 1 billion in the period 2015-2017. Approximately 50% of the financial resources will be associated with procurement and supply management of pharmaceuticals and other health products. Significant part of the above funds will come from donor agencies (DFDS, 2016).

The major public health programs in Nigeria includes:

- HIV/AIDS
- Tuberculosis and Leprosy
- Malaria
- Reproductive Health and Family Planning
- Expanded Program on Immunisation (Vaccines)
- Essential drugs
- Neglected Tropical Diseases (NTDs) and
- Nutrition.

Currently, the supply chains for the above public health programs are all vertically and independently operated. There are even parallel systems within the same programs differentiated by funding source-usually operating different supply chain activities to the same health facilities leading to duplication of efforts and sub-optimal utilization of resources (DFDS, 2016).

2.3 INTEGRATION OF VERTICAL PUBLIC HEALTH SUPPLY CHAIN SYSTEMS

Nigerian stakeholders have increasingly recognized the need to improve and integrate the pharmaceuticals and other health products vertical supply chains in the country for better efficiency, effectiveness, and sustainability (cf. SCMS, 2008; Ibegbunam & McGill, 2012). However, these submissions seem inconsistent and do not distinguish between product integration and supply chain integration (USAID|DELIVER PROJECT, 2009).

According to the above technical report by USAID|DELIVER PROJECT, merging together, vertically separate supply chains for specified programs or product categories to achieve management of some or all logistics functions into a single supply chain for different product categories is better known as product integration. While this type of integration can reduce redundancies and complexities, it does not guarantee health commodities availability for all product categories and hence resulted in poor customer service (USAID|DELIVER PROJECT, 2009).

Even though the primary objective of product integration is to ensure greater efficiency, reduced complexities and redundancies and establish sustainability; there is also a greater desire for improved supply chain performance and customer service. The later objectives can only be attainable through supply chain integration and not product integration (cf. New, 1996; Lee, 2000; DELIVER, 2009; Sweeney, 2012; Allan et al., 2014). These authors agree that an effective integration in supply chain systems will lower cost, improve efficiency, increase product availability, improve the supply chain performance and deliver the needed customer service. However, Cristina et al (2012) argue that supply chain integration is not a "one-size fit all". According to this author, supply chain performance, after integration, only increases, if supply complexity is high, and is of little consequence in low supply complexities. Also, van Donk and van der Vaart (2005) argues that total integration of supply chain systems is not feasible in situations of shared resources and low capacity. In the context of public health supply chain system, 'total' integration, refers to integration of all logistics functions such as product selection, quantification and procurement, warehousing and distribution and inventory management. They continue to assert that 'total' supply chain integration should be exploited in circumstances of demand uncertainty while suggesting integrating flow of stock and its management only if the demand is predictable. Public health supply chain systems in Nigeria present a combination of volatile and predictable supply and demand based on seasons and product categories. For instance, malaria commodities seem to have high volatility and uncertainty in rainy season while vaccines present a more predictable demand which is based on target population or birth-cohort enrolment. Raja et al (2000) seems to take note of this mix situation that exist in the public health supply chain systems when they advise supply chain integration where necessary and not a "fix for all" solution.

However, from the above, proponents and opponents of total supply chain integration, there is one common denominator to all, which is the fact that, integration is necessary for supply chain improved performance and customer service; they all agreed on need for tradeoffs between benefits and costs in implementing supply chain integration (Christopher, 2005). The question many studies have not attempted to answer, however, is *how much of integration is justified, and under what circumstances?* (Childerhouse and Towill, 2011). A clear understanding of this issues, in the context of public health supply chain, will lead to defining modalities to achieve seamless integration of vertical supply chain systems in the Nigerian public health sector.

2.4 COST-BENEFIT ANALYSIS OF VERTICAL PUBLIC HEALTH SUPPLY CHAINS INTEGRATION

Through supply chain integration demand and supply indices for pharmaceuticals and other health products are properly and effectively connected together to yield improvement in customer service and costs savings. (DELIVER PROJECT, 2009). However, there are apprehensions being expressed by programme managers in charge of vertical supply chains who fear the fact integrating their supply chain with others may lead to lost relevance and possibly their jobs. Also, they expressed fears that losing control of their portion of supply chain may affect performance and customer service to their clients (WHO | PATH, 2013).

This expression of fear from vertical supply chains could have succeeded in adding another layer of technical and operational complexities to integration. To achieve effective integration, there is need for collaboration and coordination. To support this notion, Alan et al., (2014) state that public health supply chain systems in most countries today comprises of multiple or vertical supply chains with diverse players (multiple actors). As such, every actor involved will be defensive and protective of their primary interest in such a system. It is this conflict of interest among the actors of public health supply chain systems must be carefully managed if a robust and integrated supply chain which performs optimally and deliver first class customer service at a lower cost can be achieved.

For instance, HIV/AIDS, Malaria vertical programs are required to report bimonthly while the Tuberculosis and Leprosy program reports every quarter. The reproductive health and family planning (RHFP) program has three different reporting requirements: within the program-health facilities they report every two months, local government collates reports from health facilities and report aggregate data every quarter while the state is required to report every four months. The Expanded Program on Vaccination reports their data every week. These differences in requirement for reporting could be a potential conflict of interest among these vertical supply chains. Since reporting is usually tight to health commodity resupply, some programs' ability to make their health commodities available and give the needed customer service will be disrupted (Raja et al., 2000; Aronovich and Kinzett, 2001; WHO | PATH, 2013).

As already discussed, there is tremendous cost, redundancies and complexities reduction that comes with either total supply chain or product integration especially if warehousing or distribution functions are integrated. However, commodities like vaccines and laboratory items require special storage and transport conditions (cool or cold chain) and resupply intervals than other medicines. This will mean massive investments in infrastructure and transportation. Ibegbunam & McGill (2012) have identified among other challenges the need for more investment in human resource capital as a foundation for success in scaling up and integrating HIV/AIDS services with other public health programs at the health facility level. Currently, every vertical supply chain has its own logistics management information system (LMIS) tools for recording and reporting logistics data. It means that integrating all the ATM-RV at a health facility for instance, will over stretch the capacity of the health personnel rendering these services to their clients.

2.5 JUSTIFICATION AND CIRCUMSTANCES FOR SUPPLY CHAIN INTEGRATION

The preceding sections above unveil the challenges of current public health supply chain landscape in Nigeria and the two types of integrations possible-product integration and total supply chain integration and, lastly, the cost-benefit analysis of embarking on either form or the combination of integrations. This section will attempt to consider the question, *how much integration is justified, and under what circumstance?*

According to Christopher, (2005) a system performs better when its individual components are working in harmony rather than in isolation. In the context of public health supply chain, better performance and customer service is only guaranteed when vertical supply chains are integrated. To guide this discussion in the context public health supply chain, I have adopted with modifications the four dimensions of supply chain integration suggested by van Donk and van der Vaart (2005):

- Organisational relationships
- Information integration
- Flow of goods and
- Planning and control.

The above four dimensions of integration as proposed by van Donk and van der Vaart (2005) was adopted from Lee's (2000) three dimensions of supply chain integration:

- Organisational relationship
- Information integration and
- Coordination and resource sharing

Van Donk and van der Vaart subdivided coordination and resource sharing into flow of goods and planning and control. However, as already discussed, there is a difference between for-profit commercial sector supply chains and that of public health supply chains, which is presently largely donor driven. But since the public health sector is being guided by quest for supply chain performance and customer service, those dimensions above have been modified into four dimensions of public health supply chain integration as follows:

- Relationship management
- Information Integration
- Product integration
- Coordination.

The above four dimensions of public health supply chain integration is simply a modification of van Donk and van der Vaart's flow of goods into product integration and their planning and control into coordination. In the public health supply chain system, flow of goods has much to do with warehousing and distribution network. In the context of public health, warehousing and distribution indirectly suggest integrating different pharmaceutical and other health products into a single storage and transportation mechanism which is otherwise known as product integration.

Furthermore, the planning and control component in van Donk and van der Vaart model refers to leadership in an integrated supply chain system. The most important quality of a leader is

coordination. Therefore, coordination rightly fits the leadership role that government plays in the sector of public health supply chain system.

2.6 THEORETICAL FRAMEWORK

This research applied social constructivism approach to study the modalities to achieve integration of vertical public health supply chain systems in Nigeria. Social constructivism says, 'reality is what you make of it'. Social actors infer different meanings to the same situation in which they may find themselves (Saunders et al, 2012). Social actors, in this study refer to public health logisticians working in the five major public health programs (ATM-RVs) and other interventions like NTDs and SDSS for essential medicines.

Qualitative research is often associated with an interpretive philosophy simply because the researcher needs to interpret the realities of the respondents expressed through their views and opinions about the research problem (Saunders et al, 2012). This approach is considered suitable in this study as it seeks to explore the opinion of public health logisticians and policy makers, who have oversight roles on public health interventions and their vertical supply chain systems in Nigeria. These actors are conversant with modalities of achieving seamless integration of vertical public health supply chain systems currently being operated in the country.

3.0 METHODOLOGY

3.1 RESEARCH DESIGN

This is a qualitative research study which seeks to understand the opinion of respondents on public health supply chain integration through a semi-structured interview. Therefore, this research has relied on interpretivism philosophy, and a thematic content analysis of primary data collected through semi-structured one-on-one interview and secondary data obtained through review of related literature and technical reports to support and corroborate the primary data.

3.2 POPULATION OF THE STUDY

The population of this research was derived from health professionals and policy makers conversant with public health programmes and supply chain management systems. The composition is multidisciplinary and include both male and female handling health commodities supply chain management systems for the five major vertical supply chain systems namely HIV/AIDS, Tuberculosis and Leprosy, Malaria, Reproductive health and family planning, and Vaccines and Immunisation programmes popularly known as ATM-RVs. Their qualifications range from community health workers certificate to a university degree with at least three years' experience working on health commodities supply chain system in Nigeria.

3.3 SAMPLING TECHNIQUE AND SAMPLE SIZE

For this study, non-probability homogenous purposive sampling technique was adopted to collect primary data from respondents. In non-probability sampling technique, the issue of sample size is ambiguous and follows no rules and that the sample size is depended on the research questions and objectives especially when collecting qualitative data using semi-structured or unstructured interviews (Patton 2002; Neuman, 2005). For this study, fifteen (15) participants were recruited with two (2) coming from each of the ATM-RVs programs and at least one (1) participant from the six geopolitical zones of Nigeria. The remaining five participants were recruited from policy makers (3 participants) at the federal ministry of health, Nigeria and one (1) each from other

public health intervention programs like the Neglected Tropical Diseases (NTDs) and Sustainable Drug Supply Systems (SDSS) for essential medicines.

3.4 DATA COLLECTION AND ANALYSIS

As the case is with semi-structured interviews, audio-recording and note taking of the conversation and ensuing discussion was used to collect data from participants. The semi-structured interview was administered in a face-to-face interview while some of the participants were interviewed over the phone. The average length of the interview was 49.5 minutes. The primary data generated via the semi-structured one-on-one interviews with the participants, was transcribed into thematic and sub-thematic headings and together with secondary data from existing literature were subjected to thematic content analysis.

3.5 LIMITATION OF THE STUDY

The limitation with this of research is the personal bias of respondents on the subject matter under study, since the data generated from them is completely based on their experiences and opinions of what they think, know, or want to see about integration of vertical supply chains. However, if these opinions from different experts in the field of public health supply chain systems happen to converge to a particular direction, it could give credence to their opinions and can be taken as authoritative and objective.

4.0 RESULTS AND DISCUSSION

This study set out to answer specific research questions and to achieve defined objectives. Therefore, the findings in this study has been organised in line with the four research questions it was intended to answer: the benefits and challenges of integration of vertical public health supply chain systems, the degree of integration of vertical public health supply chain systems that is justified, the circumstances under which vertical public health supply chain systems integration should take place and finally the modalities for achieving seamless integration of vertical public health supply chain systems. The findings are presented under thematic subject areas as shown in table 1.

Table 1: Thematic index

S/No	Thematic Areas	Sub-Thematic Areas	Summary of Responses
1 1.1 1.2 1.3	General overview of integration	Benefits	• Reduce complexities • Reduce redundancies • Offer costs savings • Improve performance • Increase customer service
1.4 1.5 1.6 1.7		Challenges	• Resistance to change • Conflict of interest • Low PSM capacity • Inadequate SC staff at SDPs • Poor health care financing • Policy instability • Lack of ownership mentality at SDPs • Incentive driven work attitude of SC staff
2 2.1 2.2	Justification for degree of integration	Government ownership	• Ownership of SC functions by government and its agencies
2.3 2.4 2.5		Sustainability	• Lead to development of PSM capacities across the public health sector
2.6 2.7		Logistics data repository	• Custody and control of logistics data information for the country
2.8 2.9		Value for money	• Eliminate duplication of SC roles and responsibilities • Eliminate waste in supply pipeline • Optimum use of scarce resources
3 3.1 3.2	Circumstances for viable integration	Political commitment	• Enabling policy • Political will • Leadership
3.3 3.4		Financial commitment	• Allocation of enough funds to public health sector • Adequate and skilful SC staff
3.5 3.6 3.7		Standard operating procedures (SOPs)	• Define SC activities • Develop job-aid for SC activities • Streamline SC processes • Clarify roles and responsibilities of actors • Define timelines for SC activities
4 4.1 4.2	Modalities for integration	Relationship management	• Set common vision and objectives • Establish TWGs within and

4.3			among vertical programmes • Earn the trust of actors • Collaborate on activities aimed at SDPs e.g. MSVs, trainings
4.4 4.5 4.6		Information integration	• Harmonise essential logistics data elements • Unify review and reporting timelines • Develop an integrated LMIS
4.7 4.8 4.9		Product integration	• Define product and customer categories • Segment products based on product and customer characteristics • Integrate storage and transportation based on product segmentation
4.10 4.11 4.12		Coordination	• Provide SC leadership • Serve as link and communication channel between actors • Regulate and coordinate SC activities

4.1 CONCEPT OF PUBLIC HEALTH SUPPLY CHAIN INTEGRATION: BENEFITS AND CHALLENGES

The respondents are unanimous on their understanding of the term integration being the merging of vertical public health supply chain systems into a unitary operation system that is coordinated centrally to maximize the use of resources that will result in improved performance and in meeting the six (6) 'rights' of the customer.

4.1.1 BENEFITS OF PUBLIC HEALTH SUPPLY CHAIN INTEGRATION

The respondents agreed that supply chain integration will bring about reduction in redundancies and duplication of roles in the supply chain that normally lead to a lot of waste. In the words of a respondent *"…. I strongly believe that integration when fully in place will eliminate the duplication of roles by implementing partners while trying to render service to communities in the country and that if achieved will save cost to funders*". The respondents are of the opinion that a centrally coordinated public health supply chain will certainly lead to better utilisation of scarce resources and donor funds. These they say will reduce the cost associated with running a public health supply chain in the country. Another opinion expressed by respondents is the fact that when vertical supply chain systems are integrated into a single and centrally coordinated system, there will be greater performance achievement that is not possible under the different vertical supply chains. They also submitted that the customer will be better served by such an integrated supply chain system since all services can now be accessed in one place.

4.1.2 CHALLENGES OF PUBLIC HEALTH SUPPLY CHAIN INTEGRATION

The above benefits do not come on a 'platter of gold'. There are challenges associated with integrating public health supply chain systems. The respondents are of the opinion that the service delivery point (SDP) which is the last mile constitute the weakest link in the supply chain system with weaknesses and vulnerabilities that become major challenges that integration could face. As one of respondent allured to …"*in my experience, SDPs are the weakest link in the public health supply chain system of Nigeria……some of these weaknesses include poor attitude to executing their roles, poor data management*". Such weaknesses include the lack of adequate and qualified supply chain staff at SDPs resulting in poor data management which ultimately result in poor decision making and waste of resources from expiry, pilferage, damage, stock outs. Closely related to unqualified supply chain staff is the poor attitude to executing responsibilities and lack of a sense of ownership about public health supply chain which constantly led to unreasonable demands for incentives to do a work one has been hired and is being paid to do. Another challenge include resistance to change from the status quo either because of unfounded fears about the future guarantee of one's work. Therefore, many will prefer the status quo which seems to give guarantees about job security. Also, respondents are of the opinion that conflict of interest from implementing partners (IPs) and their principal recipients (PRs) is another challenge that integration could face. They said this is because every donor has their different set of requirements and expectations to meet their contract terms, hence, this most of the time is the reason for the work overload that SDPs staff has to cope with. They feared in the event of integration, as stated by a respondent "*program managers feared the fact that they may lose their traditional roles and control and also relevance and possibly their jobs in the event of integration*". The opinion of respondents here suggests conflict of interest which may derail the integration project. The respondents express serious worries about the ability of the government to sustain the integration mantra. This they said is because of the history of policy instability associated with low- and medium-income countries like Nigeria, which they identified as a major challenge to integration. In this line of thought, the respondents also said lack of counterpart funding from the government could truncate the progress of integration.

4.2 JUSTIFICATION FOR DEGREE OF INTEGRATION

In this section the respondent's express opinion on the degree of public health supply chain systems integration that is justifiable. Justification for integrating public health supply chain systems is based on cost-benefit analysis and trade-offs that must be made to achieve seamless integration of vertical or programmatically separate supply chains. The respondents' opinion on this matter is summarized under the following sub-thematic areas below.

4.2.1 OWNERSHIP AND SUSTAINABILITY

According to respondents, the situation whereby implementing partners have control of the entire country's public health supply chain is troubling. Many of the respondents cited situations where the government has to resort to implementing partners for information concerning the state of logistics data for the country. As one said …"*it is unacceptable for the country to fold its hands and continue to rely on technical assistance as if it will not end someday…"* Here, the respondent's express agreement that the mere feeling that the government will take ownership of supply chain processes in the country totally justified the efforts towards integrating the different

vertical public health supply chain systems. The respondents also added that ownership is needed because the technical assistance being provided by donor agencies and their subsidiaries will not last forever, hence the need to tailor supply chain activities under a unified body for easier monitoring and control. The respondents also agreed that ownership will force the government and its agencies to develop the procurement and supply management capacity in the country which is currently inadequate especially at the SDPs thereby ensuring sustainability of the entire country's public health supply chain in the event of donors' withdrawal of both financial and technical assistance.

4.2.2 LOGISTICS DATA REPOSITORY

Opinions expressed agreed to the fact that information is critical to supply chain decision making and therefor the bedrock of any supply chain system. Respondents were unanimous in their submission that custody of logistics data keeps the government in firm control of the country's supply chain system and therefore a good justification for the efforts needed to achieve public health supply chain integration. Someone said "*…lack of control over essential logistics data is the reason for poor supply chain decision making in the country and why there is so much waste of donors' funds"* Respondents argue that with the right data set, the country will be able to carry out an informed forecast and quantification exercise with some degree of accuracy. Many respondents agreed that the country will be able to tell at every point in time the pharmaceutical and other health products in its in-country pipeline and therefore decisions about redistribution measures to prevent expiry of health products and prevent waste can easily be reached.

4.2.3 VALUE FOR MONEY

All the respondents interviewed are of the opinion that probably one of the critical justifications for achieving public health supply chain integration is the fact that the country can return value for money to the donors and partners helping the country to provide pharmaceuticals and other health products to the teaming masses that need them. As was expressed by a participant "*…we need to demonstrate to the international community and those who fund our public health intervention programmes, why we deserve to be assisted with foreign aid"* Respondents argue loose and vertical supply chain practices currently in place are a major discouragement for the country's donors and technical partners. Respondents expressed the hope that with full integration in place, duplication of roles among implementing partners will be eliminated and resources can be channelled to other areas of need in the public health sector. Many of the respondents have cited examples of parallel supply chain within the same intervention area. Parallel supply chain here refers to a situation where two or more implementing partners are rendering public health services in the same intervention area. For instance, the Institute of Human Virology (IHVN), Friends for Global Health, Family Health International (FHI360) all provide HIV/AIDS services to the country and in most instances can be found in the same state at the same period. Such practices, some of the respondents have claimed, results in over-bloated in-country supply chain pipeline leading most of times to expiry of donated pharmaceutical and other health products. If integration can achieve this fit which they believe it will, many of the respondents have said, then it is enough justification for public health supply chain integration quest.

4.2.4 SUPPLY CHAIN PERFORMANCE AND CUSTOMER SERVICE

Some of the respondents have argued that public health supply chain integration will first and foremost bring about strengthening of the vertical supply chains for the various programs. These they argue is because no one will want to come to the table of collaboration on supply chain activities without first putting their internal processes in order. In the words of a respondent "…*one of the thing integration does to supply chain systems is that it bring in synergy and greater system performance and ultimately influences positive delivery of the customer's rights"* Again, some respondents have argued that because greater visibility of information is one of the core of supply chain integration, vertical supply chains for different public health programmes will make it a point of duty to ensure best practices are exported outside of the program. Above all, most respondents have expressed opinion that a unified centrally controlled system is going to be better in terms of performance than any vertical supply chain can hope to achieve on its own. This potential notion of improved supply chain performance and increased customer service is of great value and therefore a justification for public health supply chain integration, the respondents have so concluded.

4.3 CIRCUMSTANCES FOR VIABLE SUPPLY CHAIN INTEGRATION

There must always be an enabling environment for every idea to thrive. Likewise, for a seamless public health supply chain integration to thrive in the country, certain conditions must exist and continue to be sustained. The respondents' views in line with this truth are summarised below.

4.3.1 POLITICAL COMMITMENT

It is the opinion of the respondents that government political will is highly needed to establish and sustain public health supply chain integration in the country. The respondents all agreed that an enabling environment must first be created by the government to foster integration. Someone during the interview said, rather bluntly, "…*there cannot be integration without the government of the country's involvement"* This the respondents agreed the government has started it with the formulation of a Nigeria supply chain policy for pharmaceuticals and other health products in February 2016. The respondents state it now left for the government to show enough political commitment to back this policy and enforce implementation. The respondents argued that Nigeria probably has some of the best government policies in place, yet most of these policies are a mere decoration on the wall. Again, the respondents feared that lack of continuity in government policies is another factor that could slow the integration drive once a new administration come in place and do not share the vision of the current one.

4.3.2 FINANCIAL COMMITMENT

Like many low- and medium-income countries, Nigeria is facing fierce competition for its scarce resources and sometimes what directly benefits the masses are not given enough priority, some respondents have argued. The respondents expressed the opinion that for a viable public health supply chain integration, the government must show enough financial commitment to its course. The respondents claimed that presently, the funds that is piloting public health supply chain integration are largely donated by international partners like The Global Fund, however, if the integration practices must be sustained in the country, government, and its agencies at all levels

(Federal, State and Local government) must of a necessity make substantial financial commitments that should continue to drive integration practices.

4.3.3 STANDARD OPERATING PROCEDURES

Another sub-thematic area respondents expressed opinion on is the need for standard operating procedures (SOPs). Those who saw this as a need, stated that an SOP will help to streamline supply chain processes, define activities and their timelines, develop activity-specific job-aid and define roles and responsibilities. The respondents argued that this is necessary because public health supply chain integration involves many actors who before now have their different ways of carrying out logistics and supply chain activities and may also have different persons executing those logistics functions than may be obtainable under an integrated system, hence, there is need to establish procedures of how these activities should be performed and by whom.

4.4 MODALITIES FOR SEAMLESS SUPPLY CHAIN INTEGRATION

This section summarised the opinion of respondents on the four dimensions of public health supply chain integration: relationship management, information integration, product integration and coordination. These four dimensions were adopted from those of van Donk and van der Vaart's dimensions of supply chain integration with modifications.

4.4.1 RELATIONSHIP MANAGEMENT PRACTICES

Opinion of respondents on this, lean strongly on the ability to establish a set of common objectives that every actor especially those at policy and management level can buy into. They argued that since integration involves multiple actors from different backgrounds and possibly variety of interests, a set of objectives that can accommodate these differences in interest will be a good starting point to build relationship among actors. A respondent said "…*through a good relationship atmosphere, the fears, worries and concerns of actors are made bare and tackled collectively in a way that will be accepted by all"*

Respondents point to the fact that there are existing forums within and among vertical programs that brings together implementing partners to interact with one another internally and externally. These forums are called Technical Working Groups (TWGs). These forums can be an avenue to build new relationships and strengthen old ones among actors. These forums bring partners together to review supply chain activities and share best practices, some of the respondents have claimed.

Respondents have also expressed the opinion that activities such as joined monitoring and supportive supervision visits and capacity building trainings for supply chain staff will strengthen relationships among actors. The respondents noted that aside cost savings to implementing partners, carrying out these join activities will further unite the actors and build trust for collaboration on more complex integration practices. Respondents added that a strong relationship build trust and trust in turn will facilitates collaboration on any task between actors.

4.4.2 INFORMATION INTEGRATION PRACTICES

Respondents started by saying that trust among actors will make sharing of information easy to achieve. A respondent said that "…*information is so critical to the success of supply chain, just as humans cannot survive without oxygen and is the first deliverable in an integrated supply chain"* Even though different actors may require different information from a logistics system,

respondents all agreed that there are more similarities in the kind of logistics data required by different partners than there are differences. Therefore, it becomes easy to integrate information among vertical supply chain systems.

First and foremost, respondents argued that there is need for all actors to agree on the basic and essential logistics data needed to arrive at an informed logistics and supply chain decision for the public health system. When that is achieved, a simplified logistics management information system (LMIS) and its tools can be developed to replace the vertical ones being operated by different programmes. Finally, the reporting timelines can be harmonised to have all programmes report logistics information at a defined period. Respondents conclude by saying that without this harmonization in logistics information flow, there cannot be any integration.

4.4.3 PRODUCT INTEGRATION PRACTICES

Respondents are of the opinion that because pharmaceuticals and other health products are different in nature and use, hence, there is need to consider each product according to its peculiarity. A respondent maintained that "*we have to embark on this (meaning, product integration) carefully and cautiously or else we stand to lose everything we hoped to gain in the first place...*" Respondents assert that because of these differences in the nature of the products, some products such as vaccines and laboratory items require cold or cool chain storage and transportation and therefore need special storage and transportation conditions than other products. Based on this scenario, respondents argued that integration must take note of these special requirements with some of the products it intends to integrate to ensure that the six rights of the customer is not comprised by pursuing a blanket integration that does not consider categorization of products according to special requirements.

Further still, respondents have recognized the fact that vertical supply chains in the public health sector serve a unique patient category with different product demand variability. Respondents agreed that products need to be grouped with this demand variability in mind so as not to compromise the six rights of the customer we are hoping to serve under integration.

Therefore, respondents suggested the fact that products should be according to the above differences as either products with special storage and transportation requirements such as vaccines and laboratory products or products with high demand variability such as malaria products versus products with very predictable demand like vaccines and essential medicines or products with short half-life such as anti-retroviral drugs and some laboratory items. According to respondents in this study, there could be three products category that integration could look at: based on special handling requirements, based on demand variability, and based on shelf life or system that will deal with all three scenarios so as not to achieve supply chain performance at the expense of customer service.

4.4.4 COORDINATION PRACTICES

Most of the respondents claimed that coordination is probably the centre piece that hold other supply chain integration practices together. A respondent alludes that "…*the impetus and momentum of integration rest on skilful art of coordination*" Respondents claimed that coordination defines and regulate supply chain activities among actors and by so doing provide leadership for supply chain integration. Respondents agreed that this leadership role must be played by the government to ensure that the vision and objectives of public health supply chain

integration is maintained. Through coordination, the government can serve as a link between the different actors and the channel for communication. This coordination role, respondents agreed, is what the logistics management units in the various states are meant to achieve. Conscious

4.5 DISCUSSION

To discuss the findings of this research, the discussion has been structured under the main aim of this research study which is to examine modalities for integration of vertical public health supply chain systems and develop a practical contextual framework for the integration.

Applying the insights from the data obtained through semi-structured interviews and review of related literature, the researcher has identified areas of possible integration for vertical public health supply chain systems in the country. To have a holistic understanding of the journey to the integration of public health supply chain systems, the researcher has utilised three (3) minor research questions to make the deductions from the main research question more authoritative and valid. Hence, in discussing these findings, the information revealed from the three (3) minor research questions (i.e. (i) what the benefits and challenges of integration are; (ii) what degree of integration is justified; and (iii) what the circumstances under which viable integration can take place) will be embedded within the focus of the research study.

This research study has revealed four (4) modalities to achieving seamless integration of public health supply chain systems in the country; these modalities are also corroborated in the literature and were referred to as dimensions of supply chain integration or integration practices (Lee, 2000; van Donk and van der Vaart, 2005). These modalities if implemented alone in the pursuit of supply chain integration will result in a tailored integration, however, when they are implemented in harmony such that one leads to another in a continuum, the result will be a fully integrated supply chain system.

The first modality to achieve a tailored integration in public health supply chain system is termed *coordination.* Coordination as a dimension of public health supply chain integration tie together the loose ends of the whole process of integration. Respondents have agreed that coordination as a supply chain integration practice provides leadership role that steer and hold all actors accountable for their supply chain responsibilities to the whole system. This fact has also been corroborated in supply chain literature that leadership is the single most influential factor to achieving a successful transformation (Lambert and Cooper, 2000; McAdam and McCormack, 2001). To further strengthen the role of leadership to achieve set goals in an integrated public health supply chain system, Robinson and Malhotra (2005) have argued that leadership is also important in not only providing direction and guidance but also need to encourage participation of actors that form the integrated supply chain network. According to respondents, this leadership role falls naturally on the logistics management units (LMUs) located in the ministries of health in the states. It is also true that LMUs can serve as a link and communication channel between stakeholders through dissemination of information. The LMUs can also make sure that all actors abide by the SOPs that govern supply chain activities in the country. Now, there is no such SOPs that exist except the ones being used by vertical programmes. However, the respondents have expressed strong opinion of the need for a SOPs that will clarify roles and responsibilities, define supply chain activities and their timelines, and develop job-aid to ensure standardization and reproducibility of functions throughout the whole supply chain network.

Secondly, *relationship management* has been identified as a supply chain integration practice or dimension of supply chain integration and therefore as the first modality towards achieving tailored integration of public health supply chain systems. The public health supply chain being a network of interconnected organisations or actors with possible functional and organisational barriers, need to be carefully managed into wholesome unit to deliver public health supply chain that performs and continuously improve in its processes as well as ensure the six rights of the customer. To implement a supply chain relationship management among such actors, there is need for a clear understanding of the objectives and goals of actors making up the supply chain to come up with a vision that will guide the behaviour of actors within an integrated supply chain system (Christopher, 1996).

Furthermore, a good and functional relationship is the basis for earning the trust of partners in a system that is made up of multiple actors to come together and collaborate on a shared vision such as ensuring the commodity security of the customers it serves. This trust can lead to breakdown of existing functional and organisational barriers that hitherto constitute a challenge to a seamless integration of public health supply chain system (USAID | DELIVER, 2011).

Also, respondents have identified collaboration on supply chain activities to strengthen relationships among actors. Such activities as monitoring and supportive supervision visits (MSVs) to SDPs, joined training and capacity building activities such as on-the-job training will not only contribute to cost savings for actors and hence achieve value for money for donors, but will establish stronger relationships and confidence in one another (Cooper et al, 1997).

Thirdly, *information integration* is another supply chain integration practice or dimension and hence the second modality for attaining tailored integration of public health supply chain systems. Information is at the heart of every functional logistics and supply chain system; and just as it has been stated that 'No product? No program! (Hart, 2004) Likewise, it is also true that No information? No product! Quality information will lead to efficient supply chain decision making which in turn will lead to meeting the six rights of the customer which is the goal of every logistics and supply chain system. According to Zhou and Benton (2007) quality of information and its delivery positively influences the level of performance of a supply chain. This corroborate the three attributes of a quality information in the context of a public health supply chain system, which are: accuracy, completeness, and timeliness. Respondents argued that a simplified LMIS is needed as a platform to create visibility of such quality information to all stakeholders to guide informed decision processes. This fact was also corroborated by Zhou and Benton (2007) when they argued that the "level of effective supply chain practices increases as the level of information sharing increases". However, the only challenge when it comes to information integration is the reality that all vertical programmes and their supply chains have different reporting period that is tight to their resupply cycles. Hence, information is directly related to ordering and resupply of pharmaceuticals and other health products. Therefore, achieving information integration by harmonizing data review and reporting cycles will facilitates product integration.

Lastly, *product integration* as a tailored public health supply chain integration strategy is another dimension of supply chain integration that respondents have claimed presents a lot of opportunities for integration public health supply chain systems in Nigeria. At present, vertical programs and their supply chains each provides a storage and transportation arrangement for

their products. This amount to so many funds being spent on storage and transportation facilities that are not being used up to their optimum capacity. Therefore, bringing these vertical supply chains under one roof in terms of product storage and transportation will bring a lot of savings in fixed costs of infrastructure, fleet maintenance and can also improve good storage practices of these programmes as well as improve transportation efficiency (Yadav et al, 2014). However, product integration must be undertaking with caution to ensure that the benefits of such integration outweigh the cost of doing so (Raja et al, 2000). Therefore, on the other hand, product segmentation needs to be considered according to demand variability (uncertain demand Vs predictable demand) e.g., Essential medicines, Malaria products on one side and anti-cox, reproductive health, Vaccines and Anti-Retroviral Treatment (ART) on the other side. On the other hand, product could be segmented based on special storage and transportation requirements for instance, vaccines and certain laboratory products that require cold or cool chain, on one side, or their shelf life such as ART and laboratory items that normally have about two years or less, on the one side (Allain et al, 2010).

Therefore, there is no 'one size fit all' when it comes to integration of public health supply chain systems. Rather, the degree of integration needs to be justified by doing a careful cost-benefit analysis of the scenario to be adopted (Kearney Inc., 2004). According to Allain et al (2010) integration at the level of warehousing and distribution can bring about substantial savings in overhead and operating costs. However, respondents expressed a concern that bringing together this massive quantity of pharmaceuticals and other health products under one roof will require huge initial investments in warehousing facilities for central storage as well as overhauling the stores at the SDPs to accommodate all the products and other health commodities within a given review and reporting period. These are government owned facilities which have suffered many years of neglect because of low political and financial commitment to the health sector in general.

In conclusion, I would like to propose a practical contextual framework for a seamless integration of public health supply chain system (see Figure 1, below). As earlier stated in the above discussion, the four dimensions of public health supply chain integration will each provide a tailored integration. But an integrated public health supply chain is a continuum, and all the dimensions or modalities of the integration must fit correctly into the continuum (Yadav et al, 2014). When all these dimensions of public health supply chain integration act in synergy, a continuum is created that ensures a seamless integrated public health supply chain system. However, other elements need to be present to bind this continuum of integrated supply chain firmly to ensure resilience, performance and six rights of the customer. First, there is need for logistics management unit to coordinate the action of various actors and provide leadership as discussed above. Secondly, there is need for supply chain staff with requisite knowledge and capacity of procurement and supply chain management that will operate the system. Without an adequate and qualified human factor, the system will fall apart. Thirdly, are finances; without financial backing to embark on the business of coordination and leadership, it becomes impossible for the integrated supply chain continuum to stay together. Finally, there is need for monitoring and controlling between the four components of the dimensions of public health supply chain integration. Monitoring and controlling will ensure that supply chain activities are being undertaken as specified in the SOPs and there are opportunities for continuous improvement.

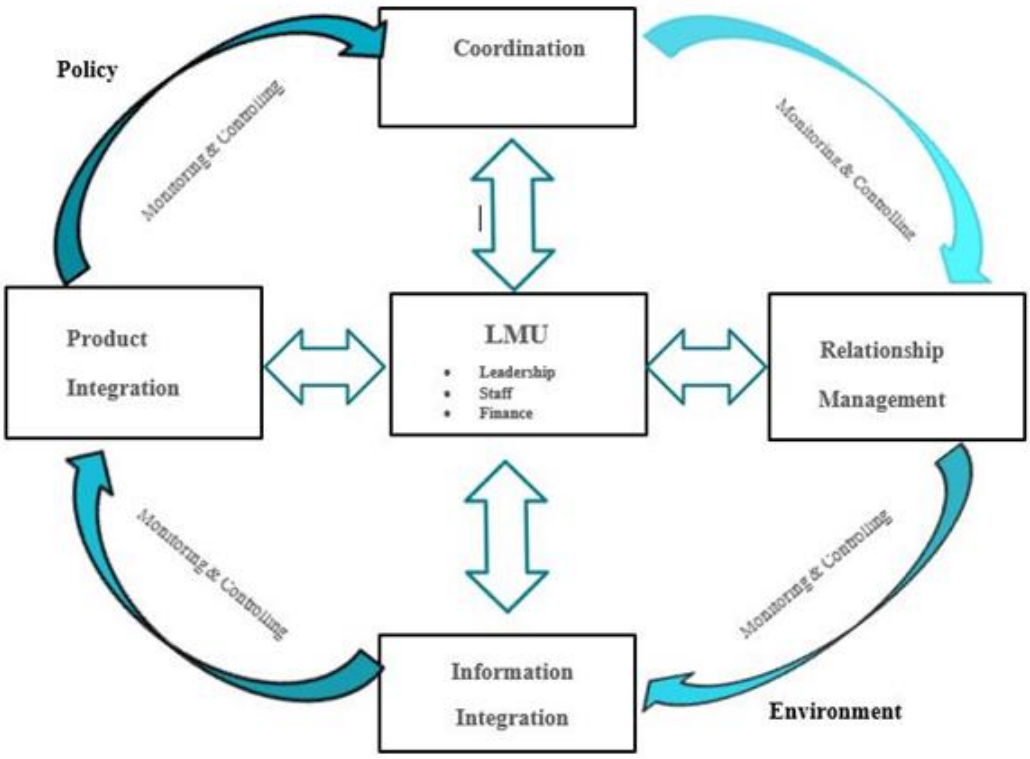

Figure 1: The continuum of integrated public health supply chain system

Also, very important in the success of any continuum of integrated public health supply chain system, is the policy that established such a system and the political will that is backing it. Without such a policy or in the event of policy change, the integration momentum will die altogether. Another important external factor is the environment within which integration is being pursuit. Environment here refers to both the political and socio-cultural factors prevalent in the country. For instance, in the event of any political instability or political unrest, not only integration but every program will be affected.

5.0 CONCLUSSIONS AND RECOMMENDATIONS

The researcher's aim here is to summarise key points from the findings and to demonstrate how these findings have answered the research questions that the study starts out to answer in the first instance, and as well-provide recommendations for further research.

5.1 CONCLUSSIONS

This research study has presented the findings of constructivism and interpretive philosophical approach which has led to the adoption and use of dimensions of supply chain integration and developed a practical contextual framework in which these modalities for supply chain integration can be used in a continuum to achieve a seamless integration of public health supply chain system.

In this research study, the researcher sought a better understanding of the benefits and challenges of public health supply chain integration, the justifications for degree of public health supply chain integration being pursued and the circumstances under which viable public health supply chain integration will be possible. This approach has provided a comprehensive and holistic view of the subject of public health supply chain integration that was not available in supply chain literature before now. Before now, there has been pockets of studies that either consider integration of vaccines supply chain with other public health supply chain systems (Allain et al., 2010); HIV/AIDS supply chain with other public health supply chain systems (Ibegbunam and McGill, 2012); family planning and HIV integrated supply chain (USAID | DELIVER PROJECT, 2010). This is the first time a practical step by step contextual framework is being proposed that will seamlessly integrate all public health supply chain systems within a country.

Firstly, this research study has found out that there are four possible modalities or tailored integration of vertical public health supply chain systems available. These modalities or tailored integration of vertical public health supply chain systems include relationship management, information integration, product integration and coordination. These modalities also known as dimensions of supply chain integration has been corroborated in the literature by the works of Lee, (2000) and van Donk and van der Vaart (2005). Those four tailored integrations have benefits and challenges, justifications, and circumstances for their implementations. However, when the four modalities interact in a continuum, it gives rise to a total integrated public health supply chain system.

Secondly, this study has found that despite teaming challenges in operationalising integration, the benefits far outweigh the costs. This serves as the justification for embarking on total integration of public health supply chain system in the country. Among other things, the study has found that mere perception of ownership of the processes (logistics functions) and outcomes (e.g., logistics data repository) by the government, hence, ensuring the future sustainability of the entire public health supply chain system is among the strongest justification for integration. The study, in addition, has found that ownership brings about PSM capacity development in the public health supply chain, which is currently a major gap, especially at the SDPs. This lack of PSM capacity at the SDPs has been the cause of expiries, damage, and waste of pharmaceuticals and other health products worth millions of US Dollars yearly.

Thirdly, the study has revealed that for viable integration to occur and be sustained, there is a need for political and financial commitment on the part of government and its implementing partners. There is no doubt integration brings about costs savings by eliminating duplication of roles from donors, economies of scale in pull procurement and transportation and joined warehousing (cf. Cooper et al, 1997; Yadav et al, 2014). However, the study concludes that initial massive investment in infrastructure such as in warehousing to accommodate all pharmaceuticals and other health products is needed. This underscores the need for financial

commitment from government and its implementing partners. Aside this initial investment in infrastructure, there is need for adequate funding of supply chain leadership activities to coordinate the action of various actors.

Fourthly, it was found that for attainment and sustainability of supply chain performance and meeting the six rights of the customer, there is need for a logistics management unit that will provide supply chain leadership and coordinate the action of various actors to achieve common goals of integration. The importance of supply chain leadership over supply chain management was also reported by Sharif and Irani, (2012). In their submission, they emphasised the need for more supply chain leadership capabilities by managers as the most influential key to transformation. In this study, the logistics management unit that is well funded and manned by qualified supply chain experts can naturally fit into this role.

5.3 RECOMMENDATIONS

The recommendations below are offshoot of the findings of this study: The first recommendation is for scholars interested in the field of public health supply chain integration. Further research needs to be conducted to quantitatively assess the benefits of integration by measuring performance indicators such as lead time, stock outs, expiries, distribution efficiencies, order fill rates before and after. Also, further studies are required to evaluate more the impact of public health supply chain leadership capabilities by supply chain managers as against emphasising excellence in supply chain management skills. There is need for this kind of study to be conducted using large sample size and data collected using focus group discussions to allow for debate on differing views. Finally, detailed research studies may be conducted to explore the applicability of the contextual framework of the integrated continuum of public health supply chain system proposed in this study.

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