

ADDIS ABABA UNIVERSITY

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**DEPARTMENT OF LOGISTICS AND SUPPLY CHAIN
MANAGEMENT UNIT**

**THE EFFECT OF COLD CHAIN LOGISTICS PRACTICE ON THE PERFORMANCE
OF HUMANITARIAN ORGANIZATIONS: THE CASE OF MEDECINS SANS
FRONTIERES (MSF)**

**Thesis submitted to AAU school of commerce Department of Logistics and Supply Chain
Management in partial fulfilment of requirement for a degree of Masters in Logistics and
Supply Chain Management**

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Advisor: Matiwos Ensermu (PhD)

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Addis Ababa, Ethiopia

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DECLARATION

I hereby declare that this thesis entitled “*the effect of cold chain logistics practice on the performance of humanitarian organization: the case of MSF Holland*” submitted as the partial

fulfillment of the MA in Logistics and Supply Chain Management has been carried out by me under the guidance and supervision of Matiwos Ensermu (PhD). The thesis is original and has not been submitted for the award of any degree or diploma to any university or institutions to the best of my knowledge.

Student researcher

Kifle Teshale

Signature Date

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CERTIFICATE

This is to certify that the thesis entitled *“the effect of cold chain logistics practice on the performance of humanitarian organization: the case of MSF Holland”* submitted to AAU

school of commerce Department of Logistics and Supply Chain Management research work carried out by Kifle Teshale, under my guidance and supervision. Therefore, I hereby declare that no part of this thesis has been submitted to any other university or institutions for the award of any degree or diploma.

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Dean, Graduate studies

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Date

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and Date

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and Date

External Examiner Signature

ACRONYMS

CCL: - Cold Chain logistic

DDL: - Digital Data Logger

IT: - Information Technology

LN: - Liquid Nitrogen

MCM: - Medicines sans Frontiers

NGO: - Non-Governmental Organizations

SPSS: - Statistical Package for Social Science

TMD: - Temperature Monitoring Device

TSSP: - Temperature Sensitive and Perishable Products UNICEF: -

United Nations International Children's Emergency Fund WHO: -

World Health Organization

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Abstract

The purpose of this paper is to examine the effect of cold chain logistics practice on the performance of humanitarian organizations: the case of MSF Holland. The study identified four independent variables namely, shipment of cold chain items, distribution and transport, storage condition and technical capability of employees are the defining variables while performance of MSF is dependent variable of the study. The study used mixed research method which means both qualitative and quantitative method of conducting research were used in the study. Quantitatively the data were collected through distributing questionnaires for MSF Holland employees who are directly engaged in cold chain logistic practice and organizations that works closely with MSF Holland, qualitatively data was obtained through conducting interview where eleven interviews were made by the researcher. A total of 201 questionnaires were distributed through purposive sampling techniques and 185 were returned back which represents (92%) of the responses. Furthermore, the data collected was analyzed descriptively where frequency, mean and standard deviation were used to quantitatively describe the data, correlation analysis was done to show how much the dependent and independent variables are related and regression analysis was also used to understand the extent of the effect of the independent variables on the dependent variable. More importantly, the study revealed that all the independent variables of the study have positive and strong correlation with the dependent variable which means that the existence proper management of those variables in humanitarian organizations like MSF Holland has a positive effect on their performance while the nonexistence or miss handling of those independent variables of the study negatively affect their performance. Adding to this, the regression analysis signified that the four independent variables of the study have 96.3% of variation on the dependent variable and based on this and descriptive statistics results, the research provided some recommendation in which it is considered as vital. Humanitarian organizations like MSF must work collaboratively with government and other stakeholders to create skillful and professional employees who can monitor and supervise the cold chain shipments process, trucks, vans, and other primary modes of transportation for this process. Specifications necessary to transfer packages must be fulfilled and a storage facility where all necessary variables like temperature, scheduled maintenance to keep systems running and keep cold chain items in good condition should also be prepared.

Key words: Shipment of cold chain, Transportations, Storages, Technical capacity, performance

CHAPTER ONE

INTRODUCTION

1.1. BACKGROUND OF THE STUDY

The logistics industry has grown significantly over few decades which has brought with it different innovations and evolutions in the way it is practiced as well as equipment and infrastructure that is used to transport and store products. It dates back in 1700's when British fisher men used ice to preserve their fish from being spoiled that cold chain emerged (IATA Cargo Data, 2019). Cold chain logistics is the management and process flow that enables the safe and effective transport of temperature sensitive items and products along a supply chain with the right temperature and humidity requirement (Marine insight, 2021). Cold chain is a low temperature-controlled supply chain, it takes a chain of coordinated processes from production up to consumer's premises to transport, store and manage this temperature Sensitive products (WHO vaccine module, December 2020). These days, cold chain logistics is an important part of any modern successful supply chain practice especially for those humanitarian organizations which are engaged in transporting sensitive lifesaving materials.

Different products which are labeled perishable use cold chain systems like some food items, pharmaceutical drugs, biological samples and specimens, beverages and etc. with better standard of living in that of the developed world people are aware of the quality and the need to get those products fresh. Not every product has to be kept at very low or sub-zero temperatures; some of them need storage and transport at ambient temperature to preserve their texture and quality like for instance some drugs or Biological.

According to CDC, basically there are three elements to be considered for vaccines and biologics and/ or pharmaceutical drug products to be handled i.e. well trained staff, the right equipment and standard working procedures (CDC, cold chain protocol, 2013). The cold chain logistics practice in our country puts forward different challenges on the day-to-day activity of Humanitarian organizations in providing support to our community. Especially these days our country is in a very distressful situation which adds to the existing problems in reaching the intended communities in need. Humanitarian organizations spend 80% of their fund in logistical activities Wassenhove (2006) therefore, their performance depends on how well organized their logistics management is

doing. Furthermore, stakeholders who involve in the clearance and which provide permits lack trained manpower and awareness how sensitive those items are for the normal operation of humanitarian organizations and tend to treat them as commercial items. Due to the statement above, studying the effect of logistics activities on the performance of humanitarian organizations is very critical to the very existence of those organizations which provide humanitarian assistance to distressed communities Wassenhove (2006).

1.2. BACKGROUND OF THE ORGANIZATION

MSF (Médecins Sans Frontières, a French word or in its English translation Doctors without borders) is an international independent medical non-governmental French origin humanitarian organization which is known for its projects in conflict zones and in countries affected by endemic diseases, disasters, or exclusion from health care. MSF was officially founded on 22 December 1971 with 300 volunteers who are doctors, nurses and other staff including the 13 founding doctors and journalists. The action of MSF is guided by medical ethics, and the principles of impartiality, independence, and neutrality. According to MSF activity report 2020, there are around 65,000 people composed of doctors, logistics personals and other administrative support staffs from 140 countries where 80% of the staffs are locals. MSF was able to raise € 121 million and the allocated budget in ten countries for 2020 was € 550 million of which around 55% was allocated for conflict affected African countries like DRC, South Sudan, Nigeria, and the like. MSF has been operational in Ethiopia since 1984 and referring to 2020 activity data there were 79,600 outpatients, 6360 admitted to hospital, 5120 individual mental health consultations, 4010 births assisted, and 38 children were treated in inpatient feeding program with 846 local staff and 45 international staff and € 15.7 million was allocated for the activities.

In order to perform the above MSF imports medical products and supply from its own European supply centers with an objective of operational effectiveness and qualitative requirements which is strict and considers that it is the moral responsibility of the organization to control the same. However, according to existing experience, sometimes MSF is not authorized to import the medical products. In this case it is the responsibility of the National Drug Authorities to assure the quality of the drugs in our countries case the authority will be FMHACA (Food, Medicine and Health care Administration and Control Authority). The authority formerly known as Drug Administration and control Authority, the whole objective of the Authority is to regulate the

country's pharmaceutical sector in an environment vulnerable to drug smuggling and circulation of standard medicines.

1.3. STATEMENT OF THE PROBLEM

Mainly Humanitarian organizations are composed of three major departments depending on their objectives (in this case MSF): the doctors' who are responsible for treating patients, Logisticians who are responsible for the supply and movement of human resource and equipment from place to place and last but not least Administration people. Movement of life saving materials is affected by or depends on different factors like: the presence of temperature-controlled transporting mechanism whether locally or internationally which includes packaging, transporting and in general handling mechanisms. Furthermore, the swiftness of responses from different stake holders for instance FMHACA, the customs office in which the shipment is to be cleared from and lack of awareness of transporters in handling the shipment they are transporting are the major setbacks Zhen (2007).

The researcher made a preliminary study on what are the challenges and practices which hinder the performance of different humanitarian organizations engaged in a similar type of humanitarian activities as the one under study (MSF, Medicine Sans Frontiers). The nature of items imported makes it difficult for them to comprehend the trouble they face while clearing and transporting.

Moreover, the life span of the items makes it even more challenging; these items are classified in to four (4) in kind reagents, vaccine, medicaments (biologics) and blood bank packages. According to the study made different incident have been observed, like reagents being expired for taking too long to clear the items from the customs premises, vaccines being exposed to light while transportation, stay long in customs check points where the officers needed to recheck what their colleagues at some point gave consent and provided a permit and medicaments and blood storage tanks where the package needs to be intact being checked up on without proper precaution. There are four situational factors affecting humanitarian logistics such as environmental, governmental, socioeconomic, and infrastructural situational factors Kunz and Rainer (2012) and Beyene (2018).

The Customs commission had adopted an electronic single window system (ESW) to facilitate clearance process in April 2020 with the help from the World Bank group. The ESW systems helps connect 16 major cross boarder regulatory agencies and avoid presenting a paper-based clearance process which is considered to minimize clearance times and avoid unnecessary

demurrage and/

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or storage costs. Even if Technological support (ESW) system is adopted importers and exporters are still facing the same kind of problem as before its adoption. Customers (Importers and exporters) are still requested to appear in person to clarify issues and follow-up as documents are presented through the system. These issues make the service even very poor by extending the clearance time of goods specially those goods which require special attention requiring cold chain. Due to the statement above, those imported reagents, medicaments, vaccines, and blood samples will directly be affected and get destroyed Rogie (2012).

According to Kovacs (2011), there are lots of problems in relation to cold chain practice where the most expensive medical supplies and vaccinations became invalid and turned down to garbage without using them for proper and appropriate purpose, this is because of the existence of lack of knowledge and proper implementation of managing, transporting and distribution of cold chain logistic practice, hence, the problem becomes rampant in developing nations and third world countries where there is knowledge gap which is considered common.

Eilers (2005) states that the existence of problems in relation to cold chain logistic practice may even lead the world to spend extra billions in expenses for the countries even though the majority of the third world nations receive medical supplies in the form of aid or donation from developed nations. But these nations might also want to quit their donation when these problems are not improving, thus critical observation of the problem is needed and scholars in these areas must examine the problem and suggest possible solutions.

There have been different research's on the issue of challenges and performances of humanitarian organizations separately; nevertheless they did not specifically discuss the effect of cold chain practice on the performance of humanitarian organizations. In addition to this, as temperature controlled materials are very sensitive to handle studying the practices which affects performance of humanitarian organizations like MSF is found to be important by the researcher.

1.4. OBJECTIVES OF THE STUDY

1.4.1. General objective

The general objective of the study is to examine the effect of cold chain logistic practice on the performance of Humanitarian organization, the case of MSF Holland.

1.4.2. Specific objective

- To explore the effect of shipment of cold chain logistic practice on the performance of MSF Holland.
- To examine the effect of distribution of cold chain logistic practice on the performance of MSF Holland.
- To analyze the effect of warehousing cold chain logistic practice on the performance of MSF Holland.
- To explore the effect of technical capacity on cold chain logistic practice on the performance of MSF Holland.

1.5. RESERARCH QUESTIONS

- What is the effect of shipment of cold chain logistic practice on the performance of MSF Holland?
- What is the effect of distribution of cold chain logistic practice on the performance of MSF Holland?
- What is the effect of warehousing on cold chain logistic practice on the performance of MSF Holland?
- What is the effect of technical capacity on cold chain logistic on the performance of MSF Holland?

1.6. SCOPE OF THE STUDY

The study is conceptually limited to cold chain logistics practice and its effect on the performance of humanitarian organization: the case of MSF Holland, hence in the study the researcher set independent variables which are critical to display cold chain practices and dependent variable performances of MSF which is vary depending on the independent variables.

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The topic is chosen as a result of the existence of the problem, since cold chain practice is sensitive activity where the increase of the performance in cold chain management helps to support the needy people who eagerly demand the products while the vice versa has multiple effect on the life of the people.

Geographically, the study was limited to MSF Holland, an organization engage in humanitarian service, and which is located in Addis Ababa. Different branches of MSF were also considered indirectly as sources of information for the study. The study couldn't reach the all-humanitarian organization department that does not require any cold chain supply.

1.7. LIMITATION OF THE STUDY

The study had some methodological limitation where the research is focused only on MSF Holland, an organization engage in humanitarian service, the findings, conclusion and recommendation of this research might not appropriately work and fit for other humanitarian organizations, moreover, the study used mixed research where numerical trends and patterns and people's perception, attitude and ideas had investigated and methodologically the study limited to collecting data through questionaries' and interview and observation of cold chain practice couldn't include the methods of data collection where it gives clear image on the practice of it, and due to different reasons the findings solely works for the MSF Holland.

Geographically, due to time and money constraints the research focus on MSF Holland, thus within this limited area of the study the findings would not work for other similar humanitarian organizations found in other places.

1.8. SIGNIFICANCE OF THE STUDY

This study supports MSF Holland and other humanitarian organizations which are operating in this cold chain supply practice. The research had to identify factors which impede the performance of MSF in practicing cold chain practice, hence, the study will enhance the

organization to fulfill the demands of customers or beneficiaries by identifying obstacles in delivering cold chain supply, and the research will also give advantage for humanitarian organizations which are engaged in cold chain practice to improve their organizational responsiveness. Moreover, the study is significantly helpful to understand the critical aspect areas or issues which needs to be solved in

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order to make the cold chain practice more efficient and effective where this cumulatively supports the organization's performance.

1.9. DEFINITION OF KEY TERMS

Cold chain logistics: - is the transport of temperature-controlled goods, such as temperature sensitive foods, beverages, and bio-pharmaceutical products.

Medicines' Sans Frontiers: - is an international Nongovernmental organization operated in Ethiopia, commonly known as Doctors without borders.

Temperature Sensitive and Perishable: - Products are products which usually be kept at a specific temperature to avoid growing bacteria, perish or destroyed.

Non-governmental organization: - voluntary group of individuals or organizations, usually not affiliated with any government, that is formed to provide services or to advocate a public policy, MSF.

Humanitarian Organizations: organizations which aimed to give aid service for those who are suffering in diversified reasons, like famine and disaster.

1.10. ORGANIZATION OF THE STUDY

This study organized in five chapters where chapter one discusses the on the introduction of the study, background of the study and the objectives, research questions of the study. Furthermore, the scope, limitation and significance of the study were also discussed. The second chapter considers or includes theories related to the research topic, publications, and literatures. In addition to this the chapter included previous studies conducted on the issue and the conceptual framework of the study. Third chapter is focusing on the research methodology used; the collection of data, sampling used, sources and instruments of data collection and method of data

analysis discussed in detail. Adding to this the plan to check the validity and reliability of the study would also include. Chapters four consists of data interpretations, analysis, and discussion. Finally, the last chapter provide the finding and conclusion and recommendation of the study together with ideas for possible future study to be conducted on the subject matter.

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CHAPTER TWO

RELATED LITERATURE REVIEW

2.1. INTRODUCTION

This chapter reviews relevant literature on the key areas that the study covers. It presents related theoretical literature with a focus of on the objectives and theoretical thresholds of this study. It also reviews related empirical literature, conceptual framework, and literature gap.

2.1.1. Cold Chain Logistics

In supply chain process, cold chain refers to a systematic logistics program, where temperature sensitive products are always delivered and kept in the cold (low temperature) environment in the whole process, for example: storage, production, transportation, distribution, and marketing to ensure quality & safety, quick delivery and reduced wear and tear of logistics. Usually, cold chain depends on four aspects of frozen storage, frozen processing, refrigerated transportation and distribution, and finally frozen sales Zhang (2007). Typically, cold chain products (temperature sensitive products) include fresh food, dairy products, vaccines, blood etc. Bo & Danyu, (2009) and Mohan et al. (2017) some foods such as some species of fish need difficult and rigorous meat processing, warehousing, and transportation to guarantee their freshness and quality. Due to the high-end consumers, this guaranteed fresh quality is very important. Cold chain is a complete supply chain, which ensures that the core needs or requirements of maintaining cold (low) temperature environment for the reason to safe and maintain quality of perishable foods. Cold chain requires huge investment and special treatment as compared to normal logistics systems.

According to Rodrigue (2013), the main purpose of the cold chain is to protect the integrity of temperature sensitive and perishable products (TSPP) from the point of production and processing, through each of the transport stages handling, loading, unloading, and storage and may even extend to storage at the consuming household. In addition, Salin and Nayga (2003)

explore a value-based concept of the chain and assume that the cold chain preserves value and as such is a necessity for the global food trade.

According to Rodrigue (2013) a cold chain is a science, a technology, and a process. i.e. Science because of the requirements for understanding of chemical and biological processes concerning

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perishability. Technology, as it relies on physical infrastructure and software in order to ensure the proper temperature conditions along the chain. Process, for it involves a series of logistics activities. The successful alignment of these elements of the cold chain is crucial.

Cold Chain logistic (CCL) encompasses all the processes and equipment needed to ensure proper temperature-controlled environment. It includes all activities related to temperature control logistics services within production, processing, packaging, storage, transportation, distribution, retail display and household refrigeration of TSPP Aung & Chang (2014) Casper (2007). The CCL and in particular the food transport refrigeration is considered to be a critical link in the food chain and has to be managed with the relevant importance Manzini & Accorsi (2013) Tassou, De-Lille & Ge (2009).

The generic CCL process includes pre-cooling and cold storage in the production, processing, packaging and cold storage in the production unit, storage during the distribution and by the consumers, and refrigerated transportation in between the different participants in the chain Joshi, Banwet, & Shankar (2009). According to Rodrigue (2013), the high level of control throughout all

the stages is essential for the temperature integrity. In this respect, vertical integration is a common strategy in the food industry. Moreover, the shipment integrity depends on operations such as the shipment preparation, modal choice, customs procedures, the last mile transportation and quality assurance. Therefore, taking into account the TSPP characteristics, its routing weather conditions, cost/perishability ratio, time for customs inspection, final storage delivery and quality control are very important for the integrity of the shipment. All of these processes have a high risk of integrity breach, and therefore require special attention Rodrigue (2013).

2.1.2. Cold Chain Equipment's for Keeping Temperature

Dry Ice

The success of industries that rely on the cold chain comes down to knowing how to ship a

product with temperature control adapted to the shipping circumstances. Different products require different temperature level maintenance to ensure their integrity throughout the movement process. If a shipment needs to be frozen, then an efficient way of providing a sub-zero atmosphere is to use dry ice with the packing materials. Dry ice, which is solid carbon dioxide, is about -80°C and is capable of keeping a shipment frozen for an extended period of time. It is safe to use with the

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shipping of pharmaceuticals, dangerous goods, and foodstuffs. Prices can range, but the amount of dry ice needed increases with the size and duration of the shipment. (WCSOP, 2005).

Some problems do exist with using dry ice to freeze shipments. First, the extreme temperature of the blocks of dry ice can burn human skin on contact, requiring the use of gloves or protective wear when handling the blocks. Secondly, dry ice does not melt, instead it sublimates when it comes in contact with the air. On average, if left in the open air it will dissipate at a rate of one pound per hour. Also, as it releases carbon dioxide gas it takes away the oxygen in the air, making it unsafe to ship with live animals or to store in a poorly ventilated truck or cargo holds. Sealed containers also cannot be used to transport dry ice because the pressure created by the carbon dioxide will cause the vessel to break. (WCSOP, 2005)

While using dry ice as a temperature control does provide an efficient way to transport frozen materials along a supply chain, the health risks and sublimation rates that characterize the substance also make monitoring the shipments a major issue. Depending on the size and the shape of the shipment, routine checks along the supply route must be performed to ensure that the dry ice has not dissipated beyond its necessary level. This requires logistical coordination at the major nodes of the cold chain. Before export, during any transfers, upon arrival and before the final delivery are all crucial parts of the supply chain where the dry ice levels must be checked. If at any of these instances the levels are found to be low or the dry ice has completely evaporated, various measures must be taken to try and maintain the integrity of the shipment. Cleland (1996).

The product being shipped is a major factor, while some food stuffs or pharmaceuticals shipments have been tested and are proven to be able to handle certain temperature variations, other clinical studies or medicinal shipments may be completely ruined by even a minor temperature variation. Thawing and refreezing a product could cause irreparable damage and end up costing those involved considerable time and money. Contingency plans and organization

between the shipper, recipient and the travel coordinator help to limit these instances and prepare handlers on how to deal with situations where the dry ice needs to be replenished. Eilers (2005).

Being able to ensure that a shipment will remain frozen for an extended period of time comes down largely to the type of container that is used. Factors such as duration of transit, the size of the shipment and the ambient or outside temperatures experienced throughout its passage are important in deciding what type of thermal packaging is required. Two categories that classify

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these containers are validated and pre-qualified. Validated packages are those that have been specifically tested to transport a certain product under controlled conditions and have accomplished this consistently. Pre-qualified on the other hand, are packages that offer a specific temperature range, but are not tested for a specific product. Heinze (2007).

Gel Packs

In pharmaceutical and medicinal shipments, large portions are classified as chilled products which mean they must maintain a temperature range between 2 and 8°C. Staying within this temperature is vital to the integrity of a shipment along the supply chain. Any excursions can result in irreparable and extremely expensive damage. The common method to provide this temperature is to use Gel Packs or packages that contain phase changing substances that can go from solid to liquid and vice versa to control an environment. Depending on the shipping requirements, these packs can either start off in a frozen or refrigerated state. Along the transit process they melt to liquids, while at the same time capturing escaping energy and maintaining an internal temperature. They are not dangerous to handle like dry ice and can be purchased much easier. James (2006).

The problems that are presented with using Gel Packs come when it is suspected that they have melted or become ambient. If a delay occurs and no replenishment protocols have been established, opening a case and replenishing the packs could spike the temperature and jeopardize the value of the shipment. Close attention must be paid to knowing when and if a shipment can be restocked.

Kaufmann (2011).

Advanced packaging includes brands such as Kryo-Trans, Kodiak and Envirotainers. These containers possess more hardware than the other models and use advanced technology to maintain the 2-8° C range. Kryo-Trans for instance use heavy insulation and cooling systems

from the lid to produce the refrigerated atmosphere. They also have a temperature monitor built in that can be downloaded to show the interior temperature throughout the trip. Kodiaks use vacuum insulated panels to stay within the temperature range, while also providing thermostats and temperature monitors that display up to the minute temperature readouts. The Envirotainers are battery powered cooling units that have internal fans that maintain the inner atmosphere. The options with these models tend to be more expensive than the simpler designs, but they do provide easier forms of monitoring the shipments and aid in limiting complications along the supply chain. Kaufmann (2011). Some pharmaceutical and medical products need to stay at room temperature (10- 25°C)

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during shipment, or within a controlled ambient environment. Despite having a larger possible temperature variety than chilled products, controlled ambient shipments face just as many obstacles and require the same logistical attention. Weather and improper packaging techniques are just two exposure obstacles that can push the package out of the desired atmosphere. As a result, over heating or freezing can occur, causing just as much damage to the controlled ambient shipment as it would to a chilled shipment. Proper supply chain planning is the best way to stop this or any cold chain anomaly from happening. James (2006).

Liquid Nitrogen

Another method of controlling a shipment's temperature is by using liquid nitrogen (LN), an especially cold substance used to keep packages frozen over a long period of time. While this is an extremely effective way to control a frozen atmosphere, the substance also produces large amounts of odorless and colorless nitrogen gas that if incorrectly contained can displace all of the oxygen in an area, creating a deficient oxygen environment. Exposure to this gas can cause dizziness, vomiting, unconsciousness and even death (Information Specific to Liquid Nitrogen 2003). Dry shippers, or highly insulated and durable units that provide atmospheres for different temperature extremes and prevent LN leakage, use LN to create arctic environments for the transportation of pharmaceuticals and medical supplies. This substance has also been used in the long-term cooling and freezing of foodstuffs and high value spices (Mahajan & Goswami 2001). When transporting with liquid nitrogen, proper dangerous goods regulations must be followed. First, an inversion test should be performed where the dry shipper is placed on its side and checked for any free-flowing liquid nitrogen, if any LN is seen pouring out of the shipper, then the package may not be able to be transported. As long as there is no free-flowing LN, then the shipment does not have to be labeled as having liquid nitrogen, otherwise, the shipment label

must indicate the presence of the substance. When a product needs to remain in an extremely cold atmosphere for an extended period of time, LN can provide better results than dry ice, but also presents more safety hazards that must be accounted for and planned around.

2.1.3. The Shipment and Transportation of Cold Chain items

Successfully moving a shipment across the supply chain without suffering any setbacks or temperature anomalies becomes a more frequent accomplishment if a comprehensive logistical

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process is established. This means carefully calculating and preparing every precautionary measure for each phase of the supply chain. When a temperature sensitive product is being moved, it is vital to first find out specifics about the item. Certain questions must be asked before shipping, such as what the product is and if it is dangerous in any way. For example, a lab mice infected with a contagious disease or HIV positive blood require different attention than frozen produce.

Other concerns include where the shipment is going and the weather forecasts for those regions. Will the shipment experience extreme cold or heat along the transport route? Will it be moving from a country in the dead of winter, to a country in the height of summer? These questions lead to others such as what the desired temperature of the shipment is, what is the stability of the product to changes in temperature and are there any pre-packaging procedures that need to be performed. Answering these questions can help to better determine the proper container and temperature control device to use. Once a temperature range is established, conditioning issues such as replenishment must be acknowledged. This will allow the handler to be prepared should a delay or a depletion of freezing or refrigerating substances occur. The type of packaging also determines what forms of monitoring are available. If the shipment is not using a container with a built in temperature monitor, then one must be supplied for the shipment. These steps make both transporting a much smoother process and the defense of the integrity of a shipment easier. Subramanyam (1989).

After all the pre-transfer questions are answered, the most efficient mode or modes of transportation must be chosen. Several key factors play into how the shipment will be moved. Distance between the origin and the final location, the size and weight of the shipment, the required exterior temperature environment and any time restrictions of the product all effect the available transportation options. These logistical characteristics are the difference between using

land, sea or air to transfer the package. Short distances can be handled with a van or truck, while a longer trip may require an airplane or freight ship. Heavier loads may require a larger and typically slower shipping vessel, which also means factoring in more transit time. Exterior temperature also plays an important role in protecting a shipment. Shipments that need to stay in a refrigerated area or have low tolerance to heat or direct sunlight must be transported on a craft that can accommodate these needs. Vehicles need to be equipped with cooling or heating devices along with a calibrated temperature monitor. Ackerman *et.al* (2007)

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Key considerations when arranging a delivery concern not only knowing where to go, but at what time to get there. Packages must be physically given to the recipient, not just left at the delivery location. Communicating the knowledge of any delays that would push back delivery due or being advised of the times that they are available to receive shipments are important steps to avoiding complications. Once a package clears customs, it must be picked up and transferred to the client. Trucks and vans, the primary modes of transportation for this stage, must meet the specifications necessary to transfer the package. They need to be able to block out exterior weather, have enough room to store the shipment and be capable of restraining any unnecessary movement that could damage the package during transit. Subramanyam (1989).

2.1.4. Warehousing and Storage of cold chain items

A cold chain is a temperature-controlled supply chain that includes all vaccine-related equipment and procedures. The cold chain begins with the cold storage unit at the manufacturing plant, extends to the transport and delivery of the vaccine and proper storage at the provider facility, and ends with administration of the vaccine to the patient. Froes (1995).

The cold chain system is a means for storing and transporting vaccines in a potent state from the manufacturer to the person being immunized. It consists of a series of storage and transport links, all designed to keep vaccines within an acceptable temperature range until it reaches the users. It makes use of human, material and financial resources as well as standards at different levels. The cold chain remains a highly vulnerable point for national immunization programs in developing countries with tropical climates. The success of the EPI is therefore highly sensitive to the cold chain status and hence its management should not be taken lightly. Gazmararian (2002).

It is important for a facility to have proper storage and monitoring equipment that is set up

correctly, maintained appropriately, and repaired as needed. This equipment protects patients from inadvertently receiving compromised vaccine and protects facilities against costs of revaccinating patients, replacing expensive vaccines, and losing patient confidence. Froes (1995).

Every vaccine storage unit must have a reliable temperature monitoring device (TMD). The use of a continuous monitoring and recording device called a “digital data logger” (DDL), set at recording intervals of at least every 30 minutes. Yuan (1995). Many DDLs use a buffered temperature probe. Temperatures measured by a buffered probe match vaccine temperature more closely than those

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measured by standard thermometers, which tend instead to reflect air temperature. DDLs provide details on how long a unit has been operating outside the recommended temperature range (a temperature excursion). Each DDL should have a current and valid Certificate of Calibration Testing (also known as a “Report of Calibration”) to ensure device accuracy. Cleland (1996).

Storage units and temperature monitoring devices need regular maintenance to ensure proper operation, maintain required temperatures, and extend the useful life of the equipment. Check storage unit door seals regularly for signs of wear and tear, check door hinges and adjust so that the door opens and closes smoothly and fits squarely against the body of the unit. Leaving the door open can cause the thermostat to respond to warmer room temperatures, and the unit will work harder to maintain the correct temperature inside. Makuru (2012). The temperature may become very cold in some parts of the unit. Using an open-door alarm and a self-closing door may be helpful, clean unit coils and motor per manufacturer instructions, clean inside of units to discourage bacterial and fungal growth. Cleaning must be done quickly to minimize the risk of the temperature going out of range, defrost manual-defrost freezers when the frost exceeds either 1 cm or per the manufacturer suggested limit. Follow the manufacturer’s instructions. While defrosting, store vaccines temporarily in another unit with appropriate freezer temperatures, temperature monitoring devices experience “drift” over time that affects accuracy. If calibration testing indicates the device is no longer accurate within $\pm 0.5^{\circ}\text{C}$ ($\pm 1^{\circ}\text{F}$), it should be replaced. Adjustments to correct accuracy are not recommended, storage unit temperatures may need to be adjusted over time. Temperature adjustments should only be made by a vaccine coordinator and not during a busy part of the workday when the door is being frequently opened. The coordinator should confirm there is not another issue (e.g., unit unplugged, door left open, broken TMD, etc.)

before making any adjustment to the temperature Henjeet (1996).

Many pharmaceuticals must be kept in controlled temperatures to maintain potency during transport and storage. Challenges in maintaining this cold chain can damage or diminish access to lifesaving drugs. To ensure high-quality care, health systems must find ways to ensure that heat sensitive drugs are managed within a temperature-controlled supply chain from manufacture, through procurement and internal logistic systems, to the point of use. In fragile health care systems, such as those in developing countries, vaccine immunization programs often have the best, or only available, refrigerated cold-chain systems. Nikia, *et al.* (2013). Integrating other heat sensitive health products into these systems can improve transport and storage, increasing access

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and saving lives. WHO and UNICEF confirm that it is permissible to transport and store drugs in the vaccine cold chain, provided that best storage and labeling practices are adhered-to at all times to clearly distinguish non-vaccine products from vaccines and diluents.

As noted, WHO and UNICEF guidance materials have included broad language suggesting that, if key provisions are met, other products may be safely stored in the vaccine cold chain. These provisions include maintaining good storage practices and clear labeling and separation of non vaccine products from vaccines and diluents at all times. For instance, the (WHO, 2014) Immunization in Practice manual states that “[if you are working] ... in an area with only one refrigerator and you need to store other heat-sensitive supplies such as drugs, ointments, serum, and samples, be sure to label them clearly and keep them separate from vaccines and diluents.

2.1.5. Technical Capacity

Cold chain management to be efficient, three major elements are required. These include well trained personnel, reliable transport/storage equipment and efficient management procedures. An absence of any of these would lead to a deficient cold chain system. Health workers play an important role in maintaining an undisrupted cold chain as they are the last point of contact between the vaccines and the recipient. Hence, it is very pertinent that they be trained and supervised regularly in order to ensure efficient practice of cold chain management. In addition to training and supportive supervision of health workers, logistic materials and tools for monitoring storage temperature (thermometers, temperature logging charts among others) should be available at health facilities. These contribute to encouraging health workers to put into practice knowledge that has been acquired, hence, supporting effective and efficient immunization Divine (2019).

Lack of available humanitarian logisticians is another important challenge facing humanitarian logistics. For instance, Tsunami relief supports were negatively impacted by the lack of available trained and experienced field logisticians (Fritz Institute, 2005). This is further underlined by Telford & Cosgrove (2007) that many NGOs have limited capacity of allocating appropriately experienced logisticians who can operate in an emergency at an international level. Consequently, Kovacs & Spens (2011), echoed a need for establishment of humanitarian academic partnerships to improve training, education, as well as research to improve on logistics practices. Accordingly, Kovacs, Peter & Larson (2012) suggested competencies that are deemed relevant for the future

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logistics managers such as: General, Finance, IT, Logistics specific, Management/strategy, Operations, Supply chain management, Focus on processes/flows, Legal, security and international trade, Multimodal logistics, Logistics in emerging markets, Competencies/skills, Analytical, Interpersonal, Leadership, Change management and Project management.

2.1.6. Problems and Challenges for Cold Chains

There are still several roadblocks in the path to improving the cold chain. Issues beyond proper packaging techniques and detailed logistical strategies continue to require the attention of companies and groups aiming to improve the chain's efficiency. One of the largest obstacles is the strengthening of supply chains to reduce waste in developing countries, in particular, the ability to provide better forms of cold storage for medical supplies and food between urban and rural regions. "The World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) have estimated overall wastage rates [of vaccines] in developing countries [at] around 50%" (Setia, et al 1148). In 1993 effort to end polio in Egypt, a reported 25% of vaccines in urban clinics were wasted, while 41.5% were squandered in rural regions (Setia et al, 1148-9). Other collapses in the cold chain have led to polio outbreaks in South Africa and vaccine damage in Hungary due to extreme weather exposure (Setia et al, 1154). A study of the maintenance of hepatitis B vaccinations in Indonesia found that 75% of the costly medication shipments were exposed to potentially damaging freezing temperatures during transit. (Wirkas et al 692). With the high levels of disease and national debt that plague developing nations such as these, to lose valuable resources due to holes in the cold chain is a problem with a critical social impact. To combat losses in the food trade economy, countries like India, Singapore and the Philippines are stressing the importance of refrigeration facilities and cold chain logistics. In India, measures are being taken to advance the cold chain for the 134.5 million tons of food they produce. More

refrigeration centers and better supply routes are needed to update the current services that only accommodate about 13% of their food and vegetable production. Another area of particular concern for shippers is the proper transportation of hazardous goods. Since the attacks of 9/11 and the heightened security concerns of countries combating terrorism, the transfer of shipments containing potentially hazardous goods has fallen under greater government scrutiny Clark (2006). The movement of materials classified as dangerous is vital to the bio pharm and medical industries, but complications or accidents that occur during transit can be both costly and illegal.

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2.2. Theoretical Framework

2.2.1. Resource Based Theory

Resource Based Theory also called Resource Based View (RBV) of the firm is concerned with the relationships between internal resources strategy and firm performance. It focuses on the promotion of sustained competitive advantage through the development of human capital rather than merely aligning current strategic goals. Beardwell and Claydon (2010) argue that a firm will have a competitive advantage when it is implementing a value creating strategy not simultaneously being implemented by any competitor. On the other hand, a firm will have sustained competitive advantage when it is implementing a value creating strategy not simultaneously being implemented by competitors and when the competitors are unable to duplicate the benefits of this strategy. Barney (1991) studied four empirical indicators: values, rareness, imitability, and substitutability in order to assess the relationship between firm resources and sustained competitive advantages. In his research, he clarified the main relevant concepts, which are, firm resources, competitive advantage and sustained competitive advantage. Firm resources can be classified into three resource categories: physical, organizational Tomer (1987), and the last resource is human capital Beardwell and Claydon (2010) which is the main interest of this present study.

Barney (1991) argues that to understand the source of competitive advantage, it is assumed that a firm's resource may be heterogeneous and immobile with four potential attributes. The first characteristic is that the resource must be valuable in terms of executing the organizational strategy efficiently and effectively. The second attribute is the resource should be rare and not possessed by current and future competitors. Imitability is the third resource attribute which means that not only do competitors lack them but also cannot obtain them. The last characteristic

is substitutability which means that the resource cannot be copied and there are no possible alternative options with other firms Barney (1991). To illustrate this relationship between firm resources and sustainable competitive advantage, Barney (1991) developed a resource-based model which is the interaction between the firm's immobile resources which are rare and the sustainability of the firm's competitive advantage which can be used by organizations to analyze its resources with the potential of generating a sustainable competitive advantage. This theory is important, to effectively execute the career management as human factor is essential because only individuals with

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appropriate competencies can understand, describe and analyze all types of resources and their applicability to the evaluation criteria.

2.2.2. Stakeholder Theory of Supply Chain

The term stakeholder emerged in 1963 from a groundbreaking memorandum at the Stanford Research Institute, which argued that managers "needed to understand the concerns of shareholders, employees, lenders and suppliers, in order to develop objectives that stakeholders could support". Sinclair (2010) Stakeholders are further defined as any group within or outside an organization that has a stake in the organization and/or its performance. Daft, Murphy & Willmott, (2007) or affects strategic decision making within an organization. Boselie (2010) This introduced a novel view on organizations' purpose, which opposed the prevalent neoclassical understanding of business, which argued that solely stockholders need to be considered by managers when making decisions. Parmar et al. (2010) Subsequently, R. E. Freeman was the first to apply the term to strategic management and detail the idea of stakeholder theory and according to management in his 1984-publication "Strategic Management: A Stakeholder Approach". Sinclair (2010)

According to Freeman et al. (2010) stakeholder theory was designed to solve three problems which had arisen throughout the last decades and aims at improving our understanding of value creation and how it is traded, connecting ethics and capitalism, and help managers deal with these matters. Freeman et al. (1997), Parmar et al. (2010)

Further, stakeholder theory encompasses facets of descriptive, normative, managerial as well as instrumental theory. Descriptively, organizations are claimed to have stakeholders. From an instrumental perspective form that consider their stakeholders' interests are said to be more

successful than those that do not. The field which examines why firms should give regard to their stakeholders is the normative perspective. Donaldson & Preston (1995), Freeman (1999). The whole idea stems from the presumption that business is an integral part of society rather than an institution that is separate and purely economic in nature. (Freeman & Liedtka, 1997, p.286), and that “managerial actions have the potential to affect a broad range of people” and that “pursuit of corporate objectives can be easily disrupted by the actions of unexpected groups” as indicated by real cases, such as the global financial crisis. Parmar et al. (2010)

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2.2.3. Resource Dependency Theory

Resource dependence theory (RDT) characterizes the corporation as an open system, dependent on contingencies of the external environment Pfeffer & Salancik (1978). According to RDT, firms engage in collaborations with external stakeholders in order to manage their dependency on critical resources. It proposes that organizations that lack certain resources will develop relationships with other organizations with the aim of obtaining those required resources Salin (2003).

In summary, RDT explains how dependence on resources external to the organization relates to organizational actions, network exchanges, and outcomes Heinze (2017). Central to these actions is the concept of power, i.e. control over vital resources Heinze (2017). Organizations attempt to reduce others’ power over them, often simultaneously trying to increase their own power over others. Although constrained by external factors, managers can still act to reduce environmental uncertainty and dependence Kaufmann (2019). RDT has been related to big data mainly in the context of SCM. Specifically, within a supply chain framework, RDT has been found very useful across a wide range of applications. Hazen et al. (2016).

Through the lens of RDT, Prasad, Zakaria, and Altay (2016) studied big data in humanitarian supply chain networks. It was noted that resource providers have the necessary power to pressure non-governmental organizations (NGOs) to adopt BDA and to specify the expected outcomes. NGOs’ resource dependence on governments and donor agencies could lead to widespread big data adoption, revolutionizing how NGOs deliver humanitarian services and thus enhancing outcomes.

The supply chain, in fact, involves different organizations with distinct levels of power and dependences. Usually, organizations share information with their chain partners and, depending

on which side of dependence an organization stands, the sharing of data, information or analysis can become a critical resource Ketchen & Hult (2007). From such a perspective, Waller and Fawcett (2013) argue that the ability to apply BDA to that information may increase a firm's power. Therefore, RDT may explain how the ability to use big data for supply chain decisions could affect an organization's power in relation to its suppliers or customers.

Collaborating to that argument, Hazen et al. (2016) add that RDT can also explain the adoption and use of BDA for supply chain sustainability. In this respect, BDA could be seen as a critical resource that supply chain partners depend upon to carry out sustainability initiatives, increasing power for the organization holding BDA resources and capabilities.

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2.3. Empirical Literature Review

There are some researchers conducted in the issue of cold chain practice and different perspectives and ideas were tried to inspect by different scholars, hence the study will attempt to examine some of them and focus studies which are conducted locally.

A study done by Birhanu, (2020) on the issue of cold chain management practice and challenges on the case of private health facilities providing expanded program of immunization service in Addis Ababa, based on this study, the overall cold chain management practice was good at 60% (n=30) out of 50 facilities visited. The overall storage condition of 16% (n=8) facilities was good. The overall transport trend of only 12% (n=6) facilities was good. The overall technical capacity of EPI focal persons was good at 42% (n=21) facilities was good and the overall logistics information system of 24% (n=12) facilities was good. Overall from the findings of the study, it can be concluded that there were vaccine cold chain management practice gaps and there were challenges related to lack of vaccine standard fridge for vaccine storage. Majority 44(88%) of facilities have been using domestic fridges to store vaccines.

The study conducted by Yetwale, (2018), also tried to assess vaccine cold chain management practice through focusing the case of public health facilities at north shoa zone, Amara region of Ethiopia, the study revealed that 81.7% (n=49) out of 60 facilities monitored the cold chain in twice daily bases at the time of visit. Taking the last six month temperature monitoring status of the facilities, 51.7% (n=31) of the facilities had complete set of twice daily manual temperature monitoring chart. In 38.3% (n=23) of the facilities one or more refrigerators were nonfunctional. All receipts and dispatches were recorded in 58.3% (n=35) of facilities. The vaccines were not packed with air circulating and appropriate gap between them in 38.4% (n=23) of the facilities.

The other research conducted by Kifle (2020) on the issue of the effect of supply chain performance measurement on integrated pharmaceuticals logistic system of the Ethiopian pharmaceuticals supply agency, results indicate that six of the twelve independent variables of the three dimensions (organization and process benefits, financial benefits and set up and operating costs), technological investment (95.8%), safety (95.7%), price trend (93%), standardization (91%), staff specialization (87.3%) and warehouse management (78.57%) are relevant and have

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statistically strong effect on performance measurement of Integrated Pharmaceutical Logistics System in their order of influence.

A study done in central Ethiopia revealed that of 116 visited facilities, only 22 (19%) had functional refrigerators. The remaining facilities transported vaccines from nearby facilities having functional refrigerators. Complete temperature recording of the last month was observed in 13(59.1%) facilities. Of 22 functional fridges, the thermometer reading was found to be 13 outside the recommended range in 6(27.3%) on the date of data collection. Vaccine storage in the refrigerator was not proper in 12(54.5%) facilities. Sixty-five (56%) health workers had satisfactory knowledge on cold chain management. Professional qualification and year of service in the immunization program showed a statistically significant association with knowledge of cold chain management ($P < 0.05$) Rogie & Berehane (2012).

2.4. Research Gap

This study will examine the effect of cold chain logistic practice on the performance of humanitarian organization where the focus area is MSF. The key issue in this study is examining the current trends, practice, and implementation of the way we transport, ship and store medical and other equipment's which are necessary for people life. Thus, the researcher usually perceived and heard a lot of ideas regarding on cold chain logistics activities where most of the employee who are engaging in this area consider that doing cold chain logistic is aimed at distributing medical equipment's with frozen way, however, the issue and the science of cold chain logistic is quite different from most of us perceive.

For humanitarian organizations like MSF delivering cold chain logistic is significant in order to maximize the performance of the organization and since it is one of the basic objectives of the organization. Thus, the researcher observed the gap that there are no or few research which assess

the supply chain practice of some limited equipment's, but as a researcher I couldn't find a research

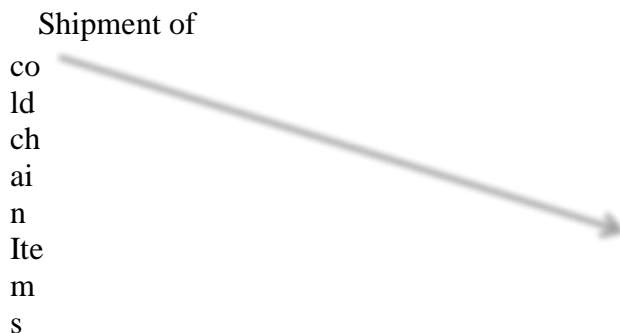
which was conducted in cold chain logistic in relation to performance of humanitarian organizations. Moreover, the organization Doctors without border is huge international nongovernmental organization which aimed to deliver such activity; thus, it is significant to examine the knowledge and other logistical gap in delivering the equipment in relation to the performances of the organization.

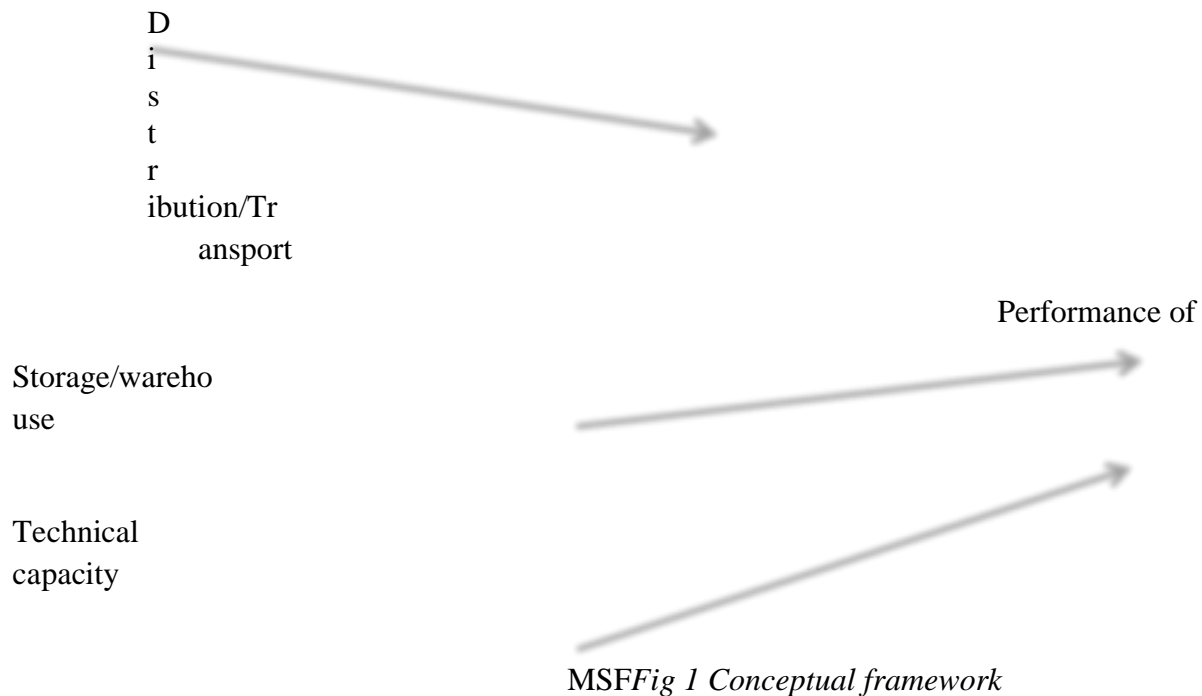
2.5. Conceptual Framework of the Study

There is association between cold chain logistics practices and performance of the organization. The safety of cold chain Pharmaceuticals/ Vaccines is greatly influenced by variation during transport, shipment, storage conditions, handling, and packaging Bishara (2007). WHO recommends the range of temperature for storing and transporting vaccine should be on the basis of data supplied by manufacturer. Each vaccine has its own specific storage requirements so it is extremely important to know how long, and at what temperature each vaccine should be handled as they are delicate biological substances that can become less effective or destroyed if they are not stored and transported properly. The cold chain has three main components: transport and storage equipment, trained personnel, and efficient management procedures. All of these elements must combine to ensure safe vaccine transport and storage Afsar & Kartoglu (2006).

Based on the above assumption and idea the researcher developed the following conceptual framework of the study.

Independent variables Dependent variable





Source Afsar & Kartoglu, (2006)

CHAPTER THREE

RESEARCH METHODOLOGY

3.1. INTRODUCTION

According to John (2019), without proper and valid methodology, a trustworthy of the research is trivial. Research is a process that involves the collecting, recording, analyzing and interpreting of information, and it is all about providing answers to questions and developing knowledge. For this study give high attention to the methodology use in order to increase the level of acceptance and validity.

This chapter deals with the methods that are used in the research to come up with the objective of the study. This chapter includes the source of data, research design, population and sampling procedure, sample population, sample size, sampling techniques, data processing and analysis, methods of data analysis, ethical consideration.

3.2. SOURCES OF DATA

The researcher used primary and secondary source of data. Questionnaires and interview were the primary data collection mechanism. The reason for selecting questionnaire data collection method

is because not only it makes the manageability of the gathered data easier but also the high possibility of getting responses from many participants of the research. The other source of data is secondary source where different literatures, empirical views and related materials assessed to make the concept more feasible.

3.3. RESEARCH DESIGN

The research design that employed in this study is descriptive and explanatory research. It is mixed research technique that can incorporate both qualitative and quantitative methods. A design which allows ways of formulating a problem for more clear explanation of events which is called explanatory research. Research that explores why something occurs when limited information is

available is called explanatory research Mugenda (2003).

Both approaches used to collect and analyze data on the role of performance of humanitarian organization specifically MSF Holland which are found in Addis Ababa, from staff of Addis

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Ababa MSF Holland and other stakeholders, and a qualitative approach implemented to examine the performance of humanitarian organization i.e. MSF Holland through interview. The researcher intended to assess and describe the effect of cold chain logistic practice on performance. The descriptive analysis approach applied to the present study because it seeks to gain insight into a phenomenon as a means of providing clearly the effects of cold chain logistic in an area of study. Recommendations to improve the situation will be made based on the findings of this study Suryabrata (2003).

3.4. RESEARCH APPROACH

The research used mixed research where quantitative and qualitative methods applied where descriptive design, which enable the researcher to describe or provide a quantitative or numerical description of trends, attitudes, or opinions of population by studying the sample from the entire population where both methods enabled to examine the opinion, view and perception of the study population. From the sample results, the researcher generalized or drawn inference to the population. Therefore, this method support to describe the factors associated with the practice of cold chain logistic with its effect on the performance of MSF.

The researcher was also applying descriptive and explanatory research design. Descriptive

research employed as a main research method of this study and used to describe the effect of cold chain logistic in the performance of MSF Holland and this was triangulated by qualitative method through conducting interview with concerned body of the MSF Holland and other key informants from stakeholder offices.

As described by Suryabrata (2003), descriptive method is a method that describes the study systematically, factually, and accurately utilizing facts, behaviors and relationship between the phenomena's being studied. As cited by Naik *et al.*, (2010) the researcher also used exploratory research design since the researcher explained the relationship between the determinants of effective cold chain logistic variables and how these dimensions affect performance of MSF.

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3.4. SAMPLE SIZE AND SAMPLING TECHNIQUES

3.4.1. SAMPLE SIZE

The study was basically targeting the staffs of MSF Holland Addis Ababa branch, which are directly related to the practice of cold chain logistic practice and two organizations who actively engage in cold chain logistic with MSF Holland. The reason for selecting these organization and employees of these organizations is because the staffs have direct contact with the work and are the direct link to provide information regarding the cold chain practice which directly benefits the research to obtain more reliable data. The information that the researcher received from all three organizations including MSF Holland the total number of concerned employees is 406 where they can understand the research questionnaire and respond to what it requested, thus, to determine the sample size of the research the following formula is adopted.

The sample size calculation formula from population is adapted from Kothari (2004) and the sample size determined as the following.

$$n=N/(1+Ne^2)$$

Where; “n” is the sample size,

“N” is the population size and

“e” is the level of precision. At 95% confidence level, degree of

variability=0.5 and level of precision/sampling error= 5%,

The sampling will be

$$n= 406/ (1+406(0.05)^2)$$

$$n= 406/ (1+1.015)$$

201.48

n=201

Using this formula, the sample population will be **201** professional employees to be the total sample size selected from the total study population of 406 professional employees. The research was also conduct interview with the key informant where the researcher emphasized management personnel's who are directly related with the work of cold chain logistic management of MSF and custom managers and supervisors included to obtain reliable information. Since the sampling is

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not limited in qualitative study, the researcher stopped the interview when it is believed that the data is saturated.

Inclusion and Exclusion criteria

The study was focus on the cold chain logistic on an organization which is operating in Ethiopia called Doctors without borders(MSF), hence the participants of the study included by some criteria and those who would not fulfill these criteria were out of the study participants. Therefore, the research included those permanent employees of MSF and other two organizations which are directly operating in cold chain logistic activity with MSF. Thus, permanent employees with direct involvement in the cold chain practice were included and for interview the management team who are leading the clod chain practice in these organizations were included and others without fulfilling these elements were excluded from the study.

3.4.2. SAMPLING TECHNIQUE

The researcher used non-probability sampling procedure that is purposive sampling method in the study. The use of purposive sampling enables generating meaningful insights that help to gain a deeper understanding of the research phenomena by selecting the most informative participants Creswell (2018). The main goal of purposive sampling is to focus on specific characteristics of a

population that are of interest, which best enables to answer research questions which varies depending on the type of purposive sampling technique that is used. Mihret et al. (2010).

3.5. METHODS OF DATA ANALYSIS

Data analysis was conducted through a descriptive statistic to provide details regarding the demographic question and the various factors which can be considered as the effect of cold chain logistics practice in performance of MSF Holland. And also, Statistical Package for Social Sciences (SPSS) version 22 is used to analyze the data and to display the relationship between the dependent and independent variable of the study as well as the effect of the independent variables over the dependent one.

According to Mugenda (2003) data analysis used to process of bringing order, structure and meaning to the mass of information collected. The exploratory method would be analyzed through survey method where the collected data from questionnaires would be adopted and coded for

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completeness and accuracy and the response on each item put into specific themes in scientific way for easy analysis. In order to draw meaningful conclusion, data had been summarized and presented using appropriate table format with frequencies, percentages for classifications of responses for easier understand and also for visual impression.

Inferential statistics was adopted to see the relationship between the dependent and independent variable the study did correlation analysis and to investigate the effect and influence of the independent variable to the dependent variable the study used regression analysis with the appropriate assumptions.

The qualitative data was presented through thematic analysis where it is a method for analyzing qualitative data that entails searching across a data set to identify, analyze, and report repeated patterns. Braun and Clarke (2006). It is a method for describing data, but it also involves interpretation in the processes of selecting codes and constructing themes.

3.6. RELIABILITY ANALYSIS

Reliability is a measure of the degree to which a research instrument yields consistent results or data after repeated trials. For this study internal consistency, reliability was determined by Cronbach's alpha. When conducting Cronbach's alpha, one must be sure not to mix positively

and negatively worded questions if so, Alpha will be negative. It is useful in assessing the consistency

of the results across items within a test. It represents number between 0 and 1. According to Zikmund (2010) scales with coefficient alpha between 0.65 to 0.7 indicate fair reliability and higher are considered respectable and very good to determine reliability.

Table 3.1 Reliability statistics

Variable	Number of items in the scale	Cronbach's Alpha Result
Shipment of cold chain items	5	.711
Distribution/ transportation	5	.783
Storage	5	.841
Technical capacity	5	.822
performance	5	.862

Source SPSS (2022)

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From the above table 3.1 evidenced that in this study reliability tested, the alpha value for four variables were measured, tested and number of questions in the instrument identified, finally alpha result was determined the increase confidence that the instrument would yield acceptable results and it proved that scales with coefficient alpha acceptable for further analysis. Zikmund (2010).

3.7. VALIDITY

According to Mugend & Mugenda (2003) content validity is a measure of instrument and it provides adequate coverage of the investigative questions guiding the study. For survey, each question given to a panel of subject matter expert analysts, and they rate it. They gave their opinion about whether the question is essential useful or irrelevant to measuring the construct under study. So, content validity uses a more formal and statistics-based approach because

experts in the field judge the questions on how well they cover the study issues. Hence, in this study content validity was determined by consulting the advisor and logistics experts. In order to improve the instruments, the research adviser and lecturers looked at every question in the questionnaire, interview and did their own analysis to ascertain that the questions answer the research objectives of the study.

3.8. ETHICAL CONSIDERATIONS

Ethics is the moral distinction between right and wrong, and what is unethical may not necessarily be illegal. Bhattacharjee (2012). In order to be ethical a researcher is considered voluntary participation and harmlessness. Subjects in a research project must be aware that their participation in the study is voluntary, that they have the freedom to withdraw from the study at any time without any unfavorable consequences, and they were not harmed because of their participation or non

participation in the project. Name of the respondents would not be asked to write in order to increase the confidentiality of the information they give, and also the questionnaires and interview explains that the purpose of research which is only for academic purpose and finally the respondents have been included based on their willingness.

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CHAPTER FOUR

DATA ANALYSIS, PRESENTATION, AND INTERPRETATION

Introduction

This chapter comprised of the result and discussion part of the research where the data obtained through distributing questionnaires and interview are analysed by descriptive statistics and correlation and regression analysis with the assumption of the regression analysis and thematic analysis of the qualitative data have been incorporated in the chapter.

4.1. Response Rate

The main objective of this paper is to investigate the effect of cold chain logistic practice on the

performance of humanitarian organization on the case of MSF. In this chapter, the data obtained in the study are analysed, presented, interpreted, and discussed. The chapter starts by providing the demographic and personal information of respondents. The descriptive and inferential statistics are proceeded, and the thematic presentation of qualitative data presented then after.

A total of 201 questionnaires were distributed to the respondent's where the employee of MSF through purposive sampling techniques. This sampling technique is selected because it enables the researcher to draw representative data by selecting samples from the population based on reasons in which sample population are more of convenient for the research. Also, the researcher used this technique to gather the data quickly. In order to have a representative sample the researcher have administered questionnaire to sampled respondents with different backgrounds in terms of qualification, field of study and number of service year. Out of the 201 questionnaires 185 (92%) questionnaire were properly filled. This response is quite large to confidently run the analysis. Accordingly, the analysis of this study is based on the response obtained from these respondents.

4.2. Demographic Information of the respondents

The first section of the questionnaire demanded personal information from respondents. These questions include qualification, field of study and number of service year.

Table 4.1 Demographic nature

Table		Frequency	Percentage
Position	Expert	77	41.6
	Senior Expert	64	34.6
	Team and Above	44	23.8
Total		185	100.0

Qualification	Diploma and below	26	14.1
	Degree	87	47.0
	MA and above	72	38.9
Total		185	100.0
Field of Study	Logistic and Procurement	48	25.9
	Economics	23	12.5
	Management	38	20.6
	Accounting	28	15.1
	Other	48	25.9
Total		185	100.0
Service year	1-3 years	37	20.0
	4-6 years	72	38.9
	7-9 years	41	22.2
	More than 9 years	35	18.9
Total		185	100.0

Sources SPSS output (2022)

The above table 4.1 shows the demographic nature of the participants of the study where the employee of the organization qualification, service year, job position and field of study assessed hence, the majority of the study sample population 41.6% are expert in their position, while 34.6% of the population of the study are senior expert and the remaining 23.8% of the population are team leaders and above team leaders position, this shows the study got employee who have expertise on the cold chain logistic practice, the qualification of the participants of the study the large portion of the study participants 38.9% have MA and above in academics qualification while 47% of the participants of the study have first degree holder and the rest 14.1% of the participants of the study have diploma and below diploma level, as this data implies the majority of the study population are master's degree holders and it signifies that it is good for the study to acquire reliable information since they have good academics qualification and readiness to respond for the questions, the field of the study of the participants of the study is also assessed and the high number of the participants 25.9% are studied on procurement and logistic supply while 20.5% of the participants of the study studied management and 15.1% of the employee are studied accounting and 25.9% studied other fields which are not stated in the research, this implies that the existence of high amount of employee who studied logistic and supply chain helps to have good information over the issue of cold chain practice and the existence of others is also significant which helps the research to know the views of others, in regards to service years, the large number of employees 38.9% of the population served in between 4-6 years, 22.2% of the study participants are served between 7 years to 9 years and 20% of the participants are serving from 1 up to 3 years and remaining 18.9% of the study sample population are served more than nine years, this benefited the research where the participants are not junior and they can easily understand the issue and respond on the matter.

4.3. Data Analysis and Interpretations

In order to know the general knowledge of the respondents in the study area, different questions were forwarded to them and the responses of the respondents are briefly summarized in the following tables.

Table 4.2 shipment of cold chain items

No.	Items	Alternatives	Frequency	Percent	M/SD
1.	Cold chain goods are protected from warm during loading and unloading.	Strongly Disagree	7	3.8	M= 3.6 SD= 1.1
		Disagree	35	18.9	
		Neutral	35	18.9	
		Agree	55	29.7	
		Strongly Agree	53	28.7	
		Total	185	100	
2.	There is good packaging and handling in the process of cold chain logistic	Strongly Disagree	2	1.1	M= 3.87 SD=0.99
		Disagree	18	9.7	
		Neutral	39	21.1	
		Agree	69	37.3	
		Strongly Agree	57	30.8	
		Total	185	100	
3.	Qualified professionals are monitoring the shipment process of cold chain logistic	Strongly Disagree	9	4.9	M=3.6 SD=1.2
		Disagree	35	18.9	
		Neutral	23	12.4	
		Agree	64	34.6	

		Strongly Agree	54	29.2	
		Total	185	100	
4.	Goods are well protected from damage and malfunction	Strongly Disagree	9	4.9	M=3.75 SD=1.1
		Disagree	18	9.7	
		Neutral	41	22.2	
		Agree	60	32.4	
		Strongly Agree	57	30.8	

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		Total	185	100	
5.	The transfer of materials from ship/plane/ to truck is performed with due consideration of all cold chain logistic procedures	Strongly Disagree	5	2.7	M=3.77 SD=1.04
		Disagree	23	12.4	
		Neutral	28	15.1	
		Agree	83	44.9	
		Strongly Agree	46	24.9	
		Total	185	100	

Sources SPSS output (2022)

The above table 4.2 elucidates the shipment of cold chain items where the descriptive statistics of the study displays that the vast majority of the participants 58.3% are agreed and strongly agreed

that cold chain goods are protected from warm during loading and unloading while 22.7% of the study population refuse and said that there is no proper protection of items from warm in loading and unloading circumstances and 18.9% of the study population are neutral, the mean value 3.6, SD 1.1 implies that moderate score where there is such kinds of protective practice but significant others doesn't believe on the precaution, and the problem lies in the condition that dispersed responses of participants as the standard deviation implies, the other issue on shipment process is the existence of good packaging system where the descriptive study displays that 68.1% of the study participants believed that there is good packaging and handling in the process of cold chain logistic but 10.8% of the study population doesn't believe on the packing of cold chain items and 21.1% of the participants refused to take either side, the average responses of the study 3.87 and SD, 0.99 shows that there is good packaging and handling of cold chain items while significant participants questions and unsure about the existence of good packaging, the SD shows the more homogenous responses of the participants where they agree on the existence of good packaging and handling of cold chain items, the other issue that had assessed in the research was the existence of qualified professionals which can monitor the shipment process, thus the analysis displays that 63.8% of the participants of the study assured that there are qualified professionals that are monitoring the shipment process of cold chain logistic in contrast 23.8% of the study population said that there is no as such qualified employee who can monitor the shipment process of cold chain items, and 12.4% of the participants neither agree nor disagree on the matter, the average

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responses and the mean of the question, 3.6 is moderate and shows there is some agreement on the question while there is also significant complain and disbelieve of the existence of professionals which monitor the cold chain shipments and the SD shows the dissimilar spread of scores on scale. The management of goods is also examined in the survey where the majority of the participants of the study 63.2% described that goods are well protected from damage and malfunction, while 14.6% of the participants of the study said that goods are not protected well form malfunction and the remaining 22.2% are neutral, the mean value 3.75 is moderate and SD 1.1 displays that there is problem in managing goods from malfunctioning despite the fact that there is high positive support on effective management of cold chain items from malfunction and the SD implies participants responses wide difference and distribution in which heterogeneous responses shows some participants of the study disbelieve on the matter and some others support on the existence of proper management of items form malfunctioning. The other critical issue is

the transfer of cold chain items from plane/ship to truck performance where the survey result of the research indicated that the mass of the respondents 69.8% are agreed and strongly agreed that the transfer of materials from ship/plane/ to truck is performed with due consideration of all cold chain logistic procedures, and 15.1% of the population who participated in the study are disagree on the issue and said that they don't believe on legal and due transfer of cold chain items from plan/ship to truck and the remaining 15.1% of the participants are neutral the mean score 3.77 and SD, 1.04 implies that there is good transfer of items however the average responses displays significant participants are in doubt of having the transfer is carried out through considering all cold chain logistic procedures.

Table 4.3 Transport/Distribution

No.	Items	Alternatives	Frequency	Percent	M/SD
1.	Cold chain items are transporting by suitable type of vehicle	Strongly Disagree			M= 3.6 SD= 1.1
		Disagree	32	17.3	
		Neutral	25	13.5	
		Agree	74	40.0	
		Strongly Agree	54	29.2	
		Total	185	100	

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2.	The transportation of cold chain items are not exposed to excessive heat	Strongly Disagree	2	1.1	M= 3.87 SD=0.99
		Disagree	28	15.2	
		Neutral	25	13.5	
		Agree	60	32.4	

		Strongly Agree	70	37.8	
		Total	185	100	
3.	Cold chain items are carefully protected from spoil during distribution	Strongly Disagree			M=3.6 SD=1.2
		Disagree	21	11.4	
		Neutral	48	25.9	
		Agree	37	20.0	
		Strongly Agree	79	42.7	
		Total	185	100	
4.	Every prerequisite are fulfilled during the transportation of cold chai items	Strongly Disagree			M=3.75 SD=1.1
		Disagree	32	17.3	
		Neutral	28	15.2	
		Agree	60	32.4	
		Strongly Agree	65	35.1	
		Total	185	100	
5.	Frequent inspections are carried out to check the functionality of vehicles	Strongly Disagree			M=3.77 SD=1.04
		Disagree	23	12.4	
		Neutral	27	14.6	

		Agree	59	31.9	
		Strongly Agree	51	27.6	
		Total	185	100	

Sources SPSS output (2022)

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The above table elucidates the transportation of cold chain items from one point to the other and since the transportation is significant the survey result of the research displays that the mass of the participants of the study 69.2% are suggested that the items are transporting by suitable type of vehicle but 17.3% of the study participants refused to agree on the question and said the items are not transporting by proper vehicles, and 13.5% of the participants are neutral and the mean value of the question 3.6 is moderate where even though, large portion of the population are convinced that the cold chain items are transporting by suitable vehicles not minimum are refused and the SD 1.1 is high and shows the wider distribution of scores and significant participants are in doubt over the use of proper vehicles. The other issue investigated in the research is whether the items are exposed to excessive heat or not, and hence the result shows that 70.2% of the participants of the study assured that the items are not exposed for excessive heat when the transportation is goes on in contrast 17.3% of the study population refused to agree and they considered that the cold chain items are exposed to excessive heat during transportation, and 13.5% of the study population are neutral and the mean score 3.87 is high where the study proved that there is no as such kinds of problem in regard to exposing items for heat, and the SD 0.99 displays the homogeneous of the responses of the participants in which most of the participants are agreed on the matter, the distribution situation of cold chain item is also assessed in the research where the majority of the participants of the study 62.7% are said that cold chain items are carefully protected from spoil during distribution while 11.4% of the participants refused to agree and the items can spoil by thieves, and 25.9% are neutral and the average responses of the study 3.6 is moderate where there is some problems of theft in cold chain items and the SD 1.2 is high where it displays the responses are heterogonous where dispersed, the other concepts that have been assessed in the study is the prerequisites that have to be performed before transporting cold chain items, thus, the mass of the respondents 67.5% said that every prerequisite are fulfilled during the transportation of cold chain items while 17.3% of

the participants of the study refused to agree on the issue and 15.1% of the participants are neither agree nor disagree in the question, the mean value 3.75 and SD, 1.1 shows the dispersed responses of the participants where there is high positive support but significant claim over the preconditions that have to be performed before transportation. Transporting cold chain items after receiving them from plan and ship demand suitable vehicles and the vehicles have to be checked frequently whether they are functional or not and the descriptive stats exhibits that 59.5% of the study population assured that there is frequent inspections are carried out to

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check the functionality of vehicles and 14.6% of the participants are neither agree nor disagree on the question and 12.4% of the study population are disagreed, the average responses of the question 3.77 and SD, 1.04 implied that there is trends of checking vehicles but it might not be frequent since significant others are claimed the opposite and dispersed answers observed in the responses.

Table 4.4 Storage/Warehouse

No.	Items	Alternatives	Frequency	Percent	M/SD
1.	There is availability of needed storage which can keep cold chain items	Strongly Disagree	7	3.8	M= 3.98 SD= 1.1
		Disagree	16	8.7	
		Neutral	30	16.2	
		Agree	53	28.6	
		Strongly Agree	79	42.7	
		Total	185	100	
2.	The storage system has adequate technology to keep cold chain items	Strongly Disagree	5	2.7	M= 3.7 SD=1.1
		Disagree	32	17.3	
		Neutral	23	12.4	

		Agree	76	41.1	
		Strongly Agree	49	26.5	
		Total	185	100	
3.	Storage equipment's are fully functional	Strongly Disagree			M=3.2 SD=1.0
		Disagree	58	31.4	
		Neutral	46	24.9	
		Agree	62	33.5	
		Strongly Agree	19	10.2	
		Total	185	100	
4.		Strongly Disagree			

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	There is quick modification and repairing mechanisms when storage encounters problems	Disagree	48	25.9	M=3.26 SD=1.02
		Neutral	71	38.4	
		Agree	35	18.9	
		Strongly Agree	31	16.8	
		Total	185	100	
5.	There is no problem	Strongly Disagree	12	6.5	M=3.22

	in ensuring the sanitary condition of the storage	Disagree	39	21.1	SD=1.15
		Neutral	64	34.6	
		Agree	37	20.0	
		Strongly Agree	33	17.8	
		Total	185	100	

Sources SPSS output (2022)

The above table 4.4 indicates that the storage and/or the warehousing condition of cold chain items where it is essential factor for the performance of humanitarian organizations, especially for MSF, the table shows that 71.3% of the study sample population assured that there is availability of needed storage which can keep cold chain items, while 16.2% of the study population are neutral and 12.4% are disagreed and strongly disagreed on the question, the mean value of the question, 3.9 is high and it shows there is needed storage but not enough since significant number of participants are reserved and the SD of the question 1.1 is high and shows the dissimilar responses of the study, the other factor on storage system is having adequate technology in warehouses and the descriptive stats displays that 67.6% of the study participants believed that the storage system has adequate technology to keep cold chain items however, 20% of the population are not agree on the existence of technologically equipped warehouse for cold chain items, the mean value 3.71 is moderate and shows the division of ideas in support and refusal of the idea and the SD 1.1 is high and the distribution of scores have been observed and some are supported while others are not. Sometimes storages can encounter problems thus quick modification is needed since we move and store sensitive equipment's, therefore, the result of the data displays the majority of the respondents of the research 38.4% of the study population have no stance since they prefer to be

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neutral and this signals that they might not have enough awareness on modification or they might not to talk about it, but 35.7% of the study population agreed and strongly agreed that there is quick modification and repairing mechanisms when storage encounters problems while 25.9% of

the participants of the study failed to agree on the existence of proper and quick modification of warehouses, the mean value 3.2 is low which shows there is loophole in deciding and implementing quick modification of stores to make it suitable for the cold chain items, regarding on the sanitary condition of the storage system 37.8 of the population said that there is no problem in ensuring the sanitary condition of the storage while in contrast to this data 27.6% of the participants are failed to agree on the notion of having sanitary of storage and 34.6% of the study population are neutral, the average responses 3.22 is low where it denotes that there is limitation in properly taking care of the sanitary condition of storage of cold chain items and the SD 1.15 is high which implies dispersed or dissimilar responses of the participants of the study.

Table 4.5 Technical capacity

No.	Items	Alternatives	Frequency	Percent	M/SD
1.	Least human error occurred in delivering cold chain item	Strongly Disagree	5	2.7	M= 3.4 SD= 1.01
		Disagree	32	17.3	
		Neutral	58	31.4	
		Agree	64	34.6	
		Strongly Agree	26	14.0	
		Total	185	100	
2.	Employees have better awareness in cold chain logistics practice	Strongly Disagree			M= 3.41 SD=1.01
		Disagree	41	22.1	
		Neutral	58	31.4	
		Agree	55	29.7	
		Strongly Agree	31	16.8	

		Total	185	100	
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3.	Contentious awareness creation program have been carried out by MSF Holland and stakeholders	Strongly Disagree			M=2.8 SD=0.89
		Disagree	71	38.4	
		Neutral	85	45.9	
		Agree	12	6.5	
		Strongly Agree	17	9.2	
		Total	185	100	
4.	Employees are implementing safety precaution in cold chain logistic practice	Strongly Disagree			M=3.4 SD=0.96
		Disagree	39	21.1	
		Neutral	53	28.6	
		Agree	69	37.3	
		Strongly Agree	24	13.0	
		Total	185	100	
5.	There are enough employees who have technical ability to handle cold chain items	Strongly Disagree			M=3.3 SD=1.09
		Disagree	55	29.7	
		Neutral	48	25.9	

		Agree	48	25.9	
		Strongly Agree	34	18.5	
		Total	185	100	

Sources SPSS output (2022)

As the above table shows the technical capacity of the staff who are engaged in receiving transporting and delivering of cold chain logistic practice have been assessed in the survey, hence the result displays that the majority of the participants of the study 45.7% assured that there is least human error occurred in delivering cold chain item while 20% of the study population refused and implied that there is huge human errors occurred in delivering of cold chain items where it signals the gap in technical awareness of the employee, and 31.4% of the study are neutral where it denotes the unsure of the question and they prefer not to decide on both directions, the mean value 3.4 is

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moderate where some are positive towards the question but significantly most are not and the SD 1.01 displays the dispersed responses of the participants and not having common replies shows the existence of limitation in the issue, on the technical capacity of employee on cold chain practice the perspective of the population was taken in the survey and 46.5% of the employee suggested that employees have better technical capacity in cold chain logistics practice but 22.2% of the participants of the study refused to agree on the having of the employees better knowledge and understanding over the cold chain practice, and 31.4% of the participants are neutral, similarly the average responses of the data 3.4 is moderate and there are employee who have better knowledge over the issue but there are also employee who have knowledge gap in cold chain practice, the issue of creating continuous development is vital to avoid and minimize the problem and the descriptive study assessed the issue and the result shows that the majority of the participants 45.9% are neutral where they preferred to be silent and it denotes they don't have information whether there is continuous training program or not and 38.4% of the study population replied that there is no such kind of trends and practice to maximize the potential awareness of the employee and 15.7% of the participants supported the idea, but the average responses 2.8 is below the expected where it signified that there is huge loophole of not making

or creating awareness to effective practice of cold chain logistics, the SD of the 0.8 implies the homogenous responses of the participants and employees have reservation on the existence of continuous training program to abolish knowledge gap. Employees have to adopt the safety precaution that has to be implemented in cold chain logistic practice; hence, the descriptive stats shows that 50.3% of the employee supported that employees are implementing safety precaution in cold chain logistic practice, but 21.1% of the participants are not in favor of the majority and 28.6% of the study signals the neutral and the mean value 3.4 is moderate and it denotes some of employee adopt and implement safety precaution but yet limitations are there since significant people question it and the SD of the question 0.96 implies the dissimilar responses of the study participants, the other issue that the research tries to investigate is weather there are enough employee who have technical ability or not and the result shows that 44.3% of the population agreed and strongly agreed on the matter and 29.7% of the study population were disagree and 25.9% of the sample population are neutral, the mean value 3.3 is moderate and it denotes there is limitation and gap and shortage of having enough employee who have equipped with technical ability in performing cold chain practice, the standard deviation of the question 1.09 is also implies the wider spread of the responses.

Table 4.6 Performance

No.	Items	Alternatives	Frequency	Percent	M/SD
1.	Cold Chain items are delivered on time	Strongly Disagree			M= 3.77 SD= 0.86
		Disagree	16	8.6	
		Neutral	46	24.9	
		Agree	87	47.0	
		Strongly Agree	36	19.5	
		Total	185	100	
2.	Achievable plan is set	Strongly Disagree			M= 3.67

	to make cold chain practice effective	Disagree	14	7.6	SD=0.88
		Neutral	71	38.4	
		Agree	62	33.5	
		Strongly Agree	38	20.5	
		Total	185	100	
3.	MSF has ways to solve different problems in doing cold chain logistic	Strongly Disagree	5	2.7	M=3.4 SD=1.0
		Disagree	30	16.2	
		Neutral	48	25.9	
		Agree	78	42.2	
		Strongly Agree	24	13.0	
		Total	185	100	
4.	MSF conduct the necessary assessment to identify the need of community in cold chain items	Strongly Disagree			M=3.8 SD=0.81
		Disagree	12	6.5	
		Neutral	46	24.9	
		Agree	92	49.7	

		Strongly Agree	35	18.9	
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		Total	185	100	
5.	Customers are satisfied by the performance of MSF Holland cold chain logistic supply	Strongly Disagree			M=3.45 SD=0.90
		Disagree	30	16.2	
		Neutral	64	34.6	
		Agree	69	37.3	
		Strongly Agree	22	11.9	
		Total	185	100	

Sources SPSS output (2022)

The above table shows the performance variable of the study where some performance related questions were forwarded and the study revealed that 66.5% of the participants of the study said that cold chain items are delivered on time while 24.9% of the population are neutral and 8.6% are disagreed on the question, the mean value 3.77 is slightly less than high where it is positive and good delivery are observed and the SD is also displays the similarity of the responses where people are less hesitate on the timely delivery of cold chain logistics. On the issue of having feasible and achievable plan the mass 54% agreed and strongly agreed that there is achievable plan is set to make cold chain practice effective, 38.4% of the participants of the study are neutral and 7.6% are not agreed the average responses 3.64 implies the moderate support of the participants where huge number of participants are neutral and the fact that they stayed neutral is manifestation of lack of information and knowledge over the issue, the other point discussed in the study is giving early solution for the problems, where the research data indicates that the mass 55.2% of the study population said that MSF has ways to solve different problems in doing cold chai logistic, but 18.9% of the participants of the study refused to agree in which they are in doubt over the quick giving of solution for the problems in MSF, and 25.9% are neutral, the mean score 3.4 is moderate where the SD 1.0 which implies of heterogeneous responses of the participants of the study which means some are positive view for quick responses while yet some other do not believe on it, the customer satisfaction is good indicator of the performance where

the study assessed the condition the survey displays that 49.2% of the study population support that customers are satisfied by the performance of MSF Holland cold chain logistic supply but in contrast 16.2% are not agreed on

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the satisfaction of the customer, 34.6% of the population are neutral and 3.45 is moderate and 0.9 of SD which is high and the dispersed responses of the employee and implies that there is limitation and gap in satisfying customers but good implications are also there.

4.4. Correlation Analysis

As the purpose of correlation analysis is to discover the extent and also the path of the relationship among the study independent variables i.e. (shipment of cold chain items, distribution and transportation, storage, and technical capacity) and the dependent variable i.e. performance of MSF, Pearson correlation analysis was used to explore their relationships and results are summarized in the table

Correlations						
		Performance	Shipment	Transportation	Storage system	Technical Awareness
Performance	Pearson Correlation	1	.951**	.948**	.966**	.967**
	Sig. (2-tailed)		.000	.000	.000	.000
	N	185	185	185	185	185
Shipment	Pearson Correlation	.951**	1	.979**	.969**	.915**
	Sig. (2-tailed)	.000		.000	.000	.000
	N	185	185	185	185	185
Transportation/ Distribution	Pearson Correlation	.948**	.979**	1	.976**	.930**
	Sig. (2-tailed)	.000	.000		.000	.000
	N	185	185	185	185	185

Storage/ warehouse system	Pearson Correlation	.966**	.969**	.976**	1	.964**
	Sig. (2- tailed)	.000	.000	.000		.000
	N	185	185	185	185	185
Technical Awareness	Pearson Correlation	.967**	.915**	.930**	.964**	1
	Sig. (2- tailed)	.000	.000	.000	.000	
	N	185	185	185	185	185
**. Correlation is significant at the 0.01 level (2-tailed).						

Table 4.7 correlation analysis

Sources SPSS output (2022)

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Cohen (1988) effect size standards, correlation coefficients $< \pm 0.28$ are small effects; medium effects range from $\pm 0.28-0.49$; and, large effects are greater than ± 0.49 . Cohen (1998) cited by Warokka et al. (2012), also interpreted the coefficient of correlation between 0 and 1 as in the following manner. The correlation coefficient (r) ranging from 0.10 to 0.29 may be regarded as indicating a low degree of correlation, r ranging from 0.30 to 0.49 may be considered as a moderate degree of correlation, and r ranging from 0.50 to 1.00 may be regarded as a high degree of correlation.

Accordingly, as the above table 4.7 clearly shows that the shipment of cold chain items has high positive relationships with the dependent variable performance of MSF where ($r=0.951$) and positive relationship exist between the variables.

The other variable of the study distribution and transportation also has positive and high relationship with the performance of MSF where the existence of good distribution and transportation has positive effect on the performance of MSF ($r=0.948$)

The other independent variable of the study storage system which the table displays that the Pearson correlation coefficient ($r=0.966$) which means there is strong and positive relationship with performance of MSF, i.e. the existence of good storage system helps to increase and maximize the performance of MSF in cold chain logistics.

The technical capacity of the employee has also positive and strongly correlated as the Pearson correlation coefficient of the study displays ($r= 0.967$) and it means the positive increase of the independent variable will have positive effect over the dependent variable i.e. performance of MSF.

4.5. Test for Assumptions of Linear Regression Model/Regression Diagnostics

Prior to running the regression analysis to test the statistical significance, a preliminary analysis (Regression Diagnostics) was conducted to verify the assumptions of classical linear regression model like linearity, normality and multi-collinearity, tests/assumptions.

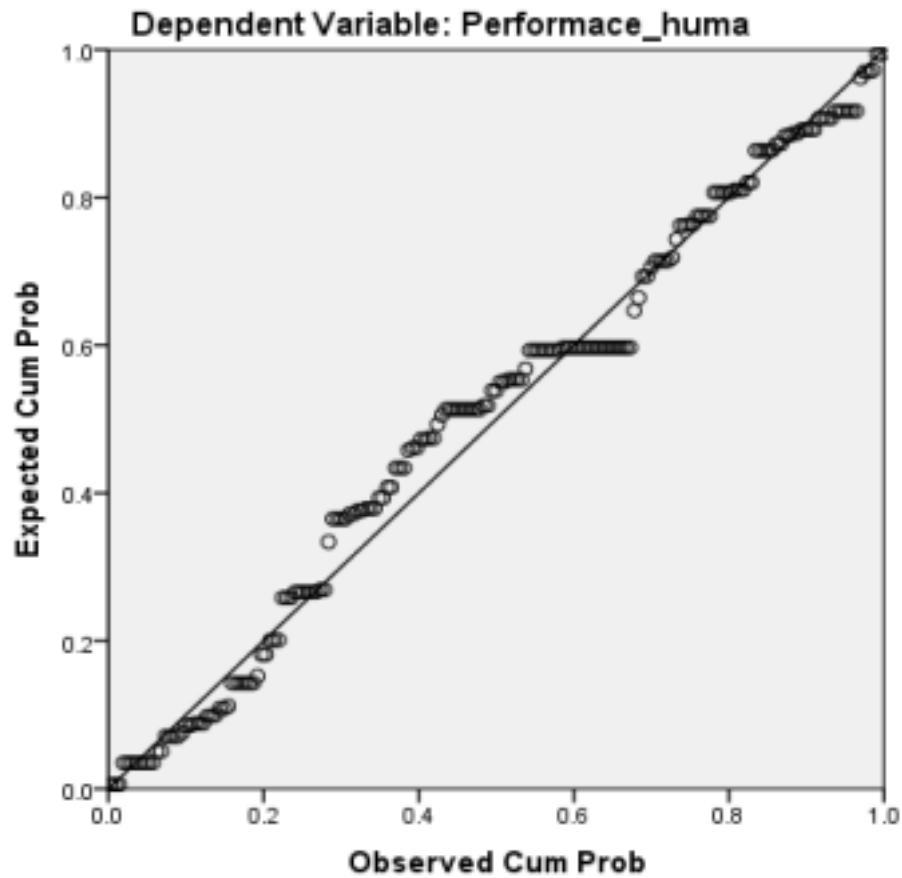
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4.5.1. Linearity test

The assumption of linearity can be tested by examining the Normal (P-P) Plot of the Regression Standardized Residual and the scatter plot. Therefore, the linearity of the relationship between the dependent and independent variables was checked using scatter plots of the regression residuals for the model through SPSS software. The scatter plot of residuals indicates that the points dwell in a rationally straight line from bottom to top. Therefore, we can conclude that the assumption of linearity was not violated.

Graph 4.1 Linearity test

Normal P-P Plot of Regression Standardized Residual

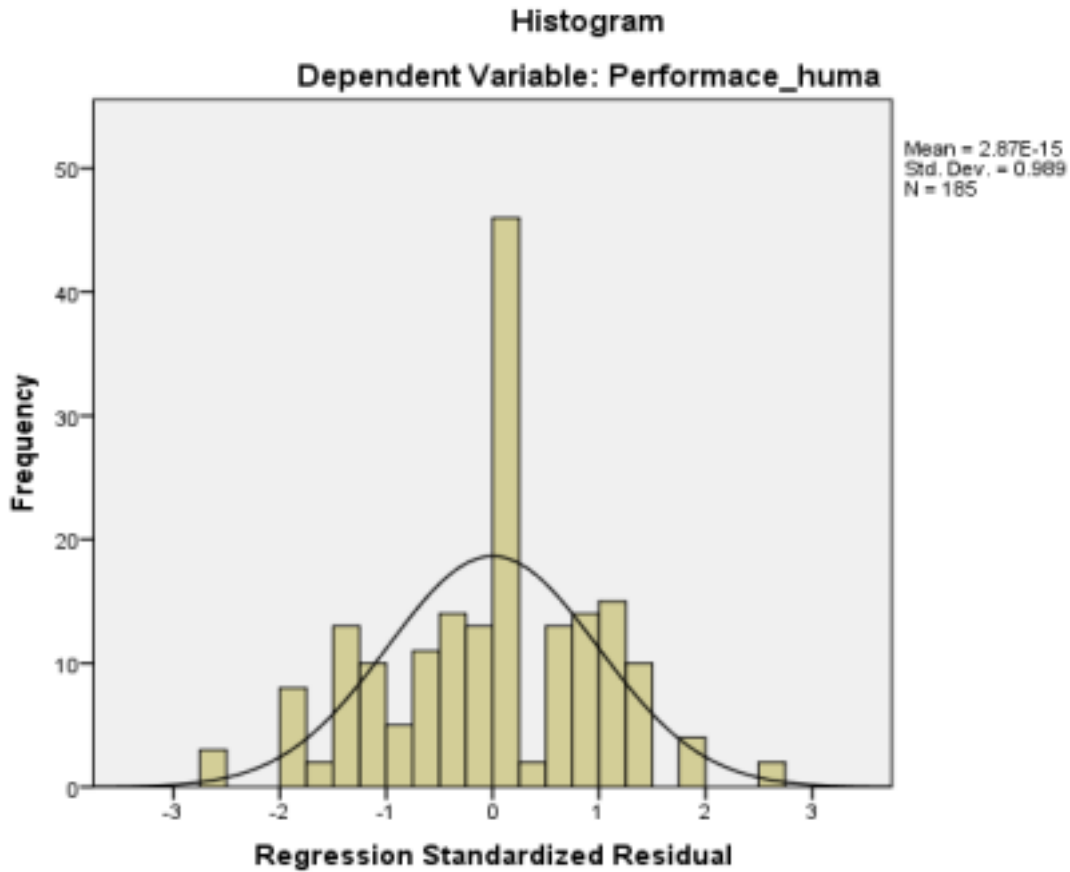


Sources SPSS output (2022)

4. 5.2. Normality Test

Normality test was used to determine whether the error term is normally distributed or not. The occurrence distribution of the standardized residuals as compared to a normal dispersal, as shown, even though there are some residuals comparatively far away from the curve, many of the residuals are impartially nearby. Moreover, the histograms are curved which lead to conclude that the residual (disturbance or errors) are normally distributed for. Moreover, the histograms are bell shaped which lead to infer that the residual (disturbance or errors) are normally distributed for the model. Thus, we can assume that the assumption of “normally distributed error term” is not violated.

Graph 4.2 Normality test



Sources SPSS output (2022)

4.5.3. Multi-collinearity Test

The Multi-collinearity will occur if some or all of the independent variables are highly correlated with one another. It shows the regression model has difficulty in explaining which independent variables are affecting the dependent variable Brooks (2008). Multi-collinearity can be tested either form correlation coefficient results or from the Value of Tolerance and VIF. According to Sekaran and Bougie (2016) the acceptable value of tolerance and Variance Inflation Factor (VIF) is above 0.10 and below 10 respectively.

Table 4.8 Collinearity Diagnosis

Independent Variables	Tolerance
Shipment of cold chain items	.619

4.6. Regression Analysis	
4.6.1. Model Summary	
Distribution/Transportation	3.17
Storage/ Warehouse	Variance inflation factor (VIF) 6.402
Technical capacity	7.738 .812 9.248
	4.017

Sources SPSS output (2022)

The researcher also conducted regression analysis to explore the relationship between the independent and dependent variables after testing all the relevant classical linear regression model assumptions for the data used. As indicated in table adjusted R-square value for the regression model was 0.962. This shows that the independent variables i.e. shipment of cold chain items, distribution and transportation, storage, and technical capacity explain about 96.2% of the variation in the level of performance of MSF. The coefficients of determination (R square value), the regression coefficients (Beta coefficient) and the p-value for the significant relationships is presented and reported in table 4.11.

Table 4.9 Regression model summary

Model Summary^b				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.981 ^a	.963	.962	.16761

a. Predictors: (Constant), Technical Awareness, Shipment, Transportation, Storage system
b. Dependent Variable: Performance humanitarian org.

Sources SPSS output (2022)

4.6.2. Analysis of Variance (ANOVA)

As it is shown in the ANOVA table (table 4-10), the p-value of 0.000 for the Model is less than 0.05 significant level. This indicates that the collected data provides adequate proof to conclude that the regression model was well fit. This means that the p-value (0.000) is highly significant and can be concluded that factors (shipment of cold chain items, distribution and transportation, storage, and technical capacity) can predict performance of MSF significantly.

Table 4.10 ANOVA

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	129.815	4	32.454	1155.164	.000 ^b
	Residual	5.057	180	.028		
	Total	134.872	184			
a. Dependent Variable: Performance						
b. Predictors: (Constant), Technical Awareness, Shipment, Transportation, Storage/ warehousing system						

Sources SPSS output (2022)

4.6.3. Coefficient of variables

Table 4.11 Coefficient of variables

Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.721	.053		13.577	.000
	Shipment	.370	.059	.474	6.267	.000
	Transportation	.540	.070	.640	.769	.043
	Storage system	.301	.820	.380	.380	.004
	Technical Awareness	.562	.050	.630	11.137	.000
a. Dependent Variable: Performance of humanitarian organization						

Sources SPSS output (2022)

The above table elucidates the significance level of each independent variables of the study where the first variable of the study shipment of cold chain items displays that the (beta=.474, $p<0.05$) which indicates that the variable is statically significant, and a unit increase in shipment can affect performance by 47.4% being keeping other things constant.

The other independent variable of the study is transportation or distribution where the statical analysis of regression displays that (beta=.640, $p<0.05$) which means that there is statically significant of transportation and distribution on performance and a unit increase in transportation and distribution can affect Performance by 64% being keeping other things constant.

The other independent variable of the study is storage system where the statically analysis of regression displays that (beta=.380, $p<0.05$) which means that there is statically significant of storage system on performance and a unit increase in storage system can affect performance of MSF by 38% being keeping other things constant.

The last but not least, independent variables of the study is technical capacity where the statically

analysis of regression displays that ($\beta=.630, p<0.05$) which means that there is statically significant of technical capacity on performance and a unit increase in storage system can affect performance of MSF by 63% being keeping other things constant.

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4.7. Qualitative data Analysis

The qualitative data acquired through interview is narrated by the researcher based on the responses given by the interviewee and the researcher attempted to set themes which are appropriate based on the interview questions and the data is presented based on these themes. A total of 11 interviews were made to acquire data and the researcher paused the interview when it is considered the data is saturated i.e., the interviewees replied to similar responses after making 11 interviews and the data compiled through three thematic concepts of cold chain practices.

4.7.1. Practice of cold chain in MSF

The researcher forwarded questions which were related to the practice of cold chain logistics and the participants reflected their perceptions based on their experience, hence the 3PL service had been the first concept where whether there is such kind of integration of providing service or not and the mass of the participants of the interview described that *“the situation depend on the agreement where if the service is agreed in the manner of 3PL the customer will receive the service and if not that will not be applied in”* the participants also provided the other option where it allows the local office as mediator between the suppliers and the 3PL but the service of 3PL is not only obliged to provide document and they will be obliged to deliver the shipment by themselves. In addition to this the practice had been assessed through whether there is need assessment before deciding on the cold chain items, most of the interviewee suggested that MSF Holland usually conduct need assessment which is helpful to the organization to determine the gaps that are preventing it from reaching its desired goals, moreover it helps the MSF to prioritize the needed items in the community and independent evaluation to handle all humanitarian needs, moreover, MSF will assess the assistance to be provided. Different criteria determine what they do such as the magnitude of a given crisis the level of illness and mortality in the population the severity of exclusion from health care and the added value that MSF will bring to the affected people or region.

The other factor is the shipment and custom clearing process in cold chain items and the data

exhibits that shipment and Customs clearance process is where the main challenge exists. The need to understand the urgency of shipment and clearance of those items is very critical. There is a tendency to treat cold chain items as general cargo which does not require special attention. Due to the reasons above the shipment and clearing process still needs improvement. *“Cold chain*

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logistic demanded special attention and emphasis where the nature of the items forced us to care more than other ordinary items and the objective of bringing these items is the other factors, but in practice we haven't seen such kind of curiosity on custom clearing process”. Furthermore, the infrastructure for shipment, storage and clearance of cold chain items exists but it is not enough to accommodate the need of humanitarian organizations and others too. Therefore, it still requires improvement in that respect too. The investment involved in handling cold chain items is very huge moreover, training and development facilities are not easily available which makes it even difficult to evaluate the process in its entirety.

4.7.2. Transportation/Distribution of Cold chain items

The cold chain involves the transportation of temperature-sensitive products along a supply chain through thermal and refrigerated packaging methods and the logistical planning to protect the integrity of these shipments. The research attempt to examine distribution which means the product or item delivery, distribution to the end users, for this reason, considerations that must be taken to distribute and transport the item have been assessed. The information obtained depicts that the availability of suitable vehicles, the existence of proper warehouse or storage to store all the cold chain items, the awareness of the stakeholders who are engaging in distribution and availability of escorts who will be responsible to accompany the cold chain items, these are considered to be the most important considerations that have been pinpointed by the interviewee. The other critical factor examined through interview is the storage condition of MSF Holland and the responses received from the interview displays that the storage facility that we have in Ethiopian airlines can be considered as good for cold chain items while most of the participants agreed that they are afraid to say all the MSF Holland storages found in different regions of the country fulfill the necessary condition for storing cold chain items.

4.7.3. Technical Awareness

Technical Awareness of the employees and other stakeholder is necessary factor for the performance of the humanitarian organization especially those who engaged in cold chain logistic. They need to possess the necessary knowledge and understanding to minimize the risk of making the items damaged and useless, thus all the respondents of the interview believed that the need to have proper knowledge and understanding is significant to properly administer cold chain logistics.

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Furthermore, stakeholders' perception is also critical to be more efficient in the service so, the respondents replied that MSF does have the manpower to perform its operations and locals with the necessary skill might be involved to facilitate processes, this in turn helps knowledge transfer. When we come to stakeholder offices, mostly they are governmental offices and depend on the current rules and regulations of the country, what is allowed previously might be forbidden in the current administration, they lack consistency (what one officer allowed might be denied somewhere else by another officer). On the other hand, stakeholder office personals possessing the necessary knowledge lack the proper experience of handling cold chain items. And lastly even if the stakeholder offices possess the necessary knowledgeable manpower, they are overworked and frustrated who are waiting to retire and they will not cope with the dynamics of the current generation to understand technology. In addition to the awareness, the technical capacity of employees also makes difference in the performance of the organization where the existence of high technical skill and knowledge of employee will increase the efficiency, thus all of the interviewee agreed on the significance of technical capability and the researcher received information that there is limitation on technical capability of employees where it doesn't mean that there is no technical capability but when we compare from the demand and supply perspective, it is too low, and *“Even if there are professionals who handle cold chain items it is very critical to work on training and development. For example, DG training is provided by a single institute with a limited number for it requires huge investment therefore it is very difficult to evaluate the system with this limited resource. When it comes to MSF employees, they do take continuous trainings to handle cold chain items for the entire operation depends on them.”*

CHAPTER FIVE

SUMMARY, CONCLUSION AND

RECOMMENDATIONS 5.1. Summary of Major Findings

This research is aimed to assess the effect of cold chain logistics practice on the performance of humanitarian organization the case of MSF Holland. The study aimed to make survey on the issue of cold chain logistic practice in relation to performance and mixed research approach has been applied to study the existing fact. Numerical expressions of the research have been explained by using frequency, percentage and mean of the variable. The qualitative data has been collected through conducting interview with selected management members of the MSF Holland separately. The descriptive statistical part of the research displays that the internal consistency, reliability, and the coefficient alpha of every variable is fair and high. The mean score of every variable were taken in the range of high, moderate, and low. Thus, based on this, the following major findings have been obtained from the research.

The study finds that there is good progress and condition of protecting cold chain products from high temperature, where the study indicated there is a better result and discovery in MSF cold chain packaging as well as good procedural transfer of the items from ship, airplane to trucks.

Successfully moving a shipment across the supply chain without suffering any setbacks or temperature anomalies becomes more frequently accomplished if a comprehensive logistical process is established, it needs qualified professionals who monitor and practice it. Subramanyam (1989). However, the study pinpointed that there is lack of professionals who monitor the shipment process.

The transportation of cold chain item is significant aspect for the performance of MSF where it relies heavily on science to evaluate and accommodate for the link between temperature and perishability. Cleland (1996). And the study indicates that there is limitation in fulfilling all the necessary conditions for vehicles to transport and the items exposed to theft and spoil.

The study uncovered that there is strength in MSF in which as much as possible the cold chain items are not exposed to excessive heat however, according to Cleland (1996) transporting such items does not only focus on making it cold instead creating the desired condition and acceptable temperature range. And the study assured that there is a tendency of making frequent inspection

of vehicles to correct some kind of defect which exhibits in cold chain logistic transporting mechanisms.

The other essential condition of cold chain logistics is availability of desired storage system where Froes (1995) states that it is important for a facility to have proper storage and monitoring equipment that is set up correctly, maintained appropriately, and repaired as needed but the research uncovered that there is weakness in making storage equipment's functional, giving quick modification when problems occurred and protecting the sanitary condition of the storage.

The lack of availability of humanitarian logisticians is another important challenge facing humanitarian organizations (Fritz Institute 2005). The research also identified that there is gap in awareness of the employee about the cold chain logistic; moreover, the study proved that there is minimum experience in MSF to facilitate continuous training for employee to upgrade their awareness.

The correlation analysis of the study revealed that all five independent variables (shipment of cold chain items, distribution and transportation, storage, and technical capacity) of the study have high and strong positive relationship with the dependent variable (Performance of MSF) this shows that the existence of each variable has positive effect over the performance of the MSF.

The ANOVA analysis showed that, the p-value of 0.000 for the Model is less than 0.05 significant levels. This indicates that the collected data provides adequate proof to conclude that the regression model was well fit. This means that the p-value (0.000) is highly significant and can be concluded that factors or variables (shipment of cold chain items, distribution and transportation, storage, and technical capacity) can predict performance significantly.

The regression model summary displays that the factors that affect cold chain logistic would critically influence the performance of humanitarian organizations where 96.3% variation occurred in this circumstance and the remaining 3.7% is unknown variable which is not covered by this study.

5.2. Conclusion

Considering the analysis and interpretation of the data in the foregoing sections, the following conclusions were made:

Both the ANOVA and regression model analysis showed that the independent variables i.e. (shipment of cold chain items, distribution and transportation, storage, and technical capacity) explain about 96.3% of the variation in the level of performance of MSF.

The overall all analysis of the study showed that majority of the respondents think that the identified factors or variables positively and significantly affected i.e. (shipment of cold chain items, distribution and transportation, storage, and technical capacity) the performance of MSF.

Protecting a temperature sensitive product is very important aspect of cold chain logistics practice and it's important that any medical products shipped are protected from heat and cold. Thus, the study concluded that there is good experience and progress in MSF to protect cold chain items from high temperature through packaging and while transferring of items from ship to trucks.

As most authors agreed that having enough professional is the challenge in effectively carried out cold chain logistics, the study also proved that there is problem and limitation of having professionals who monitor the shipment process which in turn affect the performance of MSF.

The other critical element of cold chain logistics is transportation and distribution where some items have immediately been delivered to the consumers, the primary mode of transport is vehicles where those vehicles had to fulfill the necessary condition to transport items but there are plenty of problems in fulfilling such conditions.

The frequent inspection of the vehicles which is manifested in the study must be strengthened where it is necessary to make those vehicles ready for transporting the cold chain items and the inspection process has to continue for the safety of the items and the existence of inspection is positive output.

The storage system which is significant feature in moving the cold chain item where the existence of proper storage is critical and the study identified that there is problem in repairing the storage, fulfilling the standard condition of the storage which affect the performance of the humanitarian organizations like MSF. The other issue is the humanitarian condition where the study displays there is lack of enough knowledgeable, skillful, and experienced professionals who can monitor,

lead, and supervise the cold chain logistics process; thus, it is possible to conclude that there is shortage of professional employees in the cold chain logistics which significantly affect the performance of the humanitarian organizations.

The tendency to create awareness through continuous training program is low where it is important to minimize the skill gap but there is limitation on MSF to be committed in providing such kinds of trainings in collaboration with institution who can help in this regard.

5.3. Recommendations

Considering the findings and conclusion of the study, the researcher would like to forward the following recommendations.

- The experience of providing special care and protection for temperature sensitive cold chain items from unfavorable temperature, providing good packaging system and careful transfer of items from ship/airplane to vehicle must be strengthened since it is vital for the items to be used by end consumers and maximize the performance of MSF.
- MSF should work collaboratively with government and other stakeholders to create skillful and professional employees who can monitor and supervise the cold chain shipments process.
- The primary modes of transportation for this items, Trucks and Vans, must meet the specifications necessary to transfer the package. They need to be able to block out exterior weather, have enough room to store the shipment and be capable of restraining any unnecessary movement that could damage the package during transportations.
- The MSF must give huge emphasis to inspect the condition of the vehicles, the occurrence of any defect that might damage the cold chain items and be committed to correct and repair the defect to make the delivery and transportation smooth.
- MSF should be ready to prepare a more suitable storage, where checking the storage system whether it fulfilled the necessary condition and need regular maintenance to ensure proper operation, maintain required temperatures, and extend the useful life of the equipment.

➤Last but not least, MSF must create system of awareness creation program and adjust series of trainings through investigating the existing knowledge gap of employee who engage in cold chain logistic practice, and this will enhance and improve the performance of MSF.

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APPENDIX

ADDIS ABABA UNIVERSITY

SCHOOL OF COMMERCE

DEPARTMENT OF LOGISTICS AND SUPPLY CHAIN

MANAGEMENT UNIT

THE EFFECT OF COLD CHAIN LOGISTICS PRACTICE ON THE

PERFORMANCE OF HUMANITARIAN ORGANIZATION: THE CASE

OF MSF HOLLAND.

Dear Respondent

The purpose of this questionnaire is to collect primary data for conducting a study on the topic of the effect of cold chain logistic practice on the performance of humanitarian organization ;the case of MSF Holland, for the partial fulfillment of the Master’s degree in... at Addis Ababa University.

KIFLE TESHALE 0911908681

I kindly request you provide reliable information.

Thank you in advance for your cooperation

N.B: No need to write your name

Put (√) or (x) inside the box or table for an alternatives you think is right.

Part I: General Information

1. What is your current position title in your Office?

Expert Senior Expert Team and above

2. Qualification (Educational background)

Diploma and below Degree MA and above

3. Field of study

Logistic and Procurement Economics

Management Accounting Other

4. Service Year Logistics and related profession

1-3 years

4-6 years

7-9 years More than 9 years

Part II: Cold Chain Logistic Practice Questions (Tick on Your Selection)

SD=Strongly Disagree D=Disagree N= Neutral A=Agree SA=Strongly Agree

		SD	D	N	A	SA
		1	2	3	4	5
A. Shipment process						
1	Cold chain goods are protected from warm during loading and unloading.					
2	There is good packaging and handling in the process of cold chain logistic.					
3	Qualified professionals are monitoring the shipment process of cold chain logistic.					
4	Goods are well protected from damage and malfunction					
5	The transfer of materials from ship/plane/ to truck is performed with due consideration of all cold chain logistic procedures.					
		SD	D	N	A	SA
		1	2	3	4	5
B. Transportation/Distribution						
1	Cold chain items are transporting by suitable type of vehicle					
2	The transportation of cold chain items are not exposed to excessive heat.					
3	Cold chain items are carefully protected from spoil during distribution					
4	Every prerequisite are fulfilled during the transportation of cold chai items.					

5	Frequent inspections are carried out to check the functionality of vehicles.					
C. Storage system		SD	D	N	A	SA
		1	2	3	4	5
1	There is availability of needed storage which can keep cold chain items.					

2	The storage system has adequate technology to keep cold chain items					
3	Storage equipment's are fully functional.					
4	There is quick modification and repairing mechanisms when storage encounters problems.					
5	There is no problem in ensuring the sanitary condition of the storage					
D. Technical awareness		SD	D	N	A	SA
		1	2	3	4	5
1	Least human error occurred in delivering cold chain item					
2	Employees have better awareness in cold chain logistics practice					
3	Contentious awareness creation program have been carried out by MSF Holland and stakeholders.					
4	Employees are implementing safety precaution in cold chain logistic practice.					

5	There are enough employees who have technical ability to handle cold chain items.					
	E. Performance	SD	D	N	A	SA
		1	2	3	4	5
1	Cold Chain items are delivered on time					
2	Achievable plan is set to make cold chain practice effective					
3	MSF has ways to solve different problems in doing cold chain logistic	5				
4	MSF conduct the necessary assessment to identify the need of community in cold chain items.					
5	Customers are satisfied by the performance of MSF Holland cold chain logistic supply.					

Thank You

Questions for key informants' interview

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1. Is there an integrated relationship with suppliers and 3PL service providers to ensure responsiveness?
2. Does an MSF and stakeholder office possess the necessary knowledge and skilled manpower?
3. Does MSF perform a pre-assessment to identify needs with respect to volume and type of supplies?
4. How do you evaluate the shipment and clearing custom process in cold chain items?
5. What considerations have been taken to distribute and transport cold chain items?
6. How do you express the storage condition of cold chain items?
7. How do you evaluate the technical capability of the employee in effectively administering cold chain items?

