THE ROLE OF SUPPLY CHAIN INFORMATION SYSTEMS ON HUMANITARIAN SUPPLY CHAIN OPERATION PERFORMANCE: THE CASE OF UNITED NATIONS WORLD FOOD PROGRAMME, ETHIOPIA

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BY

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DECLARATION

I, **Million Asmamaw** declare that the work which is presented in this thesis entitled **"The Role of Supply Chain Information Systems on Humanitarian Supply Chains Operation Performance, The Case of United Nations World Food Programme, Ethiopia"** in partial fulfillment of the requirements for the Degree of Masters of Art in Logistics and Supply Chain Management at Addis Ababa University, is the original work of my own effort and done under the guidance of Shiferaw Mitiku (PhD), and that all the sources of materials used for the study have been duly acknowledged. I further confirm that the thesis has not been submitted either in part or in full to any other university for the purpose of earning any degree.

Name: Million Asmamaw

Signature _____

Date _____

CONFIRMATION

This is to certify that Million Asmamaw has carried out this research work on the topic entitled **"The Role of Supply Chain Information Systems on Humanitarian Supply Chains Operation Performance, The Case of United Nations World Food Programme, Ethiopia"** under my supervision. This work is original in nature and has not been presented for a degree in any University and it can be submitted for the partial fulfillment of the requirements for the award of the degree of Masters of Art in Logistics and Supply Chain Management.

Dr. Shiferaw Mitiku

Signature_____

Date _____

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List of Abbreviations and Acronyms

UNWFP: United Nations World Food Programme

SCM: Supply chain Management

IDPs: Internally Displaced Persons

HPC: Humanitarian Programme Cycle

HROs: Humanitarian Relief Organizations

IHOs: International Humanitarian Organizations

HSCM: Humanitarian Supply Chain Management

HSCIS: Humanitarian Supply Chain Information Systems

GRFC: Global Report on Food Crises

SCIS: Supply Chain Information Systems

NDRMC: National Disaster Risk Management Commission

IT: Information Technology

IS: Information System

ICT: Information Communication Technology

ERP: Enterprise Resource Planning

GPS: Global Positioning System

SCM: Supply Chain Management

CSCM: Commercial Supply Chain Management

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Million Asmamaw

Dedication

This project is dedicated in memory of my late parents specially to my mother W/ro Mulutsehay Anteneh for all your efforts and the unconditional, uninterrupted love you showed to all your children during your stay in the physical world.

Your spirit will always stay with me forever

Abstract

The research has been done under the title "The role of supply chain management information system on humanitarian supply chain operations performance, The case of the United Nations World Food Programme, Ethiopia". This research applies a quantitative method, descriptive statistics and regression model as the research methodology. Similarly, out of the total 134 World Food Programme Ethiopia employees taken as a population of the study, questionnaires were made available to 100 of those selected employees (program, logistics, and procurement unit) using a random sampling technique. Out of the total distributed questionnaires 72 responses were obtained with a response rate of 72%. Data obtained through questionnaire has been analyzed by using descriptive and regression model and related tests were used for data analysis using X&Y as independent variables and A&B as dependent variables. The analysis was supported by SPSS 23 software. The result of the analysis revealed that planning, sourcing, warehousing system were found to be significant, the research identified the current supply chain management information system practices that have an impact on overall supply chain management information systems performance of the World Food Programme namely; responsiveness, flexibility, reliability and cooperation/standardization. Empirical findings of the study showed that World Food Programme uses the required information systems to manage its planning, sourcing, logistics, and delivery and monitoring and evaluation. However, there is a lack of using some technologies like Global Positioning System (GPS)on the contracted truck and Radio Frequency Identification (RFID) on aid items that can facilitate the virtual management of the whole systems. In addition to this, the World Food Programme should work more on the information systems to make it more accessible by any end-user (beneficiaries/implementing partner),and improve the flexibility of the systems to measure the satisfaction level of beneficiaries by implementing partners is also another suggestion. Moreover, improving the current warehouse system practices expected to further enhance the humanitarian supply chain operational performance. Finally, building a new system that can support the current logistics information system with the other systems makes the whole system more efficient and can narrow the gap between the donors and the aid recipients.

Key Words: *SCMIS, IS/IT, HSCIS, Performance*

CHAPTER ONE

1. INTRODUCTION

This chapter presented the general overview of the concept of supply chain information system and brief introduction of the United Nations World Food Programme, (UNWFP) humanitarian operation in Ethiopia along with the supply chain management information system practices and its challenges that the organization facing. The chapter includes a background of the study, the background of the organization, statement of the problem, the objective of the study, the significance of the study, the scope of the study, limitation of the study, organization of the study, finally conceptual and operational definition of terms.

1.1.Background of the Study

Information plays a crucial role in the relief supply chain management. In relief supply chains, the recipient of aid is disengaged from the commercial transaction and has no direct influence on what supplies they receive. The key decision-makers in the humanitarian supply chain are the donors who finance the projects and many NGOs treat their donors as one of their customers. In the business supply chain, the end-user determines what products they need, and measuring the satisfaction level of these customers can easily be done by tracking the reception of those products. However, in relief supply chain management, need assessment of the beneficiaries are being done by an outsider, hence, measuring the satisfaction level of the beneficiary is much more challenging, as more research must be carried out to decide if these needs have been fulfilled (*Gray and Oloruntob, 2006).*

supply Chain Management (SCM) highly dependent on information and communication technology (ICT) for the handling of purchases, correspondence, decision making, and information sharing. The definition of SCM then attracted popularity and was only discussed by scholars after the implementation of ICT tools. The practice and utilization of ICT methods in Supply Chain Management began in the 1960s with the advent of electronic data interchange (EDI) systems and the subsequent introduction of material requirements planning (MRP) approaches in the 1970s, manufacturing resource planning (MRP II) in the 1980s, and enterprise resource planning (ERP)

in the 1990s. After 1990 to date, several ICT solutions have been innovated and installed to sustain the increasingly complicated supply chain system*(Alfalla-Luque and Medina-Lopez, 2009).*

Nowadays, information systems and technology have to be perceived widely to incorporate the software that companies produce and utilize, as well as a vast variety of rapidly connected and related systems that handle information with the advent of personal computers, optical fiber networks, and expansion of the internet and the world wide web. The cost and accessibility of information have also become cheap and fast. This facilitates easy connections and reduces time delays associated with the information in every supply chain network *(Himanshu S. Moharana, et al.,2011).*

The crucial function that information systems management may play in shaping successful humanitarian response, planning, and integrating different operations and decision-making is a widely accepted fact, although there is a barrier to the flow of information. *(Nezlh Altay, 2012).* However, currently, many aid agencies are trying to improve their processes and activities in a highly demanding environment. A crucial and essential method for optimizing operations is the performance evaluation and also simplifying the coordination and communication between supply chain partners*(Gunasekaran and Kobu, 2007).*

Therefore, the purpose of this study is to examine the role of supply chain information systems on humanitarian supply chains operation performance and to identify the factors affecting the adoption of humanitarian supply chain information systems in humanitarian operations.

1.2.Background of the Organization

The World Food Programme is one of the United Nations agencies working on food aid. According to the WFP, each year the organization assisting more than 86.7 million people in more than 83 countries. The organization headquarter is located in Rome, Italy, and has more than 80 country offices all over the world. The WFP is one of the leading humanitarian organizations in delivering food assistance in disaster emergencies and working with local partners and NGO's to improve nutrition and food security *(Relief Web, 2019).*

As per the WFP Ethiopia country brief published in January 2020, a total of 6.5 million Ethiopians comprising 82 percent of the planned in 2019 has got humanitarian assistance. This involve those

perceived to be severely food insecure, including 'resident' Ethiopians, locally displaced persons (IDPs), and returnees as well as drought affected people living in southern and eastern Ethiopia because of poor belg rains from March to May *(WFP Ethiopia, 2020).*

According to WFP, on any given day the organization "WFP has 5,600 trucks, 20 ships and 92 planes on the move, delivering food and other assistance to those in most need. Every year, WFP distributes more than 15 billion rations at an estimated average cost per ration of US$0.31" *(WFP, 2019).*

1.3.Statement of the Problem

The introduction of ICT, and how it impacts organizations, is the focus of information systems research. Information Systems investigates not only the technical aspects of ICTbut also explores the human and interpersonal practices in relation with the development, application and adoption of ICTs. Supply Chain Information Systems is designed to support the strategy with information and information processing capabilities. Supply Chain Information Systems is considered to provide information and its processing capability to support the supply chain 's strategic planning, processes, management research, and management insight for decision-making actions (Tarokh and Soroor, 2006).

Information systems and technology is transforming our life style in terms of the way we live and work. The information technology revolution has given humanity the capacity to handle information with mathematical exactness, this helps us to disseminate information accurately and manipulate it with great details. Such technologies are building a whole ecosystem inside the physical world and beyond. The computational power available to mankind because of IT is growing at an extraordinary pace and computers and communication are becoming an integral part. At the corporate level information system and technology can help define the organization's goals and strategies. IT can also assist with the development and support, and with the procedures for achieving them. At departmental level, IT needs to ensure a seamless flow of information through departments, and assist companies in implementing the most effective business practices. At departmental level IT can guarantee smooth flow of raw data and info through the various departments and establishes and manages an enterprise-wide database (Himanshu et al., 2011).

An updated information can expose the organization to different problems. Among those problems the required relief items may not reach at the right time and donors may not allocate the necessary fund timely. The cumulative effect of these problems can be reflected on the organization in the form of incurring unnecessary logistics costs to expedite the shipment, moreover, it can also damage the reputation and credibility of the aid organization. Therefore, this research study will focus on assessing the role of supply chain information systems on the humanitarian supply chain operational performance in particular reference to the WFP. Nevertheless, due to different reasons supply chain information is not flowing smoothly from the beneficiary or implementing partners to the humanitarian actors including donors.

The Global Report on Food Crisis (GRFC) in its 2019 report indicated the highest number of people in need of immediate food aid assistance in 2018 for 53 countries and regions. The report also provides estimates of the new food security information for the 36 of those countries from the first eight months of 2019. However, updated estimates for the remaining 17 countries were not available by September 2019. Among those nations that could not provide the updated information from Africa are Burundi, Djibouti, Ethiopia, and Libya.

In relative terms WFP and its major partner in Ethiopia (NDRMC) working hand in hand to strengthen their information system and have a long year of experience regarding the smooth flow of information. It is also well known that WFP is allocating additional funds to support the NDRMC in enhancing a system to collect and register information on the humanitarian supply chain that helps to bolster the supply chain visibility and to further augment the ongoing drought response, however, it is still observed that Ethiopia is one of the country who could not provide an updated supply chain information to the GRFC. Timely updated supply chain information systems are beneficial to the humanitarian players in the operational of their projects throughout Ethiopia *(NDRMC Report, 2019).* Moreover, the FAO representative in Ethiopia said, FAO will continue supporting the government and working with partners to generate regular, timely information as well as evidence-based analysis regarding the food security situation in the country. She also added that “Credible information is the starting point of any intervention. It pinpoints who are the most affected, where they are, how they are affected, and what their needs are”, she added.

WFP, however, actively strives to optimize sufficient IT for its activities while being attentive to business efficiencies and operational standards. Stronger integration with those who fund the

project and implementing partners is the goal of information technology. Information systems enhance facilitation and linkages in the flow of food assistance from those who fund the project to the end recipient and closing the feedback loop by providing information from the end recipients to donors. To respond to the needs of the times and to optimize the humanitarian supply chain, donor, WFP, and its partner supply chain information systems must be connected. WFP is well situated between donors and partners to serve as the catalyst and provide the critical linkages for an integrated humanitarian supply chain. This kind of systems integration can be a reality using suitable and tailored information systems and technology (Yu, 2010).

1.4.Basic Research Questions

The study is intended to answer the following basic research questions:

- What is the role of supply chain information systems on humanitarian supply chain performance?
- What are the factors affecting the adoption of humanitarian supply chain information systems in humanitarian operations?

1.5.Objectives of the study

The objective of this study is to examine the role of supply chain information system on the organization supply chain performance.

General objectives

The overall objective of the study is to examine the role of supply chain information systems on humanitarian operation in the United Nations World Food Programme Ethiopia country office.

Specific objectives

The study has the following specific objectives;

- To assess the role of supply chain information systems on theWorld Food Programme's humanitarian supply chain performance
- To identify the factors affecting the adoption of humanitarian supply chain information systems at the World Food Programme's, humanitarian supply chain operations

1.6.Significance of the study

The study is expected to have a practical significance to the humanitarian community and actors particularly to WFP, it can also be a source of information for the academia, practitioners, and scholars for it is going to highlight the crucial role of the supply chain information system on the humanitarian operation supply chain performance. The study is going to show the usefulness of implementing supply chain information systems for the policymakers and try to encourage donors to invest in this part of the infrastructure so that they will get the best value of the money they are bestowing.

1.7.Scope of the Study

The study focused on the role of supply chain management information system practice at the United Nations World Food Programme, Ethiopia country offices. Due to time and money constraint the study focused its research on Ethiopia operation within the boundary of Ethiopia specifically on WFP employees who knows about supply chain information systems. In addition to this, the study focused its research only on links or information systems that connect donors with WFP, implementing partners or beneficiaries. Because the researcher believes that to identify the real needs of the beneficiaries the donor has to get the right information from the right partner who is assisting the beneficiaries on the ground.

1.8.Limitation of the Study

The major limitations of the study were the current global pandemic which makes the data collection effort more arduous. Moreover, to have the opinion of some of the expert's interview was also planned for this study; however, most of them were out of the office and did not have the willingness to avail themselves for the interview. In order to solve this problem, the researcher prepared and used an online form.

1.9. Organization of the Study

The thesis is organized into three chapters: Chapter one contains the introduction part dealing with the background of the study, the research problem, objectives of the study, significance, and scope of the study. The second chapter focuses on the literature review about the subject matter. The third chapter presents methods of the study. Chapter four provides an analysis of the data and the presentation of the findings. Finally, chapter five focuses on the summary, conclusion, and recommendations.

1.10. Conceptual and Operational Definition

Reliability: The ability of an apparatus, machine, or system to consistently perform its intended or required function or mission, on demand and without degradation or failure *(Business Dictionary, 2020).*

Flexibility: The ability of a system, such as a manufacturing process, to cost effectively vary its output within a certain range and given timeframe *(Business Dictionary, 2020).*

Responsiveness*:* The ability of a machine or system to adjust quickly to suddenly altered external conditions, as of speed, load, or temperature, and to resume stable operation without undue delay *(Thesaurus Dictionary, 2020).*

Standardization/Cooperation: Standardization is a framework of agreements to which all relevant parties in an industry or organization must adhere to ensure that all processes associated with the creation of a good or performance of a service are performed within set guidelines (MitchellG.2019).

In this thesis the researcher would prefer to use information systems and information technology interchangeably.

CHAPTER TWO

2. RELATED LITERATURE REVIEW

This chapter provided the theoretical literature review of the study including supply chain management concepts of definition, general practices of information systems in humanitarian supply chain, the role of IT in a supply chain management. Empirical review also presented here with the role of supply chain information systems on humanitarian operation, challenges of humanitarian supply chain management and the role of information systems on humanitarian supply chain performance and finally the conceptual framework.

2.1. Theoretical Literature Review

2.1.1. Supply Chain Management Concepts of Definition

2.1.1.1. Supply Chain Management

Supply chain management is the art of managing and delivering the right product at the right time, in the right place, and at the right cost to the consumer. Supply Chain Management is an endeavor by suppliers to systematize and integrate the whole supply chain processes (sourcing, procurement, inventory management, logistics and distribution, information management) to provide affordable consumable products and services to customers *(Day et al., 2012).* This kinds of CSCM focused on making profits, however, for HSCM major objective is to alleviate human suffering and mitigate the loss of life and harm by delivering urgent humanitarian aid items in the form of food, medicine and sanitation items *(Beamon and Balcik, 2008).*

2.1.1.2. Humanitarian Supply Chain Management

Humanitarian supply chain refers to the network created through the flow of supplies, services, finances, and information between donors, beneficiaries, suppliers, and different units of humanitarian organizations to provide physical aid to beneficiaries. Humanitarian supply chains include functionalities that do not typically fall into the field of humanitarian logistics. Donors relationship management, assessing the needs of beneficiaries, planning of prepositioning of

supplies for future needs and evaluating and monitoring the effects of distributed aid items are typically the responsibility of non-logistics service (program) units *(Mentzer et al., 2001)*.

According to *Somesh & Kuldeep (2018),* the humanitarian supply chain is a system of networks formed by the flow of resources (materials, information, and finance) between donors, vendors (suppliers), aid recipients and different unit of aid agencies to provide relief items to beneficiaries using their logistics capability. HSCM is a process of an efficient and cost-effective preparation of plans, its execution, and management of aid flows, i.e. supplies, services, information, money, etc. from the donor to the final beneficiary, intending to fulfill the aid requirements. Business engineering express relief supply chain management (HSCM) as a whole to maintain and track all the systems involved and simultaneously attempt to coordinate them properly to work together with each other. Operations research uses modeling and simulation approaches to optimize the HSC output and also breaks down HSC into distinct problems like facility, transportation, location, and inventory management.

As Edgardo, (2010) mentioned in another study, a supply chain is characterized as a network of organizations, individuals, technologies, operations, information, and resources involved in the delivery of a product or service from the manufacturer to the customer. In the situation of food aid, this refers to the method of delivering and distributing food or other aid items from donors to beneficiaries. Though this is not a single chain, a set of connected supply chains through which the WFP's internal supply chain forms the center, enabling the distribution of aid items assistance from the donors to those NGOs, government counterparts, or implementing partners who can distribute the food to the beneficiaries. However, as far as we know there is no established information system that connects the implementing partner with the donor.

2.1.1.3. Information Systems in Humanitarian Supply Chain Management

As perceived commonly humanitarian supply chain information systems are designed to attain three main purposes. The primary aim is the need assessment of the beneficiary and scanning the environment (situation awareness), the secondary objective is the coordination of all humanitarian operation and the last objective is useful for humanitarian briefings and appeal to donors. In general, the information systems that are focused on coordinating and assessing the needs of the beneficiary can provide valuable background information for humanitarian relief logistics.

However, to tackle the full complication and specific detail of humanitarian supply chains, specialized logistics information systems need to supplement the general humanitarian supply chain information systems (*Kovacs, Spens&Haavisto,2016).*

2.1.1.4. The Value of Information Systems in the Humanitarian Supply Chain

According to *Howden (2009)*, information plays an important role in the relief supply chain process. In humanitarian supply chains, the recipient of aid is disengaged from the commercial transaction and has no direct influence on what supplies they receive *(Gray and Oloruntob, 2006)*. The key decision-makers in the humanitarian supply chain are the donors who finance the operation and many NGOs treat their donors as one of their customers in the humanitarian supply chain management. In the business supply chain, the end-user determines what products they need, and measuring the satisfaction level of these customers can easily be done by tracking the reception of those products. However, in humanitarian supply chain management, need assessment of the beneficiaries are being done by an outsider, because of this measuring the satisfaction level of the beneficiary is much more challenging, as more research must be carried out to decide if these needs have been fulfilled.

However, humanitarian logistics and supply chain management information systems can provide reliable and timely details on what materials are required, what products are procured, what items were shipped to beneficiaries, and to where. With this information, the monitoring and evaluation units will be able to evaluate and identify if such supplies have fulfilled the needs of the beneficiary. This feedback of closing the loop makes donors and aid agencies to be more active and attentive and will be able to sustainably respond and support the aid delivery process according to the needs of the beneficiaries *(Howden, 2009).*

2.1.2. General Practice of Humanitarian Supply Chain Management Information Systems

Humanitarian supply chains are a complicated process and thus coordination, technological know-how, and financial support are required to ensure the provision of aid items to the affected population located in crisis or disaster zones. The humanitarian supply chain system comprises of four major steps: planning, sourcing, logistics and delivery, and monitoring and evaluation. All these four major steps are organized sets of activities that have to be done in an integrated manner to plan, manage and respond to humanitarian needs (UNICEF, 2020).

Planning

This stage can be carried out into steps: needs assessment and budgeting and scheduling. Many relief agencies perform the needs assessment process in conjunction with their government counterpart to determine the extent of the disaster and what types of items are required. When the need assessment completed the resources required and its quantity is also determined. Most of the time budget preparation and scheduling is typically performed at the beginning of the year (OCHA,2020).

H1: Planning positively and significantly affects the humanitarian supply chain performance

Sourcing

Sourcing and procurement of materials and services is a vital part of humanitarian logistics. Humanitarian organizations tend to combine local sourcing and international approaches, resulting in considerable complexity. Relief organizations formally follow the official tendering process to identify the right supplier that can provide quality items with the right price. There are different ways to source supplies: First, it is typically the field office that initiates the acquisition phase and determines which materials are to be procured. Occasionally, the country office may source locally. Sourcing may often be performed as a direct order, which implies that the head office of the aid agency has made arrangements with vendors all around the world so that country offices may select appropriate vendors from their database (CRS, 2011).

H2: Sourcing positively and significantly affects the humanitarian supply chain performance.

Budgeting and Forecasting System: Based on the need assessment and the planned operation this system prepares a budget plan for the new budget year or for the new emergency operation. The budget and forecasting system need to answer the number of beneficiaries, employees (National/International), the amount of food aid item needed, the mode of transport that can transport the cargo to the final destinations (Cozzolino et.al., 2017).

H3: Budgeting and Forecasting positively and significantly affects the humanitarian supply chain performance

Logistics and Delivering

Logistics and delivery service include consolidating shipments, providing/arranging transport service and customs clearance at the discharge port, or at the border. Most of the aid agencies arrange the freight forwarding and shipping service at the headquarter level. The contracted service provider transport supplies to the port of entry, where the volume, status, and quality of the items delivered have been inspected by the licensed cargo inspectors. (WFP Manual, 2019).

H4: Logistics and delivery positively and significantly affects the humanitarian supply chain performance.

Warehouse system: This system helps to maintain the inventory level of any given warehouse by strictly following stock movements in and out from the warehouse. This system ensures a smooth flow goods from the donor to the beneficiary. This system can also follow up the balance of strategically positioned food aid items that can be dispatched to different locations (Roadman., 2004).

H5: Warehousing system positively and significantly affects the humanitarian supply chain performance

Utilization by End-User: This stage helps to identify whether the aid items delivered to the intended purpose. It focuses most of its activities at the last mile of the chain. It provides first class information for mangers and policy makers and it ensures the aid item delivered has been used for the original intended purpose. However, it needs some measure of qualitative approach to identify the real problem and take remedial action (UNICEF, 2018).

H6:* Utilization by End-User *system positively and significantly affects the humanitarian supply chain performance

Monitoring and Evaluation: This stage helps to measure the performance of the relief supply chain that has been set by the organization and the concerned government partner. Its main aim is to check supplies are delivered timely to the beneficiaries and whether the delivered aid items are appropriate for the intended purpose and continuously try to improve the aid items for beneficiaries and reinforcing the supply chain (WFP Manual, 2020).

H7: Monitoring and Evaluation positively and significantly affects the humanitarian supply chain performance

2.1.3. The Role of IT in a Supply Chain Management

A supply chain is the network of manufacturers, distributors, and subcontractors that a manufacturer uses to procure their raw materials, parts, and services. In the supply chain, the logistics units' stock, ship and deliver equipment and work-in-progress, and deliver completed goods to consumers or intermediaries as per the order delivered to them by the marketing unit. Creating an integrated logistics management system helps to reduce the price of the items, enhance the company's competence, and improves the organization's competitiveness in the market place. Integrating the supply chain and distribution processes increases performance and reduces prices, rising the comparative edge of the supplier. Supply chain management is about the smooth flow of supplies, information, and money among supply chain partners. Recent technological advancement makes it possible for companies to allow the use of information in their premises. Those technologies help to coordinate the supply chain management activities. Due to the increasing rate of technologies, the cost of information is also reduced in an integrated supply chain. IT Supply Chain Management promotes the transformation of the whole logistics set up to reach better quality rates, reduced inventory, reduced supply chain costs. Fundamental shifts have arisen in the world of today. Such developments are altering the interaction we have with our clients, vendors, corporate associates, and colleagues. Investment in IT created unparalleled incentives for businesses to enhance their competitiveness again their competitors, therefore, expenditure on IT is the prerequisite thing for a company to be able to support itself in the sector *(Emmanson's Blog, 2012).*

Such tools are effective in managing supply chain management operations. The expense of information is lowering due to an expanding and growing rate of development in the technological field. In highly interconnected supply chain systems where products and information flow in a bidirectional manner and decision-makers now need to understand that information technology is more than managing hardware computers. In late 1980 and at the early stage of the supply chain, information flow was paper-based, this kind of information flow was too sluggish by then the power of information was not well known. IT set up offers a strategic positioning of business firms such as by reducing the processing time of orders and products and integrating different

department's information flow and processes. Moreover, IT has also provided many advantages for managers and companies by reducing the number of human resource capital, logistics costs, boost customer satisfaction and it has also a very important benefit for strategic planning (Ravi J., 2020).

As reported by *Kakhki and Gargeya* Supply Chain Management (SCM) is highly depend on information and communication technology (ICT) for the handling of purchases, correspondence, decision making and information sharing. The definition of SCM then attracted popularity and was only discussed by scholars after the implementation of ICT tools (*Alfalla-Luque and Medina-Lopez, 2009).* Moreover, A competent supply chain and logistics depend on information systems of the organization. When a logistician needs to plan his operations and he needs to have detail analysis of the resources, limitations. A logistician needs to get all this data from the already accumulated information and recorded experiences. Any humanitarian logistics and supply chain operation needs to record and report changes in procedures, operations and forecasts as an experience to track changes so that one can accurately/approximately predict the future operation This kind of experience helps to create an efficient humanitarian logistics operation and will also contribute its own share to the flexibility and agility of the operation *(Comes and DeWalle, 2016).*

Information is a critical driver of the supply chain as it acts as a bridge that helps other supply chain members to act together to build a highly interconnected, well-organized supply chain system. Information is essential to the success of the supply chain, because it establishes the foundation on which the supply chain systems execute their routine activities, offers supply chain visibility and decision-makers can develop management insight and enhance supply chain performance *(Chopra and Meindl, 2016).*

Information helps managers to identify customers' demand, their level of inventory, and when more products have to be produced and transported. In brief, information technology and system offer insight into the supply chain visibility, allowing top-level managers to make choices and enhance the efficiency of their supply chain. For example, the manufacturer's IT system will display the inventory of finished products at various points of the supply chain and therefore include an optimal production schedule and inventory level based on demand and supply details *(Chopra and Meindl, 2016).*

Many of the top companies have understood the value of information systems in the supply chain. Though, a few of them understood the other dimension of information system different from the classical dimension that can match supply and demand in the market place with a tailored product by directly contacting customers and suppliers in real-time. At the same time, suppliers which are specialized in their field of production or service can coordinate their activities to innovate a cost-effective and efficient product for their customers *(Christopher, 2011).*

The Internet has completely changed the way how members of a supply chain member can communicate with each other in several issues. It also offers a perfect platform for a virtual supply chain. The internet not only enables large global markets to reach their customers at a reduced price and helps consumers to shorten their quest for goods significantly and minimize purchase costs, but it also encourages the numerous companies in the supply chain to exchange information with each other in an extremely cost-effective manner. Extranets are also transforming supply chain management. Companies of very specific internal information structures can now obtain inventory or commodity use details from consumers and can use the information to monitor the inventory status and alert their suppliers to potential requirements *(Christopher, 2011).*

However, according to *Chopra and Meindl (2016)* in order to create an efficient supply chain, the information that comes from a different place has to be the right kind, it has to arrive timely and must be disseminated and available to all who need it. According to *Christopher (2011),* leading organization are using information technology and systems to enhance their responsiveness towards their clients. Information technologies are restructuring and shaping companies and even the complexity of the ties between organizations. Information has always been essential to the effective management of logistics, but now information technology-enabled logistics can provide an efficient logistics services for their customers. Nowadays an integrated logistics management network that connects business processes, such as manufacturing and delivery, to the activities of the manufacturer on the one side and the consumer on the other has becomes a new concept. It is also the case that businesses will practically connect the replenishment of the commodity on the shelf with their upstream activities and those of their suppliers.

A commercial enterprise that has developed an integrated logistics network will reap all of the above-mentioned advantages that information and information technology brought to the market place and enhance their responsiveness and increase the visibility of their items to their customers.

On the contrary, the humanitarian logistics and supply chain faces many challenges in implementing and using information systems and technologies often these challenges can sometimes go beyond technological considerations *(Maiers, Reynolds and Haselkorn,2005).*

2.1.4. Humanitarian Supply Chain Performance

The driving principle in humanitarian operations is that "all people affected by drought or war have a dignified right to life and, thus, a right to get relief aid; and second, all realistic steps have to be taken to relieve human distress. Besides, the aim of humanitarian organizations is to save lives and alleviate human suffering and contribute its share to the national economy *(Kovacs and Spens 2007)*. Despite this noble mission, the humanitarian response has been criticized for its lack of meaningful effects on aid recipient communities, and more importantly, for its lack of success in the humanitarian assistance program. Some studies have also noted that humanitarian efforts frequently work with short-term targets are becoming the center of the debate regarding assistance efficacy, and may ultimately contribute to unforeseen, adverse long-term impacts on society by creating a market imbalance on the local economy *(Moyo, 2009).*

The debate on humanitarian supply chain effectiveness has evidently been implemented at the organizational level as an enhanced emphasis on cost and time efficiency; on the other hand, it is criticized because this may contribute to ignoring other factors, such as fair distribution of aid *(Balcik et al., 2010).* Though, efficiency should not be overlooked because humanitarian organizations are often expected to demonstrate efficient operations on the part of the aid recipient, particularly in the event of a quick onset devastation. After all, operational efficiency can be critical and plays its role in saving human lives *(Van Wassenhove, 2006).* Other than the aid recipient community, there are many players, such as aid agencies, sponsors, institutional partners, and project counterparts who are involved and concerned in the efficiency of humanitarian supply chains operations. These players are more worried to know how the financial resources have been used and how things can be improved for the upcoming operation *(Kovacs and Spens, 2007).*

This concern can be seen in the actions of the humanitarian actor to assess the accomplishment of their activities. Key donors, such as the European Development Fund (EDF) and the United Nations (UN), are encouraging government counterparts and NGO's to track and review their projects and assess their organizational achievement *(Tatham and Hughe,2011)*. Strong

monitoring standards have been blamed by humanitarian organizations for counteracting the productivity criteria of emergencies. However, humanitarian organizations have now realized that, if backed by statistics, funding requests are more likely to attract more donors; and they have started to prioritize data-based decision-making rather than qualitative one. As a result, the performance assessment of humanitarian actions should be aligned with the willingness of both relief agencies and donors to increase the integrity of operations and hopefully contribute to a higher degree of accountability *(Zimmerman and Stevens, 2006).*

As a result of the organizations such as Humanitarian Logistics Associations (HLA) and ALNAP (Active Learning Networks for Accountability and Performance) are dedicated to helping humanitarian partners in their attempts to assess the performance of their operations. Moreover, the World Bank, the Fritz Institute and the Sphere project are also issuing a set of performance measurement indicators, currently, different researchers have now started to develop their performance measurement metrics, however, and performance measurement should be linked with the organization's objectives so that the supply chain will be directed to the right course *(Davidson, 2006).* However, due to the complex environment in which humanitarian agencies operating and lack of information technology has become a challenge to collect reliable data that can assist the performance measurement process *(Abidi and Klumpp, 2013).*

The measurement of performance in humanitarian supply chains has become crucial for all relief organizations involved in emergency operations management *(Beamon and Balcik 2008).* According to *Santarelli et al., (2015),* logistics is the core of the relief operations, different authors have defined a performance system focusing on humanitarian supply chains during both disaster situations and development. The system can be used as a basis to measure the performance of humanitarian organizations in terms of response time, service quality, reliability, flexibility, standardization technical, and cost-efficiency. *Santarelli et al., (2013),* have identified five performance measurement system (responsiveness, reliability, flexibility, cooperation/standardization, and cost performance) and for each of them several KPIs, another study made by *(Jadhav, 2015)* have also identified three-dimensional performance measurement systems, resources (cost performance), Visibility and Agility. In another research done by Stevanovich, (2014) *documents,* Nenad stated five (reliability, responsiveness, agility, cost, and asset management efficiency) supply chain performance measurement systems.

However, for this specific research purpose, the researcher decides to use four of the most common performance measurement systems (Reliability, Flexibility, Responsiveness, and Cooperation/Standardization) which can be found in many findings and applicable to humanitarian supply chain performance measurement system.

2.2. Empirical Literature Review

2.2.1. The Role of Supply Chain Information Systems on Humanitarian Operation

Information plays an important part in the supply chain management of humanitarian aid. In humanitarian supply chains, the recipient of aid is disengaged from the commercial transaction and has no direct influence on what supplies they receive. The key decision-makers in the humanitarian supply chain are the donors who finance the operation and many NGOs treat their donors as one of their customers in the humanitarian supply chain management. In the business supply chain, the end-user determines what products they need and measuring the satisfaction level of customers can easily be done by tracking the reception of those products. However, in humanitarian supply chain management, need assessment of the beneficiaries are being done by an outsider, because of this measuring the satisfaction level of the beneficiary is much more challenging, as more research must be carried out to decide if these needs have been fulfilled. As for IT systems, when addressing the usage of IT in SCM, we refer to the use of inter-organizational structures that are used across organizational borders to exchange knowledge and/or process it *(Gray and Oloruntob, 2006).*

However, the humanitarian sector has not achieved the same degree of success, despite exposure to innovative market models that are widely implemented internationally in the private sector, the public sector, and military organizations. Far too often we see aid organizations missing traditional ways of operating globally, with paper or spreadsheet focused on these processes. Many do not have any technical or organized business processes, but instead conduct key business tasks, such as procurement and transportation management, on the phone or in-person in an ad-hoc manner. For certain situations, this ad-hoc approach results in higher prices of purchased goods, bribery, and corruption, as well as an excess of storage space in warehouses and other resources. The reason for such actions, such as *Blansjaar and Merwe. (2014)* correctly argues that supply chains "are not yet recognized as crucial to the sustainability of aid programs". Although it is believed that the

humanitarian sector requires its reference model and that developments in the private sector are not necessarily specifically relevant to the humanitarian sector, this does not justify why the weaknesses in organizational processes have not been resolved in several humanitarian NGOs; even for those who appreciate its importance and have exposure to greater pools of funds and highly qualified personnel. Another study made by Aurelie et al., (2017) states that strengthening the warehouse system using facility location and prepositioning of aid items helps to facilitate the responsiveness of the humanitarian operation.

Adopting computerized processes to maximize awareness and boost supply chain performance is an enticing concept. Nevertheless, running a productive on-time, on-budget, and on-scope IT project is no small task. *The 'Chaos Manifesto 2013'* estimates that just 39 percent of app development initiatives evaluated in the U.S, Europe, and elsewhere in 2012 achieved their targets. Meanwhile, 43 percent have dropped short and 18 percent have been canceled. For help agencies, investing millions of dollars on a procurement chain from donors is a high-risk commitment, but an essential one to create trust in donors and optimize the assistance earned from the beneficiaries

As stated by *Steele and Tafuri, (2015)* companies have common objectives; to introduce a procurement network to enhance the visibility of their operations, preparation, decision-making, and management, and to maximize productivity by traditional operating practices and cost savings through consolidating transactions and reducing administrative workload. Moreover, Karin B. and Emmanouil G., (2013), discovered on their research the importance of long-term agreement and regularly updating list of suppliers from their tender processing information systems. When a sudden need arises agencies can procure the required relief items either from their local or international suppliers using their updated information, this will enhance the flexibility and efficiency of the humanitarian operation.

2.2.2. Challenges of Humanitarian Supply Chain Management

The situation under humanitarian organizations and aid agencies staffs working is incredibly unpredictable and chaotic. Among some of the challenges of humanitarian supply chain management are like lack of standardized processes, unpredictable demand, lack of infrastructure, complex performance measurement systems, different actors, cooperation and coordination are some of the few to mention.

2.2.2.1. Lack of standardized procedures

Standardized procedures are one of the main factors in sustaining success for many organizations and hence the motivation to standardize procedures for humanitarian logistics is clear. The fact that the characteristics and geographical region vary from catastrophe to catastrophe in humanitarian logistics, makes the task of systematizing a procedure a challenging task. Besides, humanitarian organizations have to utilize their emergency relief program in volatile, unpredictable situations with limited lead times. *(Fawcett and Fawcett, 2013).* According to *Kovacs, Spens & Haavisto, (2016)* in the absence of standardized procedures and processes to handle the operation some humanitarian employees forced to use their own methods to collect raw data to get information that answers a specific request.

To solve this problem, implicit and explicit information has to be gathered from circumstances already encountered in disaster regions to create guidelines for action concerning emergency response. Moreover, the high turnover of experienced logisticians from one disaster to the other is inevitable and it is also normal to encounter a lack of expertise in a certain field when a logistician leaves his organizations or duty station. Moreover, it is challenging to convert practices and impose guidelines made in one geographical area into another region or country. Besides, other authorities in the field hold the opinion that the ever-changing operating climate of relief effort makes it difficult to completely standardize procedures *(Paché & Chandes 2010).*

H8: Lack of Standardized processes negatively and significantly affects the humanitarian supply chain performance.

2.2.2.2. Unpredictable demand

The assumption that a large deal of humanitarian requests is unexpected is due to the unpredictable nature of the relief operation. One of the problem elements for logisticians in disaster recovery operations is the difficulty of determining when, when and to what degree a catastrophe happens and a massive phenomenon of competition in significant quantities happens after a disaster *(Spens & Kovács, 2007).*

Besides, growing demand requires extraordinary resource use, however resources are by definition scarce, and so scarcities occur, particularly in complicated relief projects. To circumvent these

scarcities, resources have to be used in a well-organized manner. However, it is difficult to anticipate the exact demand; therefore, achieving total efficiency is unimaginable *(Scholten, Fynes & Sharkey, 2010).*

To be able to effectively minimize the value of an exact demand-anticipation, humanitarian organizations started to preposition aid items in a strategic location. Most specifically, strategically needed aid items stored in areas most vulnerable to being impacted by a natural or manmade disaster *(Spens & Kovács, 2007).*

H9: Unpredictable demand negatively and significantly affects the humanitarian supply chain performance.

2.2.2.3. Lack of infrastructure

In general, aid agencies' emergency relief operations pursue the same procedure: the emphasis at first is on defining and improving the distribution mechanism for the most pressing issue of disaster alleviating and maintenance of relief. Thereafter it is increasingly necessary to reconstruct the damaged infrastructure to guarantee a reliable supply *(Paché & Chandes 2010).*

Humanitarian organizations ought to be equipped for the worse inside the disaster-affected region: Bridges and airfields are possibly collapsed and lost and become an obstacle for the smooth flow of highly needed supplies. Additionally, a possibly destroyed electrical energy power transmitter system will have a detrimental effect on the telecom network. When the network system does not permit a sustainable transition of information, this by itself can create a difficult situation for logisticians to design routes and to exchange information Another infrastructural concern is the last-mile challenge. For example, due to partially damaged and unavailability of electric power supply and of course with inadequate power sources, it is often difficult to maintain smooth information flow *(Spens & Kovács, 2007).*

H10: Lack of Infrastructure negatively and significantly affects the humanitarian supply chain performance.

2.2.2.4. Performance Measurement

Measuring efficiency is an essential tool for controlling the humanitarian supply chain in a well-organized and operative manner and its purpose lies in quantifying an operation's productivity and effectiveness. Although it brings advantages such as simplifying communication among supply chain partners, most of the relief organizations are still struggling to adopt key figures that are persuasive. For example, mitigating suffering is an essential aspect of humanitarian assistance, but quantifying a link between the success of the supply chain and alleviating suffering is a highly complicated issue. Moreover, relief logisticians must work with numerous critical elements that complicate performance assessment in humanitarian supply chains. Just to mention a few of the challenges, humanitarian relief organizations work, inter alia, in a messy world with insufficient resources and assets in information technology. Thus, gathering and processing of reliable data are very difficult *(Leeuw, Abidi, & Klumpp, 2014).*

Valid suggestions indicate that there is a general lack of incentive to assess output in the non-profit sector: only 20% of humanitarian organizations regularly evaluate the activity, whereas 55% do not track and record performance assessment metrics. The remaining 25% percent of relief organizations are using just a few metrics. Regarding the assessment of efficiency, an expansion for growth is granted. Humanitarian organizations should step up their exploration activities in this context to confirm ongoing performance-improvement in emergency relief activities *(Leeuw, Abidi, & Klumpp, 2014)*

H11: Complex Performance measurement system negatively and significantly affects the humanitarian supply chain performance.

2.2.2.5. Different Actors

A unique aspect of the humanitarian supply chain management is the large variety of players engaged in emergency recovery operations. Participants in this kind of operations are: states, foreign and national sponsors, multinational and regional organizations, international and national charities, police and defense forces, transporters, freight forwarders, customs, and publics in general *(Sheppard, Tatham, Fisher, & Gapp, 2013).*

Such different players usually share the shared aim of alleviating the misery of disaster-affected people individuals. Every player, though, has its solution and method of doing things to accomplish that goal. Various strategies of how to accomplish a shared objective, in effect, hamper enormous relief assistance program and a suggestion of a better or new procedure is being viewed suspiciously and treat it as an imposition. Besides, this can create a lack of cooperation and coordination among stakeholders *(Spens & Kovács, 2007).*

H12: Broad Range of Actors negatively and significantly affects the humanitarian supply chain performance.

2.2.2.6. Lack of Cooperation

The continuous expansion within the humanitarian sector is a major problem that hinders achieving closer coordination between humanitarian aid agencies. Perhaps a large number of humanitarian organizations contribute to a difficult market for limited donor money, rather than an increase in output enhancement *(Leeuw, Abidi & Klumpp, 2014).*

The experts recommend a more inclusive approach to disaster management as an answer to this problem. As far as shared equipment, assets, or resources are concerned, collaboration between agencies has improved in recent years, yet a lack of communication remains unsolved. Communication-based issues also emerge when a catastrophe arises since humanitarian agencies typically do not exchange details regarding the available resources *(Lindgreen, Maon & Vanhamme, 2009).*

Fawcett and Fawcett (2013) attribute the reluctance of humanitarian organizations to exchange information with individuals by saying that "individuals view information as a means of authority and credibility. Because of this, they will not be able to exchange information that empowers another party to their possible harm. "In other terms, the search for scarce resources and funds with the prospect of forming partnerships to obtain them, contributes to damaging actions in information-sharing.

H13: Lack of Cooperation negatively and significantly affects the humanitarian supply chain performance.

2.2.2.7. Lack of Coordination

In addition to the prevailing lack of collaboration, the lack of communication related to the large number of participants in the humanitarian operations is contributing to the ultimate performance of the disaster relief activity. Estimates show that there are many non-governmental organizations. (Tatham & Pettit, 2010). The idea that many organizations continue to maintain their supply chains, which they have established over the years, makes it very challenging for organizations to coordinate supplies, human capital and the flow of information (*Chandes & Paché, 2010).*

The problem-solving approach to collaboration resides in the creation and extension of integrated information management methods. Though, the lack of understanding of the value of maintaining the supply chain of disaster recovery operations along with the disaster only philosophy of humanitarian organizations hinders the implementation of information networks, technology and logistics programs *(Maon, Lindgreen, & Vanhamme, 2009).*

H14: Lack of Coordination negatively and significantly affects the humanitarian supply chain performance

2.2.2.8. Limitation of Information Technology

Method of synchronizing processes is quite complicated due to inconsistencies of procedure within humanitarian organizations. As a result, routine preparation is frequently lacking in disaster relief supply chains. For example, there are also no standardized repositories (databases) providing information on transport period, rates charged or amounts bought and obtained *(Maon, Lindgreen, & Vanhamme, 2009).*

Currently, constitutions such as the United Nations Joint Logistics Center, have recognized the value of digital technologies throughout the relief sector by offering a shared communication network. This network assists organizations in collecting, examining, sharing of logistics information in the pre-disaster stage. There is another sign for successful advances in the area of information technology services in the relief service environment. Aid organizations have begun to build sophisticated specific programs that provide details such as mapping and monitoring

(tracking and tracing). Such applications are now available for usage by many organizations *(Kovács & Spen, 2011).*

H15: Limitations of information technology negatively and significantly affects the humanitarian supply chain performance

2.2.3. Role of Information Systems on Humanitarian Supply Chain Performance

Many organizations have invested heavily in designing and implementing information technology and systems to boost their supply chain efficiency with little benefit, although others have spent comparable sums of investment with great achievement *(Handfield and Nichols,2014).* In supply chain performance, the IT productivity paradox is widely cited as a controversial issue that needs more investigation *(Gunasekaran and Ngai,2004).*

There is yet another sign of successful progress in the humanitarian sector in the field of information technology services. Relief agencies have started to develop sophisticated specialized programs to include information such as mapping and monitoring (tracking and tracing). Many organizations have now those applications available for use *(Kovács & Spen, 2011).*

Today, organizations in a highly competitive world are struggling to improve their processes and activities. Discussions such as globalization and the growth of networks such as the internet are critical topics impacting capital, sales, and other things that businesses are involved in. The impact of information technology on businesses, on the supply chain, and the value chain is apparent from the relationship with vendors through production and contact with consumers, including the influence of information technology on the efficiency of the supply chain. The use of information technology enhances the integrity and flexibility of the supply chain components and improves the information flow among partners *(Mahshid Mashreghi et al, 2018).*

However, integration of the supply chain can be discussed at various levels of strategic alliance and collaboration, operational co-operation and integration, and technical integration. Research at all these levels describe the essential role of integration in performance; but, from a different perspective, each level addresses this significance. On the strategic level, supply chain integration at the strategic level focuses on the use of IS tools to better coordinate supply chain partners to create value *(Daneshvar K., 2018).*Information systems enabled integration at the strategic level

is also an improvement of financial efficiency and strategic advantage; furthermore, tactical and organizational integration is meant to increase operational results. Research has been published to examine the role of collaboration and communication in different areas of industry, including improving teamwork, increasing visibility, and enhancement of supply chain systems *(Zhao and Xie 2002)*

Rai, Patnayakuni, and Seth (2006), realized that performance enhancement could not be accomplished by merely being furnished with ICT tools; instead, the development of an integrated ICT infrastructure and ICT-enabled processes are highly required. The development of such an infrastructure includes a structured framework of ICT systems inside a firm and simplified data system that is consistent with global standards that allows an organization to interact with its setting *(Ross, 2003).*

Competent information systems (ISs) are important to all kinds of organizations, irrespective of scale or ambition. Efficient information systems (with reliable and appropriate information) are especially important to disaster management and humanitarian operations because the effects are typically life or death. Such information systems are important for all of the humanitarian processes — from early warning and preparedness to disaster response and recovery. They promote rapid and efficient information processes for diverse humanitarian operations, such as assessment, planning, sourcing, budget forecasting, logistics & delivery, warehousing, distribution, reporting, monitoring, and evaluation processes. According to this study information systems also facilitate coordination, information creation, and sharing within and between humanitarian organizations and their partners. Information Systems also promote collaboration, information-building, and sharing within and between humanitarian organizations and their partners. In general, we can say it is an important organizational quality for an efficient emergency response *(Emmauel and Elaine, 2011).*

Currently, several organizations have created or implemented information systems approaches and policies. That presume overarching imperatives and internationally accepted business practices, priorities, and objectives in terms of leveraging the capacity of emerging technology, often without a thorough analysis of the operational and wider background in which such innovation are integrated. This universal viewpoint assumes that information system creativity is motivated by common values of universal significance and meaning and thus presupposes that any information

systems phenomenon can be clarified in terms of a collection of general concepts and that abstract principles can be discovered as the basis for an effective pattern of professional action and organizational behavior *(Avgerou, Ciborra, & Land, 2004).*

However, information system creativity in the relief sector is exceptional, multifaceted and not motivated by the same universally accepted priorities and requirements that are true in the free market context. Certainly, information systems technological study, and organizational change in other non-business-oriented fields, such as health sector has highlighted a variety of unique, context-specific dimensions emerging in settings other than typical business organizations *(Dunker, 2002).*

Humanitarian aid organizations are assuming the immense challenges of saving lives and alleviating the suffering of victims in every corner of the world hit by a wide variety of disasters. Humanitarian relief aid contributes to recovery programs in developing countries by channeling relief items and money from the world's richest nations to the developing countries using international aid organizations and the UN agencies like the World Food Programme. Governmental donors have a heavy impact on the humanitarian operation, as they contribute the majority of the funding. However, in most cases, it is NGOs and implementing partners like the government counterpart that handle the aid distribution task by working closely with the local community. Humanitarian activities are primarily concentrated in developing countries, in rural and remote areas with weakened or totally damaged infrastructure facilities, and in host countries local populations with minimal expertise and low rates of literacy, as well as a relatively restricted capacity for promoting or maintaining information systems technological initiatives. In some situation, the host country which the relief agencies must coordinate their operation might be decapacitated because of war (Relief Web, 2006).

The relief supply chain has not achieved the same degree of success, despite exposure to innovative business management models that are widely implemented internationally in the private sector, the public sector, and the military system. Because of this relief organizations lack standard working procedures and most of the work based on paper and a simple spreadsheet. Many do not have any technical or organized business procedures, but instead conduct core business practices, such as sourcing and transportation operations, on the phone or in-person in an ad-hoc fashion. This ad-hoc approach results in higher costs of imported goods, bribery, abuse, loss in storage space, and

other resources. The explanation for these actions is that supply chain "are still not considered critical to the success of aid programs". Although it is believed that the humanitarian sector requires its own reference model and that developments in the private sector are not necessarily specifically relevant to the humanitarian sector. This does not justify why the weaknesses in organizational processes have not been resolved in several humanitarian NGOs; even for those who appreciate its importance and have exposure to greater pools of funds and highly skilled human resources (Blansjaar & Merwe, 2014).

The implementation of information systems and technologies to enhance the productivity of the humanitarian supply chain exposure and productivity of the supply chain is a beautiful concept. Nevertheless, running an efficient, on-time, on-budget and on-scope IT project is no small task (Chaos Manifesto, 2013). Overall, several researches suggest that information system enabled supply chain integration and coordination contributes to higher levels of performance (Frohlich and Westbrook, 2001).

2.3.Empirical Gap

There are several studies done by researchers on the supply chain management information system, though most of the research focus on the business perspective, in addition to this there are also studies done by other researchers on the humanitarian perspective although they mostly focus on supply chain or logistics practices and challenges. However, the researcher believes that supply chain information systems on the humanitarian perspective with regard to WFP has not been addressed so far. The study is going to identify how supply chain information system is being practiced at the WFP in its humanitarian operation and measures that should be taken to improve the practices of humanitarian Supply Chain Management Information Systems and provide appropriate recommendations on challenges facing the implementation of Humanitarian Supply Chain Management Information Systems (SCMIS).

2.4.Conceptual Framework

Figure 3.1: The Role of Supply Chain Information Systems on HSC Performance

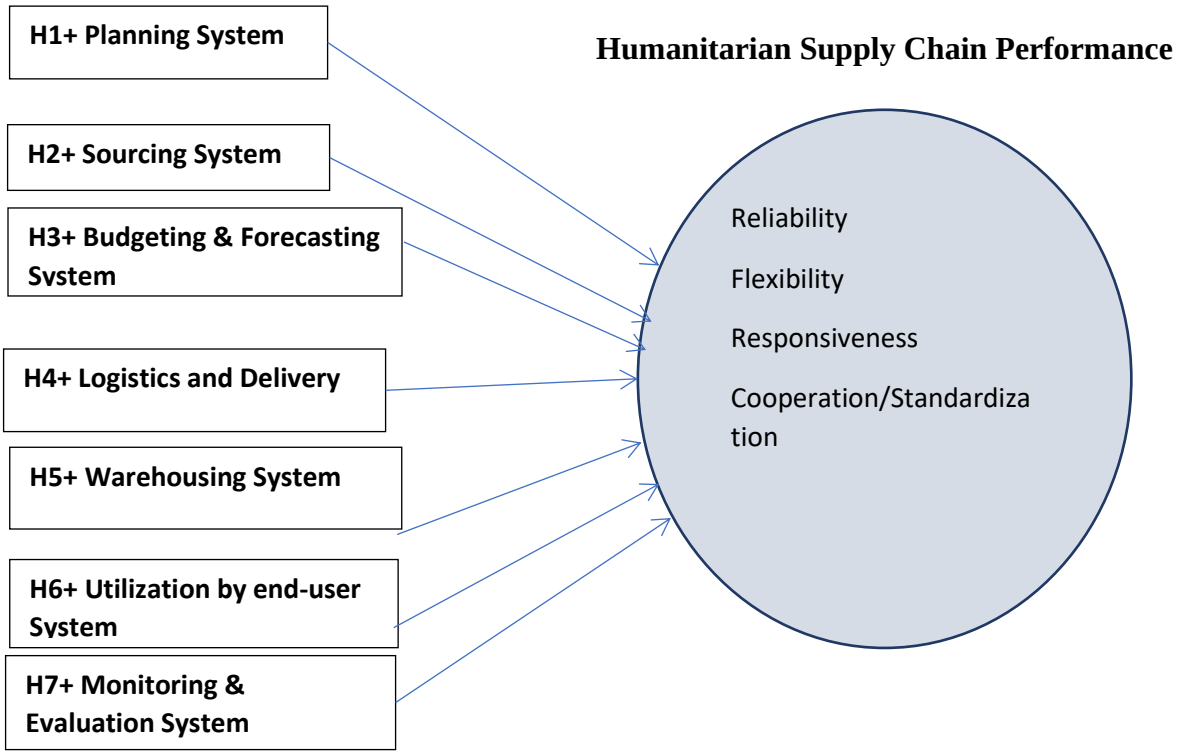
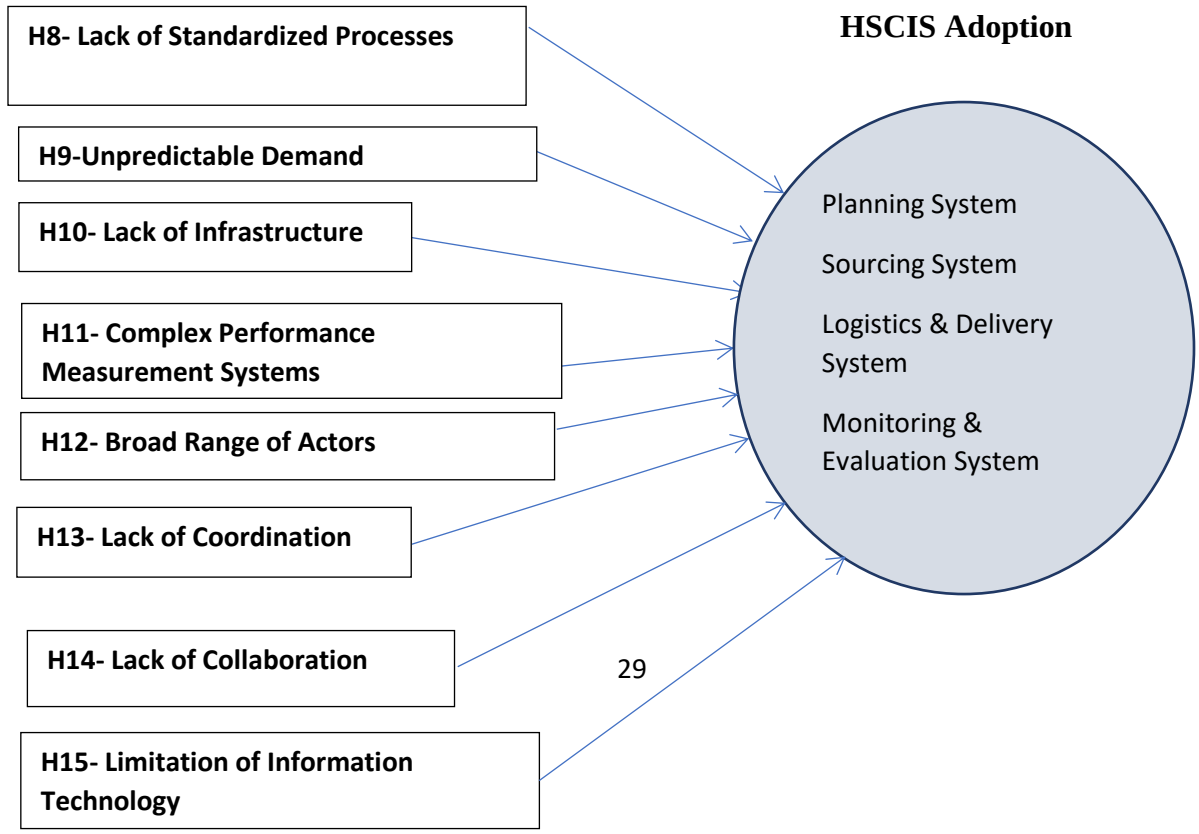


Figure 3.2: Factors affecting the adaption of SCIS for humanitarian Supply Chain performance



Hypothesis Summary

Based on the research objective set the following hypothesis has been developed and is going to be tested using appropriate statistical tools.

The Role of Supply Chain Information Systems on HSC Performance

H1: Planning positively and significantly affects the humanitarian supply chain performance

H2: Sourcing positively and significantly affects the humanitarian supply chain performance.

H3: Budgeting and Forecasting system positively and significantly affects the humanitarian supply chain performance.

H4: Logistics and delivery positively and significantly affects the humanitarian supply chain performance.

H5: Warehouse system positively and significantly affects the humanitarian supply chain performance.

H6: Utilization by end-user system positively and significantly affects the humanitarian supply chain performance.

H7: Monitoring and Evaluation positively and significantly affects the humanitarian supply chain performance

Factors Affecting the Adoption of SCIS for Humanitarian Supply Chain Performance

H8: Lack of Standardized processes negatively and significantly affects the humanitarian supply chain performance.

H9: Unpredictable demand negatively and significantly affects the humanitarian supply chain performance.

H10: Lack of Infrastructure negatively and significantly affects the humanitarian supply chain performance.

H11: Complex Performance measurement system negatively and significantly affects the humanitarian supply chain performance.

H12: Broad Range of Actors negatively and significantly affects the humanitarian supply chain performance.

H13: Lack of Cooperation negatively and significantly affects the humanitarian supply chain performance.

H14: Lack of Coordination negatively and significantly affects the humanitarian supply chain performance

H15: Limitations of information technology negatively and significantly affects the humanitarian supply chain performance

CHAPTER THREE

3. METHODS OF THE STUDY

3.1. Description of the Study Area

This study assessed the role of supply chain management information system on humanitarian supply chain operational performance in the WFP Ethiopia country office. The rational is to identify the best practices of supply chain management information systems. This chapter also demonstrates the complete framework of how data collection and analysis can be used to achieve research results. The chapter basically deals with the methods used in the research to arrive at the study's findings. It covers the research design, research approach, study population and sample design, methods of data collection, methods of data analysis, validity and reliability, multiple regression formulas, and finally ethical considerations.

3.2. Research Design

The purpose of this study was to examine the role of supply chain information systems in WFP humanitarian operation. According to *Trochim (2005),* research design provides the glue that keeps holding the research paper together. A design is used to structure the research, to show how all of the major parts of the research project- the samples or groups, measures, treatments or programs, and methods of assignment work together to try to address the central research questions. *(William M.K. Trochim, 2020). Hakim (2000)* compares a researcher designing a research project with an architect designing a building. In order to understand the problem more efficiently the thesis used in this study is an explanatory and descriptive one. Explanatory design is used to study the role of supply chain management information system practices on WFP's humanitarian operation. The study will also use descriptive research design to assess the role of supply chain management information system using frequencies, mean and standard deviation.

3.3. Research Approach

This research adopted a quantitative approach to the study. For data collected through a close-ended questionnaire, a quantitative method is employed. According to Silverman (2001),

quantification provides more trust in the precision of results drawn from qualitative evidence; and it offers the user an ability to comment on the observations of the researcher through themselves via the evidence already done.

The research approach adopted by the researcher is a quantitative study. The approach is more structured and controlled. According to *Emory (1995),* a survey is feasible when population is small and variable, hence the researcher will be able to cover all elements of the population.

3.4. Study Population and Sample Design

The target respondents were the employees of WFP in Ethiopia working on programme, procurement and logistics unit. These three units currently have 134 employees (60 of them working in programme, 60 in logistics &14 in procurement unit). The reason the researcher opts to work with these three units' staff is that they are well aware of the supply chain information systems and all the data repository and authoritative figure on information and data management are also working in these three units and the target respondents had assumed the same awareness on supply chain information system therefore simple random sampling was used to select the respondents. This study uses sample size determination formula of Krejice and Morgan's (1970).

$$n = \frac{\left(Z_{\frac{\alpha}{2}}\right)^2 Np(1-p)}{d^2(N-1) + \left(Z_{\frac{\alpha}{2}}\right)^2 P(1-P)}$$

Where, n=the sample size

p=the population proportion (assumed to be 0.5 for it provides the maximum sample size)

The degree of confidence 95%, α=5% or 0.05 ($Z_{\frac{\alpha}{2}}$=1.96) it is a table value

Margin of error (the degree of precision, d=5% or 0.05

N= total number of target population i.e., total number employee of WFP in Ethiopia.

Therefore, the sample size for this study is computed as follow

$\left(Z_{\frac{\alpha}{2}}\right)^2 = (1.96)^2 = 3.84$

N=134, p=0.5, 1-p= 1-0.5=0.5 and d=0.05,$d^2 = 0.0025$

$$n = \frac{3.84(134)(0.5)(0.5)}{0.0025(133) + 3.84(0.5)(0.5)}$$

$$n = \frac{128.64}{0.3325+0.96} = 99.52$$

$n\ is$, approximately 100

3.5. Method of Data Collection

The researcher used primary data for its study. Primary data collected using questionnaires, in order to get feedback from the respondent's, the researcher used closed ended questions. The respondents in this study were WFP employees currently working in logistics, program and procurement units.

3.6. Method of Data Analysis

In this study, quantitative data from the questionnaires was analyzed using inferential statistics. The rationale to use this method of statistics is to reach a conclusion by inferring from the sample data. According to *Trochim, (2020),* with inferential statistics, you are trying to reach conclusions that extend beyond the immediate data alone. For instance, we use inferential statistics to try to infer from the sample data what the population might think. Or, we use inferential statistics to make judgments of the probability that an observed difference between groups is a dependable one or one that might have happened by chance in this study. Thus, we use multiple linear regression to make inferences from our data to more general conditions.

Moreover, quantitative data from the questionnaires were analyzed using descriptive statistics. The rational to use this method of statistics is to describe the basic features of the data by using mean, percentage frequencies and standard deviation. Finally, the data has been entered into SPSS software for further analysis by running two multiple linear regression models as the study has two dependent variables.

3.7. Validity and Reliability

3.7.1. Validity

Validity is traditionally understood to refer to the correctness or precision of a research reading. In qualitative research it concerns the extent to which the phenomena under study is being accurately reflected, as perceived by the study population. Again, alternative terms, such as credibility and plausibility are sometimes used *(Christina H. 2000).*

Validity is often defined as the extent to which an instrument measures what it asserts to measure *(Blumberg et al, 2005).* Validity of a research instrument assesses the extent to which the instrument measures what it is designed to measure *(Robson, 2011).* It is the degree to which the results are truthful. So that it requires research instrument (questionnaire) to correctly measure the concepts under the study *(Pallant,2011).* It encompasses the entire experimental concept, and establishes whether the results obtained meet all of the requirements of the scientific research method. Qualitative research is based on the fact that validity is a matter of trustworthiness, utility, and dependability *(Zohrabi, 2013).*

3.7.2. Reliability

Reliability is generally understood to concern the replicability of research findings and whether or not they would be repeated if another study, using the same or similar methods, was undertaken. Because of the nature of qualitative research, the term confirmability, consistency, or dependability are often preferred. All of them refer to the security and durability of a research finding. *(Jan R. and Jane L. 2003).* Cronbach's alpha measure of reliability that ranges from 0 to 1, with values of .60 to .70 deemed the lower limit of acceptability *(Christina H. 2000).* For the sake of reliability, the researcher uses 0.70 as an acceptable score. According to table 3.1 below all the Cronbach's alpha was greater than 0.7 this implies that the questions are reliable except for questions on logistics and flexibility were the tolerable range 0.6.

Table 3.1: Test of Reliability

Variables	**No. Items**	**No. Items Cronbach's alpha**
Lack of standardized process	4	0.951
Unpredictable demand	4	0.765

Lack of infrastructure	4	0.857
Complex performance measurement systems	4	0.934
Broad range of actors	4	0.868
Lack of coordination	4	0.753
Lack of collaboration / cooperation	4	0.910
Limitation of information technology	4	0.803
Planning	4	0.707
Budgeting and forecasting	3	0.695
Sourcing	3	0.695
Logistics and delivery	3	0.6
Warehouse system	4	0.79
Utilization by end user	3	0.742
Monitoring and evaluation	4	0.79
Reliability (quality)	4	0.878
Responsiveness	3	0.822
Flexibility	3	0.6
Cooperation/Standardization	7	0.904

Source: Own Computation June, 2020

3.8. Multiple Linear Regression

Multiple Linear Regression Models: is a regression model involving more than one independent variable. Multiple linear regression models are a statistical approach that is used in this research. The general model for multiple linear regression analysis in which a dependent variable(Y) is associated with a set of independent (xi's) variables is presented as:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k X_k + U_i$$

Where: Y_t

Y = the response (dependent) variable

= Y intercept when each x = 0

$\beta_1, \beta_2 \ldots . \beta_k$ Are partial slopes

X_1 X_2… X_k are independent variables.

U is the error term

Assumption of Multiple Linear Regressions

- The true relationship between X and Y are linear
- The error term has zero mean zero
- The errors term has constant variance.
- The error vector has multivariate normal distribution that is U~N (0, σ^2)
- X and U are independent.
- The errors are uncorrelated.
- Number of observations is greater than the number of parameters.

3.8.1. Parameter Estimation and Hypothesis Testing

The model parameters will be estimated by using least square estimation methods.

The general model of multiple linear regressions is

$$y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k X_k + U_i$$

In multiple linear regression parameters, the least square estimate of the model parameter can be estimated then it turns out to be:

$\beta = (X^I X)^{-1} X^I Y$ (Douglas C, 2006).

Where Y=Nx1=vector of observations

X =N x P invertible matrix

β_i= P x 1 vectors of regression coefficients that was estimated from the data

3.8.2. Goodness of fit test

3.8.2.1. Overall goodness of fit of the model (F-test)

The model 's overall goodness will be checked by doing the hypothesis in the following ways. Then the hypothesis test can be stated as;

H_O: $\beta_1 = \beta_2 = \cdots = \beta_k = 0$ versus H_1: $\beta_i \neq 0$ (at least one β is different from zero).

Then to reject Ho if α value is greater than the corresponding P-value and do not reject otherwise.

The test statistics is F-distribution and its computation is based on the following table.

$$F=\frac{MSR}{MSE}$$

Where, MSR=mean square of regression, i.e. the variability of the dependent variables accounted for by the independent variables in the model, MSE=mean square of error (the variability of the dependent variable accounted by unknown factors).

3.8.2.2 Coefficient of Determination (R-square)

A calculation of how well the data fit into the regression line. The determination coefficient measures the amount of proportion that the set independent variables have explained the total variation on the dependent variable.

It is symbolized by R^2 value range between 0 and 1; and also defined as

$$\mathbf{R^2} =\frac{explained\ variation}{total\ variaton} =\frac{SSR}{SST}$$

Where, SSR=sum square of variation of the model (by all possible independent variables in the model), SST=sum square of total (all the variability of the dependent variable).

If the model is a well fitted one then the determination coefficient increases, but if the model is not properly fitted the determination coefficient decreases.

3.8.2.3 Test of Single Independent Variable (T-test)

T-test is used to test the significance of each explanatory variable in multiple linear regression models which implies the power of the strength of each independent variable in relation with the dependent variables.

Therefore, the hypothesis became as follows.

Ho: B_i =0 there is no significant linear relationship between Xi & Yi

H1: Bi≠ 0 (not H_o)

The test statistics is

$$t = \frac{Bi - 0}{S.E\ (Bi)} = \frac{Bi}{S.E\ (Bi)}$$

Besides looking at the hypothesis regarding response variables verifying the value or the significance of the general model is necessary.

3.9. Ethical Considerations

All the research participants that were included in this study was duly informed about the purpose of the study and their consent had been secured before the beginning of filling the questionnaire. Regarding the right to privacy of the respondents, the researcher maintained the confidentiality of the identity of each participant. The respondents had also the right to withdraw themselves from the study whenever they wish to do so. Moreover, all articles compiled in this study were also acknowledged and duly annotated.

CHAPTER FOUR

4. DATA ANALYSIS AND RESULTS

4.1. Introduction

This chapter comprised of data testing, testing model fit, descriptive statistics for all demographic and employee related variables, awareness of supply chain information system, challenge of supply chain information system, supply chain information system practices, performance measure of supply chain information system using frequency distribution, mean, standard deviation by using tables and graphs. Fitting regressions model for challenges and practices of the supply chain information system on the performance of humanitarian supply chain in WFP Ethiopia.

4.2. Data Testing

4.2.1. Testing Non-Response Rate

This study is a sample study that has a population of 134 WFP employees working in Ethiopia country office which is related to humanitarian supply chain information systems, so the total population size is 134 hence the study intended to consider sample employees. Therefore, the instrument for the data collection is mailed questionnaires to the sample of 100 respondents; however, out of the total mailed questionnaires, only 72 responses were obtained.

Accordingly, the response rate for this study is 72 % and the non-response rate is 28%. One of the reasons for the unavailability of adequate response rate is believed to be the current global pandemic which also happened in our country makes the distribution and the data collection process more challenging. This situation also greatly affects the face to face contact with the respondents. Moreover, most of the target population was in their home with unavailability and intermittent internet connection service. Because of this obstacle, the data were obtained from 72 respondents only. Based on the available data the following reports and analyses have been made.

4.2.2. Missing Data Assessment

Missing data usually refers to the omission of one or more values within the analysis variable(s) in the dataset. The development is often the result of a participant in the study choosing not to provide a response to a questionnaire, this kind of problem normally far beyond researcher's control. In general, a larger number of missing values within a dataset reflect the data analyst's greater challenge. Missing data problem can occur when a participant failed to state or answer certain items in the questionnaire, for example, and he / she was unavailable on the data gathering day, or some questionnaires were offensive to the respondent. This kind of problem may create inaccurate predictions and affect the model fit because of this problem the researcher decides to focus on only 72 questionnaires out of 75 responses. (William Bannon, 2015). Missing data within a quantitative research study: How to assess it, treat it, and why you should care

4.2.3. Assessing the Normality Assumptions

If the data is not presented symmetrically and is far from the average it is known to be distorted. If a small percentage of the sample is distributed to the right, it is known to be positively biased, and if a small number is scattered to the left, it is known to be biased negative. Kurtosis is the form of any or no peaks in the distribution (Tabachnick and Fidell, 2006). While no distribution may be regarded as ideal, a distribution is claimed to be usual if the values of skewness and kurtosis are zero; furthermore, an appropriate range proposed for all is between -2 and +2.

According to (Bachman, 2004) for modeling or fitting the data collected, the normality test for the data should be normal if the kurtosis and skewness values are between -2 and 2. The research reflects univariate kurtosis and skewness test for normality see on annex 3 and therefore all kurtosis and skewness values were in the range such that normality expectations fulfilled.

Based on the annex 3 all the Kurtosis and skewness measures were between -2 and 2 this implies the data is normally distributed.

4.3. Demographic Profile of the Respondent

Table 4.1: Descriptive Statistics of Demographic Variables

Demographic variables		**Frequency**	**%**
Gender	Male	52	72.2
	Female	20	27.8
Age	Below 25	0	0.0
	25 to 35	23	31.9
	More than 35	49	68.1
Highest level of education	Certificate	2	2.8
	Diploma	2	2.8
	BA/BSC	34	47.2
	MA/MSC	34	47.2
	PhD	0	0.0
Work experience (Years)	Less than 3	2	2.8
	Between 3-5	5	6.9
	Between 6-10	17	23.6
	More than 10	48	66.7

Source: Own Computation June, 2020

According to the table 4.1, out of the total 72 respondents 72.2% and 27.8% were male and female respectively, and there were no employees of WFP whose age below 25, 23(31.9%) whose age were between 25 and 35; and 49(68.1%) of them were more than 35 years. The majority of the employees were more than 35 years old. This implies the respondents were highly experienced in their profession.

Among the total respondents of the WFP employees were their education level 2(2.8%), 2(2.8%), 34(47.2%) and 34(47.2%) had Certificate, Diploma, BA/BSC, MA/MSC Respectively and also there is no PHD holder in this study. There was high percentage of the employees whose academic status were BA/BSC and MA/MSC.

Table 4.2: Awareness of Supply Chain Information System

Awareness of Supply Chain Information System		**Frequency**	**%**
Supply Chain Systems you are knowledgeable	WINGS	10	14.3
	LESS	32	45.7
	COMET	28	40.0
Do you think your organization is well performing in the supply chain management information system process?	Yes	70	97.2
	No	2	2.8
Are the WFP supply chains systems easily integrate with the systems of its partners and stakeholders?	Yes	55	76.4
	No	17	23.6
Is there enough funding to support the expansion of supply chain information system?	Yes	52	75.4
	No	17	24.6

Source: Own Computation June, 2020

Table 4.2 shows that in the WFP 10(14.3%), 32(45.7%) and 28(40%) were aware of the supply chain information system of WINGS, LESS, and COMET, respectively. Hence the LESS supply chain information system had a higher percentage of awareness which is 45.7% and followed by 40% of them were aware of COMET.

Based on the data obtained from WFP Ethiopia employees the majority of 70(97.2%) of them believed that in their organization supply chain management information system is well-performing. And also 2(2.8%) of them believed that their supply chain management information system is not performing well. 55(76.5%) of respondents believed that WFP supply chain systems easily integrate with the systems of is partners and stakeholders and 17(23.5%) did not believe. Most of the employees believed WFP supply chain systems easily integrate with the systems of is partners and stakeholders

52(75.4%) of respondents believed that there is enough funding to support the expansion of supply chain information system while 17(24.6%) did not believe. Accordingly, there is enough funding to support the expansion of supply chain information system in WFP Ethiopia.

4.4. The Practices of Supply Chain Information Systems on WFP's Humanitarian Operations

The values were assigned for the opinion of the respondents 1,2,3,4 and 5 for Strongly Disagree (SD), Disagree (D), Neutral (N), Agree (A) and Strongly Agree (SA) respectively.

Under the humanitarian supply chain information system practices there are six variables such as planning, budgeting and forecasting, sourcing, logistics and delivery, warehouse system and; monitoring and evaluation.

Table 4.3: Planning Practice

N=72	SD	D	N	A	SA	Mean	Std. Deviation
Planning							
The WFP is using supply chain information system for planning and identifying the number of beneficiaries.	1	5	7	37	21	4.01	.902
The WFP is using supply chain information system for conducting need assessments	2	7	10	37	16	3.81	.988
The WFP employees are familiar of working with supply chain information system with the required skill and knowledge	1	3	11	41	16	3.94	.820
The WFP is adopting supply chain information system as the organization believed to strengthen the organization's planning capability			3	43	25	4.31	.550
Grand Total						**4.0150**	**.60794**

Source: Own Computation June, 2020

- **Planning**

Based on the table 4.3 above questions were asked on the planning. Respondents were asked on WFP is using supply chain information system for planning and identifying the number of beneficiaries of the response 37 of them agree, 21 of them strongly agree, 7 of them neutral, 5 of them disagree and 1 strongly disagree, and the mean score is 4.01 with 0.902 standard deviation value which indicates most of the respondents are agreed.

Among the total respondents 41 of them agree, 16 of them strongly agree,11 of them neutral,3 of them disagree and 1 strongly disagree that the WFP employees are familiar of working with supply chain information system with the required skill and knowledge, and the mean score is 3.94 with 0.82 standard deviation value which indicates most of the respondents are agreed. For the remaining response results see on table 4.3.

Table 4.4: Budgeting and Forecasting Practice

N=72	SD	D	N	A	SA	Mean	Std. Deviation
Budgeting and Forecasting							
The implementation of information system helps the organization to plan and forecast the necessary budget amount at the beginning of any emergency operation			3	45	24	4.29	.542
The information system that your organization using capable of handling change in funding amount due to different external situation		1	16	47	6	3.83	.589
The information system that the WFP using ensures accountability to donors and the public in general			4	36	31	4.38	.594
Grand Total						**4.1713**	**.45015**

Source: Own Computation June, 2020

- **Budgeting and forecasting**

As can be seen from the above table 4.4 respondents were asked if the implementation of information system helps the organization to plan and forecast the necessary budget amount at the beginning of any emergency operation, the majority 45 of them agree, 25 of them strongly agree and 3 of them neutral, and the mean score is 4.29 with 0.542 standard deviation value which indicates most of the respondents are agreed. Among the respondents 45 of them agree, 6 of them strongly agree, 16 of them neutral and 1 neutral on the information system that your organization using capable of handling change in funding amount due to different external situation, and the mean score is 3.83 with 0.589 standard deviation value which indicates most of the respondents are agreed. The information system that the WFP using ensures accountability to donors and the

public in general of the majority 36 of them agree, 31 of them strongly agree and 4 of them neutral of it, and the mean score is 4.38 with 0.594 standard deviation value which indicates most of the respondents are agreed.

Table 4.5: Sourcing Practice

N=72	SD	D	N	A	SA	Mean	Std. Deviation
Sourcing							
The implementation of information system at the WFP facilitates for ordering and purchasing of the necessary relief items such as food aid items from the suppliers		1	11	40	19	4.08	.692
The information system of WFP can compare the price of items from different suppliers		2	18	40	11	3.85	.710
The WFP's country office can choose the winning supplier for procuring items from the existing database of the organization		3	20	38	11	3.79	.749
Grand Total						**3.9074**	**.56286**

Source: Own Computation June, 2020

- **Sourcing**

Based on table 4.5 on the questions asked to respondents the implementation of information system at the WFP facilitates for ordering and purchasing of the necessary relief items such as food aid items from the suppliers, based on the response 40 of them agree, 19 of them strongly agree, 11 of them neutral and one disagree, and the mean score is 4.08 with 0.692 standard deviation value which indicates most of the respondents are agreed. The respondents were asked if the information system of WFP can compare the price of items from different suppliers among the total response 40 of them agree,11 of them strongly agree,18 of them neutral and 2 of them disagree, and the mean score is 3.85 with 0.71 standard deviation value which indicates most of the respondents are agreed. For the questions asked whether the WFP's country office can choose the winning supplier for procuring items from the existing database of the organization, 38 of them agree, 11 of them strongly agree, 20 of them neutral and 3 of them disagree. and the mean score is 3.79 with 0.749 standard deviation value which indicates most of the respondents are agreed.

Table 4.6: Logistics and Delivery Practice

N=72	SD	D	N	A	SA	Mean	Std. Deviation
Logistics and Delivery							
The supply chain information system helps WFP to track and trace the items while on their way to their destination	1	1	7	40	23	4.15	.763
The WFP uses a GPS system on each contracted and dedicated WFP truck in order to identify the whereabouts of each truck	3	19	14	22	13	3.32	1.180
The supply chain information technology and system like bar coding and RFID (Radio Frequency Identification) are incorporated into each package to trace the progress of a specific bag/cartoon.	2	14	18	28	8	3.37	1.024
Grand Total						**3.6273**	**.74876**

Source: Own Computation June, 2020

- **Logistics and delivery**

Based on table 4.6 on the questions asked related to sourcing. The respondents were asked if the supply chain information system helps WFP to track and trace the items while on their way to their destination, the response was 40 of them agree, 23 of them strongly agree, 7 of them neutral, 1 Disagree and strongly disagree, and the mean score is 4.15 with 0.763 standard deviation value which indicates most of the respondents are agreed. According to the response on the WFP uses a GPS system on each contracted and dedicated WFP truck in order to identify the whereabouts of each truck of 22 of them agree,13 of them strongly agree,14 of them neutral,19 of them disagree and 3 of them strongly disagree, and the mean score is 3.32 with 1.18 standard deviation value which indicates most of the respondents are agreed. For the question asked on the supply chain information technology and system like bar coding and RFID (Radio Frequency Identification) are incorporated into each package to trace the progress of a specific bag/cartoon of the response 28 of them agree,8 strongly agree, 18 of them neutral,14 of them disagree and 2 of them strongly disagree, and the mean score is 3.37 with 1.024 standard deviation value which indicates most of the respondents are agreed.

Table 4.7: Warehouse system Practice

N=72	SD	D	N	A	SA	Mean	Std. Deviation
Warehouse system							
The warehouse system you have helps you to easily access stock items in the warehouse		2	3	31	33	4.38	.709
The storekeepers in your organization are skilled enough to use information technology to do their store keeping activities.	1	2	6	42	19	4.09	.775
The inspected items that checked by superintendents immediately feed in to the information system and available to all the concerned		6	10	44	11	3.85	.786
The information system currently you are using do check and balance of stock items stored in the warehouse			2	41	28	4.37	.541
Grand Total						**4.169**	**.5620**

Source: Own Computation June, 2020

- **Warehousing**

According to the table 4.7 above the warehouse system you have helps you to easily access stock items in the warehouse, the majority 31 of them agree, 33 of them strongly agree, 3 of them neutral while 2 of them disagree, and the mean score is 4.38 with 0.709 standard deviation value which indicates most of the respondents are agreed. Among the total response 42 of them agree, 19 of them strongly agree, 6 of them neutral, 2 of them disagree while 1 disagree on the questions asked if the storekeepers in your organization are skilled enough to use information technology to do their store keeping activities, and the mean score is 4.09 with 0.775 standard deviation value which indicates most of the respondents are agreed. The inspected items that checked by superintendents immediately feed in to the information system and available to all the concerned. The response on this question is that the majority 44 of them agree, 11 of them strongly agree, 10 of them neutral while 6 disagree, and the mean score is 3.85 with 0.786 standard deviation value which indicates most of the respondents are agreed. If the information system currently you are using do check and balance of stock items stored in the warehouse were asked to respondents. The response obtained

was 41 of them agree, 28 of them strongly agree on the issue, and the mean score is 4.37 with 0.541 standard deviation value which indicates most of the respondents are agreed.

Table 4.8: Utilization by End user Practice

N=72	SD	D	N	A	SA	Mean	Std. Deviation
Utilization by End user							
The information system of the WFP is capable of checking the delivered items to the right beneficiaries	1	5	7	37	21	4.01	.902
The information system of the WFP measures the satisfaction level of beneficiaries by implementing partners		13	18	31	9	3.51	.939
The information system of the WFP is designed to collect, analyze any other relevant information about beneficiaries		9	12	36	13	3.76	.908
Grand Total						**3.7653**	**.75044**

Source: Own Computation June, 2020

- **Utilization by end user**

According to table 4.8 above on the questions asked on the utilization by end user. 37 of them agree, 21 of them strongly agree, 7 of them neutral, 5 of them disagree and 1 strongly disagree on the information system of the WFP is capable of checking the delivered items to the right beneficiaries. And the mean score is 4.01 with 0.902 standard deviation value which indicates most of the respondents are agreed. If the information system of the WFP measures the satisfaction level of beneficiaries by implementing partners asked to the respondents then 31 of them agree,9 of them strongly agree, 18 of them neutral while 13 of them disagree, and the mean score is 3.51 with 0.939 standard deviation value which indicates most of the respondents are agreed. The information system of the WFP is designed to collect, analyze any other relevant information about beneficiaries of the total respondents 36 of them agree,13 of them strongly agree,12 of them neutral and 9 of them disagree, and the mean score is 3.76 with 0.908 standard deviation value which indicates most of the respondents are agreed.

Table 4.9: Monitoring and Evaluation Practice

N=72	SD	D	N	A	SA	Mean	Std. Deviation
Monitoring and Evaluation							
The information system of the WFP entertains feedback of timely delivery of aid items from field monitor		5	9	40	15	3.94	.802
The information system of the WFP can confirm items delivered and received with the right condition, quantity and delivered to the right beneficiaries		4	3	45	17	4.087	.7223
The information system of the WFP collects information from transporters, NGOs and communities, and then crosschecked against each other and the same report will be delivered to donors.		10	11	37	12	3.73	.916
The information system of the WFP confirms the aid items delivered to the right beneficiaries with the right amount and it ensure the continuity of the aid operation until the emergency ends.		5	8	39	19	4.01	.819
Grand Total						**3.9401**	**.65119**

Source: Own Computation June, 2020

- **Monitoring and evaluation**

Based on the above table 4.9 questions were asked for the information system applicable on monitoring and evaluation of the WFP. The respondents were asked if the information system of the WFP entertains feedback of timely delivery of aid items from field monitor of the response 40 of them agree,15 of them strongly agree,9 of them neutral and 5 of them disagree, and the mean score is 3.94 with 0.802 standard deviation value which indicates most of the respondents are agreed. Among the total response 45 of them, 17 of them, 3 of them and 4 of them agree, strongly agree, neutral and disagree respectively on the information system of the WFP can confirm items delivered and received with the right condition, quantity and delivered to the right beneficiaries, and the mean score is 4.087 with 0.7223 standard deviation value which indicates most of the respondents are agreed. For further response result on the monitoring and evaluation see table 4.9 above.

4.5. The Role of Supply Chain Information Systems on the WFP's Humanitarian Supply Chain Performance

The values were assigned for the opinion of the respondents 1,2,3,4 and 5 for Strongly Disagree (SD), Disagree (D), Neutral (N), Agree (A) and Strongly Agree (SA) respectively.

Under humanitarian supply chain performance measurement there are four variables such as reliability (quality), responsiveness, flexibility and cooperation/standardization

Result and Interpretation of Humanitarian Supply Chain Performance of WFP

Table 4.10: Reliability

N=72	SD	D	N	A	SA	Mean	Std. Deviation
Reliability (quality)							
WFP's supply chain management information systems facilitate the reliability of the delivery date by WFP	1	1	9	37	22	4.11	.790
WFP's supply chain management information systems facilitate the delivery of the right quality aid items to the beneficiaries		4	5	39	22	4.13	.779
WFP's supply chain management information systems facilitate the provision of quality services for beneficiaries and other stakeholders		4	6	40	20	4.09	.775
WFP's supply chain management information system has enabled processing of accurate reports to donors and other stakeholders		2	5	41	23	4.20	.689
Grand Total						**4.1279**	**.64655**

Source: Own Computation June, 2020

- **Reliability**

According to table 4.10 there was list of questions asked for the reliability measure of the humanitarian Supply chain performance measures. The responses of 37 agree, 22 strongly agree,9 neutral and 1 disagree and strongly disagree on WFP's supply chain management information systems facilitate the reliability of the delivery date by WFP, and the mean score is 4.11 with 0.79 standard deviation value which indicates most of the respondents are agreed. WFP's supply chain management information systems facilitate the provision of quality services for beneficiaries and

other stakeholders, 39 of them agree,22 strongly agree,6 of them neutral and 4 of them disagree, and the mean score is 4.13 with 0.779 standard deviation value which indicates most of the respondents are agreed. Based on the result of the response on WFP's supply chain management information system has enabled processing of accurate reports to donors and other stakeholders, of the majority 41 of them agree, 23 of them strongly agree, 5 of them neutral while 2 of them disagree, and the mean score is 4.2 with 0.689 standard deviation value which indicates most of the respondents are agreed. For further response results on reliability see table 4.10 above.

Table 4.11: Responsiveness

N=72	SD	D	N	A	SA	Mean	Std. Deviation
Responsiveness							
WFP's supply chain management information systems helped to increase timely delivery of goods to the beneficiaries	1	4	6	41	19	4.03	.845
The adoption of supply chain management information systems minimized the time to purchase, time to transport and time to deliver goods to the distribution area.		3	13	33	22	4.04	.818
The WFP's supply chain management information systems increase the delivery date reliability		3	13	38	17	3.97	.774
Grand Total						**4.0141**	**.69793**

Source: Own Computation June, 2020

- **Responsiveness**

Table 4.11 shows that there were questions asked related to the responsiveness measure of humanitarian supply chain. Out of the response 41 of them agree,19 of them strongly agree, 6 of them neutral, 4 of them disagree and also 1 strongly disagree on the WFP's supply chain management information systems helped to increase timely delivery of goods to the beneficiaries, and the mean score is 4.03 with 0.845 standard deviation value which indicates most of the respondents are agreed. The adoption of supply chain management information systems minimized the time to purchase, time to transport and time to deliver goods to the distribution area of the response 33 of them agree, 22 of them strongly agree, 13 of them neutral while 3 of them disagree, and the mean score is 4.04 with 0.818 standard deviation value which indicates most of the

respondents are agreed. Out of the total response 38 of them agree, 17 of the strongly agree, 13 of them neutral and 3 of them disagree on the WFP's supply chain management information systems increase the delivery date reliability, and the mean score is 3.97 with 0.774 standard deviation value which indicates most of the respondents are agreed.

Table 4.12: Flexibility

N=72	SD	D	N	A	SA	Mean	Std. Deviation
Flexibility							
The supply chain management information system has the ability to change according to external conditions.		4	23	37	7	3.66	.736
The supply chain management information system has the ability to change the variety and quantity of goods sent to the disaster area/beneficiary.	1	10	14	37	9	3.61	.933
The supply chain management information system has the flexibility to manage the balance of prepositioned goods at the local level.		9	7	40	14	3.84	.895
Grand Total						**3.6995**	**.63033**

Source: Own Computation June, 2020

- **Flexibility**

Flexibility is the measures of the performance measures that is considered so, there were questions asked to respondents, the result was compiled on table 4.12 above. Among the total response 37 of them agree,23 of them neutral,7 of them strongly agree and 4 of them disagree on the supply chain management information system has the ability to change according to external conditions, and the mean score is 3.66 with 0.736 standard deviation value which indicates most of the respondents are agreed. They were asked if the supply chain management information system has the ability to change the variety and quantity of goods sent to the disaster area/beneficiary of the majority 37 of them agree, 14 of them neutral,10 of them disagree, 9 of them strongly agree and 1 strongly dis agree, and the mean score is 3.61 with 0.933 standard deviation value which indicates most of the respondents are agreed. The supply chain management information system has the flexibility to manage the balance of prepositioned goods at the local level, among the total response

40 of them agree,14 of them strongly agree, 9 of them disagree while 7 of them neutral, and the mean score is 3.84 with 0.895 standard deviation value which indicates most of the respondents are agreed.

Table 4.13: Cooperation/Standardization

N=72	SD	D	N	A	SA	Mean	Std. Deviation
Cooperation/Standardization							
The WFP's supply chain management information system is helping to build high degree of information sharing between actors belonged to the WFP and partners involved in a disaster management.		2	11	43	13	3.97	.685
The WFP's supply chain management information systems are helping to build high degree of cooperation between actors belonged to the organization and partners involved in a disaster management.		1	11	42	17	4.06	.674
The WFP's supply chain management information systems have standardized procedures used during the resolution of the disaster in a coordinated effort.		1	10	44	16	4.06	.652
The WFP's supply chain management information system is capable to coordinate and share information between humanitarian actors		1	7	46	17	4.11	.622
The WFP's supply chain management information systems are capable to coordinate and share information between stakeholders		2	9	44	16	4.04	.685
The WFP's supply chain management information systems are capable to strengthen customer/beneficiary integration		4	10	45	11	3.90	.725
The WFP's supply chain management information systems are capable to strengthen supplier integration		4	12	42	13	3.90	.759
Grand Total						**4.0064**	**.55489**

Source: Own Computation June, 2020

- **Cooperation/Standardization**

Based on the above table 4.13, respondents were asked if the WFP's supply chain management information system is helping to build high degree of information sharing between actors belonged to the WFP and partners involved in a disaster management, the response 43 of them agree,13 of them strongly agree, 11 of them neutral and 2 of them disagree, and the mean score is 3.97 with 0.685 standard deviation value which indicates most of the respondents are agreed. Among the total response 44 of them agree, 16 of them strongly agree, 10 of them neutral and 1 disagree on the WFP's supply chain management information systems have standardized procedures used during the resolution of the disaster in a coordinated effort, and the mean score is 4.06 with 0.652 standard deviation value which indicates most of the respondents are agreed. On the WFP's supply chain management information systems is capable to strengthen customer/beneficiary integration, among the total respondents 45 of them agree,11 of them strongly agree, 10 of them neutral and 4 of them disagree, and the mean score is 3.9 with 0.725 standard deviation value which indicates most of the respondents are agreed. For further response result on cooperation/Standardization see table 4.13 above.

4.6. Challenges of Supply Chain Information System Adoption at the WFP's Humanitarian Operations

The values were assigned for the opinion of the respondents 1,2,3,4 and 5 for Strongly Disagree (SD), Disagree (D), Neutral (N), Agree (A) and Strongly Agree (SA) respectively,

Under the challenges of supply chain information systems there are eight variables such as lack of standardized processes, unpredictable demand, lack of infrastructure, complex performance measurement systems, broad range of actors, and lack of coordination, lack of collaboration/ cooperation and limitation of information technology.

Result and Interpretation of Challenge of Humanitarian Supply Chain Information System

Table 4.14: Lack of Standardize process

N=72	SD	D	N	A	SA	Mean	Std. Deviation
Lack of Standardize process							
Lack of standardized procedures negatively affects in adopting Humanitarian Supply Chain Information System which ultimately decreases the flexibility of WFP's humanitarian operation	3	4	5	35	24	4.03	1.014
Lack of standardized procedures negatively affects in adopting Humanitarian Supply Chain Information System, which ultimately affects the timely delivery of humanitarian aid items to the beneficiaries and implementing partners	3	6	4	38	21	3.94	1.033
Lack of standardized procedures negatively affects in adopting Humanitarian Supply Chain Information System which ultimately creates a communication gap among and between humanitarian partners	1	8	2	35	25	4.06	.984
Lack of standardized procedures negatively affects in adopting Humanitarian Supply Chain Information System which ultimately creates a challenge in delivering humanitarian aid with short lead times	3	6	2	36	23	4.00	1.049
Grand Total						**4.0139**	**.95025**

Source: Own Computation June, 2020

- **Lack of standardize process**

Among the challenges of supply chain information, one is lack of standardized process. There were four questions asked on the lack standardize process on the supply chain. Respondents were asked if lack of standardized procedures negatively affects in adopting HSCIS which ultimately decreases the flexibility of WFP's humanitarian operation, out of the total respondents 35 of them agree, 24 of them strongly agree while 5 of them neutral, and the mean score is 4.03 with 1.014 standard deviation value which indicates most of the respondents are agreed. Lack of standardized procedures negatively affects in adopting HSCIS, which ultimately affects the timely delivery of

humanitarian aid items to the beneficiaries and implementing partners here 38 of them agree, 21 of them strongly agree and 4 neutral, and the mean score is 3.94 with 1.033 standard deviation value which indicates most of the respondents are agreed. Lack of standardized procedures negatively affects in adopting HSCIS which ultimately creates a communication gap among and between humanitarian partners, out of the total respondents 35 of them agree, 25 strongly agree and 8 of disagree about it, and the mean score is 4.06 with 0.9845 standard deviation value which indicates most of the respondents are agreed. Lack of standardized procedures negatively affects in adopting HSCIS which ultimately creates a challenge in delivering humanitarian aid with short lead times of the majority 35 respondents agree, 24 strongly agree and 6 of the respondents disagree, and the mean score is 4 with 1.049 standard deviation value which indicates most of the respondents are agreed.

Table 4.15: Unpredictable demand

N=72	SD	D	N	A	SA	Mean	Std. Deviation
Unpredictable demand							
The existence of sudden change of relief aid (in quantity and variety) negatively affects in adopting Humanitarian Supply Chain Information System which ultimately contribute to the untimely delivery of aid item to the beneficiaries	1	15	6	37	11	3.60	1.041
The existence of sudden request of goods negatively affects in adopting Humanitarian Supply Chain Information System, which ultimately decreases the reliability of the WFP delivery capability	1	17	14	32	7	3.38	1.005
The existence of unpredictable nature of humanitarian operation negatively affects in adopting Humanitarian supply chain information systems which ultimately weakens the cooperation and coordination of activities among partners and stakeholders	1	11	8	43	8	3.65	.927
The existence of uncertain demand negatively affects in adopting Humanitarian supply chain information systems which ultimately reduces the flexibility of partners and stakeholders		12	9	43	7	3.63	.882
Grand Total						**3.5669**	**.73916**

Source: Own Computation June, 2020

- **Unpredictable demand**

Based on above table 4.15 the existence of sudden change of relief aid (in quantity and variety) negatively affects in adopting HSCIS which ultimately contribute to the untimely delivery of aid item to the beneficiaries among the responses 37 of them agree, 15 of them disagree and 11 of them strongly agree, and the mean score is 3.6 with 1.041 standard deviation value which indicates most of the respondents are agreed. The existence of unpredictable nature of humanitarian operation negatively affects in adopting HSCIS which ultimately weakens the cooperation and coordination of activities among partners and stakeholders of the response 43 of them agree, 8 of them strongly agree and 11 of them disagree, and the mean score is 3.65 with 0.927 standard deviation value which indicates most of the respondents are agreed. For other response on questions related with unpredictable demand see table 4.15.

Table 4.16: Lack of infrastructure

N=72	SD	D	N	A	SA	Mean	Std. Deviation
Lack of infrastructure							
Lack of infrastructure negatively affects the adoption of Humanitarian supply chain information systems which negatively affects the reliability and reputation of WFP		6	4	36	25	4.13	.861
Lack of technological infrastructure negatively affects the adoption of Humanitarian supply chain information systems which ultimately weakens the coordination and collaboration performance among partners		5	5	32	30	4.21	.855
Lack of infrastructure negatively affects the adoption of Humanitarian supply chain information systems which ultimately decreases the flexibility of delivering humanitarian aid to the beneficiaries		3	2	42	25	4.24	.702
Unavailability of communication infrastructure negatively affects the adoption of Humanitarian supply chain information systems, which ultimately affects the responsiveness of the humanitarian operation.	1	3	4	34	30	4.24	.847

Grand Total		**4.2049**	**.68732**

Source: Own Computation June, 2020

- **Lack of Infrastructure**

The response on lack of technological infrastructure negatively affects the adoption of HSCIS which ultimately weakens the coordination and collaboration performance among partners. The majority 32 of them agree, 30 of them strongly agree while 5 of them neutral of it, and the mean score is 4.21 with 0.855 standard deviation value which indicates most of the respondents are agreed. The response on lack of infrastructure negatively affects the adoption of HSCIS which ultimately decreases the flexibility of delivering humanitarian aid to the beneficiaries among the total response 42 of them agree, 25 of them strongly agree and 2 of them neutral, and the mean score is 4.24 with 0.702 standard deviation value which indicates most of the respondents are agreed. For additional response results see the above table 4.16.

Table 4.17: Complex performance measurement systems

N=72	SD	D	N	A	SA	Mean	Std. Deviation
Complex performance measurement systems							
The complex performance measurement system of the WFP negatively affects the adoption of Humanitarian supply chain information systems, which negatively affects the coordination and collaboration among partners and stakeholders	2	19	21	23	6	3.17	1.014
The complex performance measurement systems of the WFP negatively affect the adoption of Humanitarian supply chain information systems, which affect the delivery of goods to the beneficiaries	5	25	12	24	4	2.96	1.109
The complex performance measurement system WFP negatively affects the adoption of Humanitarian supply chain information systems, which negatively affects the flexibility of the humanitarian operation	1	24	13	23	8	3.19	1.088
The complex performance measurement system of the WFP negatively affects the adoption of Humanitarian supply chain information systems, which weakens the	5	26	8	26	5	3.00	1.155

timely response of aid by WFP to the beneficiaries							
Grand Total						**3.0962**	**1.01268**

Source: Own Computation June, 2020

- **Complex Performance Measurement Systems**

The complex performance measurement system of the WFP negatively affects the adoption of HSCIS, which negatively affects the coordination and collaboration among partners and stakeholders. Among the total response 23 of them agrees,6 of them strongly agree,21 of them neutral, 19 of them disagree and 2 them strongly disagrees, and the mean score is 3.17 with 1.014 standard deviation value which indicates most of the respondents are agreed. The complex performance measurement systems of the WFP negatively affect the adoption of Humanitarian supply chain information systems, which affect the delivery of goods to the beneficiaries of the majority 25 of them disagree,5 diagree,12 of them neutral,24 of them agree and 4 of them strongly agree, and the mean score is 2.96 with 1.109 standard deviation value which indicates most of the respondents are not agreed. For additional response results see the above table 4.17.

Table 4.18: Broad Range of Actors

N=72	SD	D	N	A	SA	Mean	Std. Deviation
Broad Range of Actors							
Working together with many stakeholders negatively affects the adoption of Humanitarian supply chain information systems which ultimately impairs the timely response of aid items by WFP	10	31	10	16	4	2.62	1.151
The availability of different partners and stakeholders in the humanitarian operation negatively affects the adoption of Humanitarian supply chain information systems, which ultimately decreases the delivery of the right quality aid items at the right time	7	39	8	15	2	2.52	1.026
The broad range of stakeholders in the humanitarian operation negatively affects the adoption of Humanitarian supply chain information systems, which ultimately	3	30	10	25	2	2.90	1.038

decreases ability to change the operation according to external conditions.							
Working together with many actors or stakeholders negatively affects the adoption of Humanitarian supply chain information systems, which ultimately becomes an obstacle towards the effort of developing the standardization of humanitarian procedures	7	31	11	18	3	2.70	1.095
Grand Total						**2.7049**	**.91767**

Source: Own Computation June, 2020

- **Broad Range of Actors**

Among the total response on availability of different partners and stakeholders in the humanitarian operation negatively affects the adoption of HSCIS, which ultimately decreases the delivery of the right quality aid items at the right time. The majority 39 of them disagree,7 of them strongly disagree, 8 of them neutral, 15 of them agree and 2 of them strongly agree, and the mean score is 2.52 with 1.026 standard deviation value which indicates most of the respondents are not agreed. the majority of the respondent response disagrees on this question. Working together with many actors or stakeholders negatively affects the adoption of HSCIS, which ultimately becomes an obstacle towards the effort of developing the standardization of humanitarian procedures among the majority of the responses 31 of them disagree, 7 of them strongly disagree and 11 of them neutral, and the mean score is 2.7 with 1.095 standard deviation value which indicates most of the respondents are agreed. See table 4.18 for further response results.

Table 4.19: Lack of Coordination

N=72	SD	D	N	A	SA	Mean	Std. Deviation
Lack of Coordination							
The existence of insufficient coordination due to the high number of stakeholders negatively affects the adoption of Humanitarian supply chain information systems, which ultimately decreases the responsiveness of the humanitarian operation by WFP	1	15	5	42	9	3.60	1.002
Lack of coordination among stakeholders negatively affects the adoption of Humanitarian supply chain information	1	5	2	46	17	4.03	.828

systems, which ultimately affects the timely delivery of aid item to the beneficiaries							
The availability of different working procedures between stakeholder's and partners office negatively affects the adoption of Humanitarian supply chain information systems, which ultimately becomes a challenge for WFP to coordinate its supplies and human		10	8	41	12	3.77	.898
Lack of coordination among stakeholders negatively affects the adoption of Humanitarian supply chain information systems, which ultimately becomes an obstacle in implementing the best quality information systems	1	4	3	42	22	4.11	.832
Grand Total						**3.8785**	**.67395**

Source: Own Computation June, 2020

- **Lack of Coordination**

Based on table 4.19 above the response on lack of coordination among stakeholders negatively affects the adoption of HSCIS, which ultimately affects the timely delivery of aid item to the beneficiaries and 46 of them agree, 17 of them strongly agree and 2 of them were neutral, and the mean score is 4.03 with 0.828 standard deviation value which indicates most of the respondents are agreed. Among the respondents 42 them of agree, 22 of them strongly agree and 3 of them neutral on lack of coordination among stakeholders negatively affects the adoption of HSCIS, which ultimately becomes an obstacle in implementing the best quality information systems, and the mean score is 4.11 with 0.832 standard deviation value which indicates most of the respondents are agreed.

Table 4.20: Lack of Collaboration / Cooperation

N=72	SD	D	N	A	SA	Mean	Std. Deviation
Lack of Collaboration / Cooperation							
Lack of cooperation among stakeholders in WFP negatively affects the adoption of Humanitarian supply chain information systems, which ultimately decreases the WFP's response to beneficiaries	1	7	6	39	18	3.93	.931
Lack of cooperation among partners negatively affects the adoption of Humanitarian supply chain information systems, which ultimately becomes an obstacle for timely delivering quality humanitarian relief items to the beneficiaries	1	5	3	41	22	4.08	.868
Lack of cooperation among partners and stakeholders negatively affects the adoption of Humanitarian supply chain information systems, which ultimately affects sharing information, assets and equipment among partners		6	3	41	19	4.06	.820
Lack of cooperation among stakeholders negatively affects the adoption of Humanitarian supply chain information systems, which ultimately affects the adaptability to the changing conditions of the humanitarian operation		5	4	44	19	4.07	.775
Grand Total						**4.0359**	**.74900**

Source: Own Computation June, 2020

- **Lack of Collaboration/Cooperation**

Based on the above table 4.20 the response on lack of cooperation among partners and stakeholders negatively affects the adoption of Humanitarian supply chain information systems, which ultimately affects sharing information, assets and equipment among partners. The result shows 41 of them agree,19 of strongly agree, 3 of them neutral and 6 of them disagree. Hence, the mean score is 4.06 with 0.82 standard deviation value which indicates most of the respondents are agreed. Among the respondents 44 of them agree,19 of them strongly agree, 4 of them neutral and 5 of them disagree on the lack of cooperation among stakeholders negatively affects the adoption

of HSCIS, which ultimately affects the adaptability to the changing conditions of the humanitarian operation, and the mean score is 4.07 with 0.775 standard deviation value which indicates most of the respondents are agreed. For the additional response result see table 4.20 above.

Table 4.21: Limitation of Information Technology

N=72	SD	D	N	A	SA	Mean	Std. Deviation
Limitation of Information Technology							
Weak integrated information system negatively affects the adoption of Humanitarian supply chain information systems, which ultimately affect the different procedures among partners	2	7	2	40	21	3.99	.986
Method of coordinating procedures is quite complicated due to inconsistencies of information systems within humanitarian partners	2	11	16	33	9	3.51	.998
Limited access to information technology negatively affects the adoption of Humanitarian supply chain information systems, which ultimately affects the delivery of goods to the beneficiaries by WFP	1	7	2	43	17	3.97	.900
Unavailability of information technology negatively affects the adoption of Humanitarian supply chain information systems, which ultimately weakens the coordination and collaboration of partners and stakeholders by WFP	1	6	2	40	21	4.06	.899
Grand Total						**3.8808**	**.75056**

Source: Own Computation June, 2020

- **Limitation of Information Technology**

Based on table 4.21 the limited access to information technology negatively affects the adoption of HSCIS, which ultimately affects the delivery of goods to the beneficiaries by WFP of the majority 43 of them agree, 17 of them strongly agree, 2of them neutral, 7 of them disagree and 1 strongly disagree, and the mean score is 3.97 with 0.9 standard deviation value which indicates most of the respondents are agreed. Among the total respondents 40 of them agree, 21 of them strongly agree, 2 of them neutral, 6 of them disagree and 1 strongly disagree on the unavailability of information technology negatively affects the adoption of HSCIS, which ultimately weakens the coordination and collaboration of partners and stakeholders by WFP, and the mean score is 4.06 with 0.899 standard deviation value which indicates most of the respondents are agreed. For

the response of the other questions related with limitation of information technology on HSCIS see the above table 4.21.

Table 4.22: Descriptive Analysis Summary for Challenges, Performance and Practices of Supply Chain Information System

Variables	**N=72**	**Mean**	**Std. Deviation**
Lack of standardize process		4.0139	.95025
Unpredictable demand		3.5669	.73916
Lack of infrastructure		4.2049	.68732
Complex performance measurement systems		3.0962	1.01268
Broad range of actors		2.7049	.91767
Lack of coordination		3.8785	.67395
Lack of collaboration/cooperation		4.0359	.74900
Limitation of information technology		3.8808	.75056
Planning		4.0150	.60794
Budgeting and Forecasting		4.1713	.45015
Sourcing		3.9074	.56286
Logistics and Delivery		3.6273	.74876
Warehouse system		4.169	.5620
Utilization by End user		3.7653	.75044
Monitoring and Evaluation		3.9401	.65119
Reliability (quality)		4.1279	.64655
Responsiveness		4.0141	.69793
Flexibility		3.6995	.63033
Cooperation/standardization		4.0064	.55489

As it can be seen from the above table 4.22 lack of infrastructure has the highest average value and followed by lack of Collaboration /cooperation and among the challenges HSCIS a Broad Range of Actors has the smallest average value. The HSCIS practice warehouse system has highest average value and then followed by planning and logistics and delivery has the smallest

average value. Among the four-performance measure of the SCIS reliability has the highest average values followed by responsiveness.

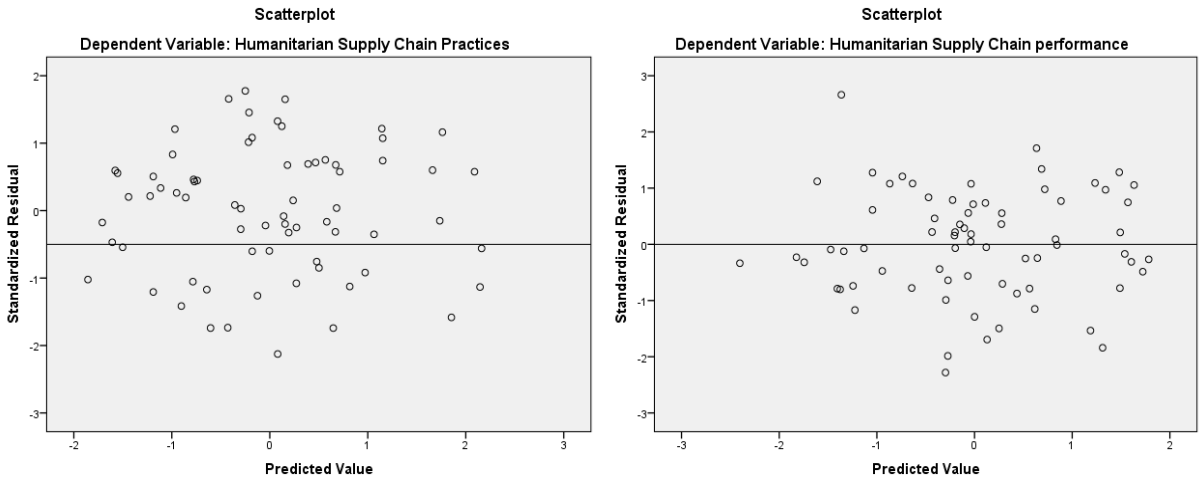
4.6. Model Test

4.6.1. Linearity test

For fitting multiple linear regression model one of the assumptions of the dependent variable with the independent variables, where there is a linear relationship between the dependent with each independent variable. Relationships between variables are considered linear when they are consistent and directly proportional to each other (Tabachnick & Fidell, 2006). Violations of this assumption resulted in the estimates obtained from the analysis, such as R-square, regression coefficients, standard errors, and statistical significance, being biased lead to wrong decision.

The results from the analysis will underestimate the true relationship between the independent variables and dependent variable if the relationships between the variables are not linear. This underestimation of the results could lead to two areas of concern; first, an increase risk of Type II error could occur for that independent variable, and second, an increase risk of Type I error i.e., overestimation for the other independent variable(s) that share variance with that predictor variable could occur (Hoxx, 1995; Osborne & Water, 2002).The linearity assumption can be tested through the visual examination of residual plots, that is plotting on the Y-axis the standardized residuals and on the X-axis the predicted value (the dependent variables estimate).If the linearity assumption is met, the standardized residuals will scatter randomly around a horizontal line which represents the standardized residuals equaling zero (Tabachnick & Fidell, 2006).

Figure 4: Test of the Linearity Assumption



4.6.2. Multicollinearity Test

For multiple linear regression there are more than one independent variable included in the model fit. Hence, if the independent variables are correlated it could be the occurrence of multicollinearity, therefore, the independent variables should be uncorrelated. Widely used technique for identifying multicollinearity is calculating variance inflation factor (VIF) between all independent variables. When an independent variable has a strong linear relationship with other independent variables, the associated VIF is large and is evidence of multicollinearity (Shieh, 2010). A rule for cut point of collinearity VIFs is 3.3 or lower to suggest no multicollinearity in the model (Kock, 2013).

Table 4.23: Test of Multicollinearity for model 1

Coefficients[a]		
Model	Collinearity Statistics	
	Tolerance	VIF
Lack of Standardize process	.497	2.011
Unpredictable demand	.491	2.035
Lack of infrastructure	.436	2.292
Complex performance measurement systems	.443	2.258
Broad Range of Actors	.671	1.491
Lack of Coordination	.260	3.853
Lack of Collaboration / cooperation	.265	3.779

Limitation of Information Technology	.313	3.196
a. Dependent Variable: Humanitarian Supply Chain Practices		

Table 4.24: Test of Multicollinearity for model 2

Model	Collinearity Statistics	
	Tolerance	VIF
Planning	.644	1.554
Budgeting and Forecasting	.656	1.525
Sourcing	.522	1.915
Logistics and Delivery	.695	1.438
Warehouse system	.540	1.851
Utilization by End user	.450	2.221
Monitoring and Evaluation	.404	2.475
a. Dependent Variable: Humanitarian Supply Chain performance		

- According to the table 4.23 there is high multicollinearity for lack of coordination and lack of collaboration/cooperation.

- Based on the above table 4.24 the variance inflation factor (VIF) for the above independent variable less than 2.475 so it implied that there is no multicollinearity.

4.6.3. Result of Model fit

There are two multiple linear regression models fitted. R-square is the measure of goodness of fit of the regression model; its range is 0 to 1 if the value of R-square closes to 1 the model fit the data well whereas when it is close to zero the regression model did not fit well.

Table 4.25: Model 1 Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.425a	.181	.073	.43118	.181	1.682	8	61	.121

a. Predictors: (Constant), Limitation of Information Technology, Unpredictable demand, Broad Range of Actors, Lack of infrastructure, Lack of Standardize process, Complex performance measurement systems, Lack of Collaboration / cooperation, Lack of Coordination
b. Dependent Variable: Humanitarian Supply Chain Practices

- The multiple linear regression model had not well fit the data for the model the dependent variable is Humanitarian Supply Chain Practices.

Table 4.26: Model 2 Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.845[a]	.715	.683	.29588	.715	22.563	7	63	.000

a. Predictors: (Constant), Monitoring and Evaluation, Logistics and Delivery, Planning, Budgeting and Forecasting, Sourcing, Warehouse system, Utilization by End user
b. Dependent Variable: Humanitarian Supply Chain performance

- 68.3% of the variability on the Humanitarian Supply Chain performance was accounted by the above listed independent variables.
- The second multiple linear regression is a good fit model; the dependent variable is the Humanitarian Supply Chain performance of the supply chain of WFP in Ethiopia.

4.7. Result of Multiple Linear Regression Model

This study is intended to show the factors affecting the adoption of humanitarian supply chain information systems and the role of supply chain information systems on humanitarian supply chain performance. Hence, there are two multiple linear regression model that are fitted according to the dependent variables. This section discussed the finding of the study based on the multiple linear regressions.

According to the result of model 1 summary of the multiple linear regression on table 4.25, the dependent variable was humanitarian supply chain practices with the independent variables; lack

of standardized process, unpredictable demand, lack of infrastructure, complex performance measurement systems, broad range of actors, lack of collaboration / cooperation and; limitation of information technology system practice. The overall goodness fit of the model result shows that the model is not good fit because the p-value is 0.121 which is greater than 0.05. Therefore, all the independent variables entered in the regression had no statistically significant effect in the humanitarian supply chain practice. And similar result is obtained from correlation measure of the dependent variables with each independent variable, that means all independent variables were not significantly correlated with the dependent variables. (See annex 2).

From the correlation matrix on annex 2, the dependent variable humanitarian supply chain performance had significantly positive correlation with the set of independent variables such as planning, budgeting and forecasting, sourcing, logistics and delivery, warehouse system, utilization by end user and; monitoring and evaluation. And also, according to the result of model 2 summary of the multiple linear regression on table 4.26, the dependent variable of that humanitarian supply chain performance to the set of independent variables such as planning, budgeting and forecasting, sourcing, logistics and delivery, warehouse system, utilization by end user and; monitoring and evaluation. The overall goodness fit of the model result shows that the model is good fit because the p-value is 0.000 which is less than 0.05. Therefore, at least one independent variable entered in the regression had statistically significant effect in the humanitarian supply chain performance. Hence, the model fit result is presented below on table 4.27.

Table 4.27: Model Result of Regression

Coefficients[a]					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.081	.368		.220	.827
Planning	**.146**	**.072**	**.169**	**2.018**	**.048**
Budgeting and Forecasting	.034	.097	.029	.353	.725
Sourcing	**.200**	**.086**	**.215**	**2.314**	**.024**
Logistics and Delivery	.028	.058	.039	.483	.631
Warehouse system	**.350**	**.086**	**.375**	**4.092**	**.000**
Utilization by End user	.047	.070	.067	.667	.507

Monitoring and Evaluation	.162	.085	.200	1.890	.063
a. Dependent Variable: Humanitarian Supply Chain Performance					

According to the result of model fitted above on table 4.27, the role of supply chain information system on sourcing practice had a statistically significant positive effect on the humanitarian supply chain performance with a beta coefficient (β=0.200, P=0.024). And similar result with Kakhki and Gargeya the supply chain management is highly relied on information and communication technology for the handling of purchases, correspondence, decision making and information sharing. Therefore, the role of supply chain information system on sourcing practice improve the performance of the humanitarian supply chain.

The role of supply chain information system on planning practice had a statistically positive effect on the humanitarian supply chain performance with a beta coefficient (β=.146, P=.048). The same result also stated by Comes and DeWalle, (2016) that a competent supply chain and logistics depend on information systems of the organization. When a logistician needs to plan his operations and he needs to have detail analysis of the resources, limitations. A logistician needs to get all this data from the already accumulated information and recorded experiences. Any humanitarian logistics and supply chain operation needs to record and report changes in procedures, operations and forecasts as an experience to track changes so that one can accurately/approximately predict the future operation This kind of experience helps to create an efficient humanitarian logistics operation and will also contribute its own share to the flexibility and agility of the operation.

The role of supply chain information system on the warehouse system practice had a statistically significant positive effect on the humanitarian supply chain performance with a beta coefficient (β=**.350**, P=0.00). Similarly, this result aligned with the findings of Aurelie et al., (2017), Strengthening the warehouse information system to access warehouse facilities and prepositioned aid items makes the humanitarian operation more responsive.

The role of supply chain information system on logistics and delivery practice was not statistically significant positive effect on humanitarian supply chain performance similar result was obtained by *Maiers, Reynolds and Haselkorn (2005)* that humanitarian logistics and supply chain faces many challenges in implementing and using information systems and technologies often these challenges can sometimes go beyond technological considerations.

The role of supply chain information system on monitoring and evaluation practice was not a statistically significant effect on humanitarian supply chain performance. This result contradicted with Howden, (2009) that feedback of closing the loop makes donors and aid agencies to be more active and attentive and will be able to sustainably respond and support the aid delivery process according to the needs of the beneficiaries.

Table 4.28: Hypothesis testing Summary based on the regression and correlation test results

Hypothesis List	P-value (Regression)	P-value (Correlation)	Decision
H1: Planning positively and significantly affects the humanitarian supply chain performance	0.048	0.000	Accepted
H2: Budgeting and forecasting positively and significantly affects the humanitarian supply chain performance	0.725	0.000	Accepted
H3: Sourcing positively and significantly affects the humanitarian supply chain performance.	0.024	0.000	Accepted
H4: Logistics and delivery positively and significantly affects the humanitarian supply chain performance.	0.631	0.000	Accepted
H5: Warehousing system positively and significantly affects the humanitarian supply chain performance.	0.000	0.000	Accepted
H6: Utilization by End user positively and significantly affects the humanitarian supply chain performance.	0.507	0.000	Accepted
H7: Monitoring and Evaluation positively and significantly affects the humanitarian supply chain performance	0.063	0.000	Accepted
H8: Lack of Standardized processes negatively and significantly affects the humanitarian supply chain Practice.	0.535	**.256**	Rejected
H9: Unpredictable demand negatively and significantly affects the humanitarian supply chain practice.	0.613	**.536**	Rejected
H10: Lack of infrastructure negatively and significantly affects the humanitarian supply chain practice.	0.038	**.156**	Rejected
H11: Complex performance measurement system negatively and significantly affects the humanitarian supply chain practice.	0.352	**.469**	Rejected
H12: Broad range of Actors negatively and significantly affects the humanitarian supply chain practice.	0.135	**.056**	Rejected
H13: Lack of cooperation negatively and significantly affects the humanitarian supply chain practice.	0.217	**.815**	Rejected
H14: Lack of coordination negatively and significantly affects the humanitarian supply chain practice	0.165	**.130**	Rejected

H15: Limitations of information technology negatively and significantly affects the humanitarian supply chain practice	0.123	**.876**	Rejected

CHAPTER FIVE

5. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This chapter deals with the summary, conclusions, and recommendations developed from the finding of the study. Based on the results/findings obtained from the study the following summary, conclusions and recommendations has been given.

5.1. SUMMARY

- This study is conducted for accessing the challenge and role of the supply chain information system on the humanitarian supply chain on the WFP in Ethiopia.
- The study is conducted on the employees of the world food program in Ethiopia.
- The study is based on primary data collected by questionnaires of five Likert scale questions and valid quantitative data is collected from 72 respondents as 72% was the response rate
- Descriptive statistics such as count, mean, standard deviation, and percentages were used and also multiple linear regression models and related tests were used to analyze the data.
- The LESS supply chain information system had a higher percentage of awareness which is 45.7% and 40% were aware of the COMET system.
- The majority of the employee 76.5% of respondents were believed that WFP supply chain systems easily integrate with the systems of is partners and stakeholders
- 75.4% of respondents believed that there is enough funding to support the expansion of the supply chain information system.
- There exists a significant positive correlation among the role of supply chain information practices and humanitarian supply chain performance.
- There exist significant positive correlations among the relationships of variables
- The standardized procedures negatively affect adopting a humanitarian supply chain information system which ultimately creates a communication gap among and between humanitarian partners.

- The existence of the unpredictable nature of humanitarian operations negatively affects in adopting humanitarian supply chain information systems which ultimately weakens the cooperation and coordination of activities among partners and stakeholders.
- Lack of infrastructure negatively affects the adoption of humanitarian supply chain information systems which ultimately decreases the flexibility of delivering humanitarian aid to the beneficiaries
- The complex performance measurement systems of the WFP did not negatively affect the adoption of Humanitarian supply chain information systems, which affect the delivery of goods to the beneficiaries.
- The availability of different partners and stakeholders in the humanitarian operation negatively affects the adoption of humanitarian supply chain information systems, which ultimately decreases the delivery of the right quality aid items at the right time
- Lack of coordination among stakeholders negatively affects the adoption of humanitarian supply chain information systems, which ultimately becomes an obstacle in implementing the best quality information systems.
- Lack of cooperation among partners negatively affects the adoption of humanitarian supply chain information systems, which ultimately becomes an obstacle for timely delivering quality humanitarian relief items to the beneficiaries.
- Limited access to information technology negatively affects the adoption of humanitarian supply chain information systems, which ultimately affects the delivery of goods to the beneficiaries by WFP
- The WFP employees are familiar with working with supply chain information system with the required skill and knowledge
- The implementation of an information system helps the organization to plan and forecast the necessary budget amount at the beginning of any emergency operation.
- The implementation of an information system at the WFP facilitates for ordering and purchasing of the necessary relief items such as food aid items from the suppliers
- The WFP is not using a GPS and RFID on each contracted and dedicated WFP truck and package to identify the whereabouts of each truck and consignment.

- The storekeepers in the organization are skilled enough to use information technology to do their store keeping activities.
- The WFP information system does not properly measure the satisfaction level of beneficiaries by implementing partners.
- The information system of the WFP can confirm items delivered and received with the right condition, quantity, and delivered to the right beneficiaries.
- WFP's supply chain management information system has enabled processing of accurate reports to donors and other stakeholders
- WFP's supply chain management information systems helped to increase the timely delivery of goods to the beneficiaries.
- The supply chain management information system cannot change the variety and quantity of goods sent to the disaster area/beneficiary.
- The WFP's supply chain management information system is capable to coordinate and share information between humanitarian sectors.
- The role of supply chain information system on planning practice, sourcing practice, and Warehouse system practice were the factors that affect the humanitarian supply chain performance of world food program in Ethiopia.
- The role of supply chain information system on budgeting and forecasting practice, logistics and delivery practice, utilization by end user practice and monitoring and evaluation practices did not affect the humanitarian supply chain performance of world food program in Ethiopia.

5.2. CONCLUSIONS

The main objective of this study was to examine the role of supply chain information systems on humanitarian supply chain operational performance in the United Nations World Food Program (UNWFP) Ethiopia country office. Based on the findings the analysis shows us that the challenges and practices of the supply chain information system on humanitarian operations of WFP, the following major findings were obtained. These are;

- The WFP is not using a GPS and RFID on each contracted and dedicated truck to identify the whereabouts of each truck and packages.

- The supply chain management information system is poor in its flexibility to change the variety and quantity of goods sent to the disaster area/beneficiary.
- The supply chain information system of the WFP currently is being used does not measure the satisfaction level of beneficiaries by implementing partners.
- There exists a significant positive correlation among the supply chain information practices and humanitarian supply chain performance.
- The role of supply chain information system on planning practice had a positive effect on humanitarian supply chain performance in WFP Ethiopia.
- The role of supply chain information system on sourcing practice had a positive effect on humanitarian supply chain performance in WFP Ethiopia.
- The role of supply chain information system on warehouse system practice had a positive effect on humanitarian supply chain performance in WFP Ethiopia.

5.3. RECOMMENDATIONS

Based on the finding of the study the following recommendations are given;

- The WFP in Ethiopia should improve the use of a GPS and RFID on each contracted and dedicated truck to identify the whereabouts of each truck and packages.
- The WFP in Ethiopia information system should start to measure the satisfaction level of beneficiaries by implementing partners.
- The WFP in Ethiopia should also give further training on the information technology and system to their employees.
- Further improvement of the role of supply chain management information system on planning practice, sourcing practice and warehouse system practice must be done. Particular emphasis should be given on these practices may improve the humanitarian supply chain operational performance.
- The WFP Ethiopia should give further attention and emphasis on the rest of the factors to improve the performance of the humanitarian supply chain.

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Annex 1: Questionnaire

Addis Ababa University

School of Commerce

Department of Logistics and Supply Chain Management

Information sheet for participants of the questionnaire

Dear Sir/Madam,

This survey is designed to obtain practical data for the study entitled "***The Role of Supply Chain Information Systems on the Humanitarian Supply Chain Operation Performance: The Case of United Nations World Food Programme. Ethiopia*****" for the partial fulfillment of master's degree in Logistics and Supply Chain Management.** You are requested to spare few minutes of your precious time to complete all the items. The study will involve WFP employees (Procurement, Program and Logistics) currently working on the LESS, COMET and WINGS. The fact that the answers for the questions will be treated as anonymous and the response will be confidential there is no known risk involved by being part of the study. This is completely a voluntary participation and you can withdraw anytime regardless of any reason you may have.

For further information you can contact me through cell number 0970401459 or addis.mitket@yahoo.com

Thank you very much!

Million Asmamaw
Email: addis.mitket@yahoo.com

Part I: Background Information

Please put "√" mark on the box below

1. Gender:

   Male ☐ Female ☐

2. Age (Years):

   Below 25 ☐ Between 25 – 35☐ More than 35☐

3. Level of Education:

   Certificate ☐ Diploma☐ BA/BSC☐ MA/MSC☐ PhD☐

4. Work Experience in the logistics sector (Years):

   Less than 3 ☐ Between 3 – 5☐ Between 6 – 10☐ More than 10☐

5. Supply Chain Systems you are knowledgeable:

   WINGS☐ LESS☐ COMET ☐

6. Do you think your organization is well performing in the supply chain management information system process?

   Yes ☐ No ☐,

7. Are the WFP supply chain systems easily integrate with the systems of its partners?

   Yes ☐ No ☐,

8. Is there enough funding to support the expansion of supply chain information system?

   Yes ☐ No ☐

Part II: Factors Affecting the Adoption of Humanitarian Supply Chain Information System

Please put "√" mark on the box below that best represents your opinion about there are challenges of adopting Humanitarian Supply Chain Information System in the WFP operation.

1 = Strongly Disagree 2 = Disagree 3 = Neutral 4 = Agree 5 = Strongly Agree

No.	**Challenges of Supply Chain information systems**	Scale				
1.	**Lack of Standardized Processes**	1	2	3	4	5
1.1	Lack of standardized procedures negatively affects in adopting Humanitarian Supply Chain Information System ultimately decreases the flexibility of WFP's humanitarian operation					
1.2	Lack of standardized procedures negatively affects in adopting Humanitarian Supply Chain Information System which ultimately affects the timely delivery of humanitarian aid items to the beneficiaries and implementing partners					
1.3	Lack of standardized procedures negatively affects in adopting Humanitarian Supply Chain Information System which ultimately creates a communication gap among and between humanitarian partners					
1.4	Lack of standardized procedures negatively affects in adopting Humanitarian Supply Chain Information System which ultimately creates a challenge in delivering humanitarian aid with short lead times					
2	**Unpredictable Demand**	1	2	3	4	5
2.1	The existence of sudden change of relief aid (in quantity and variety) negatively affects in adopting Humanitarian Supply Chain Information System which ultimately contribute to the delivery of aid item to the beneficiaries					
2.2	The existence of sudden request of goods negatively affects in adopting Humanitarian Supply Chain Information System, which ultimately decreases the reliability of the WFP delivery capability					
2.3	The existence of unpredictable nature of humanitarian operation negatively affects in adopting Humanitarian supply chain information systems which ultimately weakens the cooperation and coordination of activities among partners and stakeholders					

2.4	The existence of uncertain demand negatively affects in adopting Humanitarian supply chain information systems which ultimately reduces the flexibility of partners and stakeholders					
3	**Lack of Infrastructure**	1	2	3	4	5
3.1	Lack of infrastructure negatively affects the adoption of Humanitarian supply chain information systems which negatively affects the reliability and reputation of WFP					
3.2	Lack of technological infrastructure negatively affects the adoption of Humanitarian supply chain information systems which ultimately weakens the coordination and collaboration performance among partners					
3.3	Lack of infrastructure negatively affects the adoption of Humanitarian supply chain information systems which ultimately decreases the flexibility of delivering humanitarian aid to the beneficiaries					
3.4	Unavailability of communication infrastructure negatively affects the adoption of Humanitarian supply chain information systems, which ultimately affects the responsiveness of the humanitarian operation.					
4	**Complex Performance Measurement Systems**	1	2	3	4	5
4.1	The complex performance measurement system of the WFP negatively affects the adoption of Humanitarian supply chain information systems, which negatively affects the coordination and collaboration among partners and stakeholders					
4.2	The complex performance measurement systems of the WFP negatively affect the adoption of Humanitarian supply chain information systems, which affect the delivery of goods to the beneficiaries					
4.3	The complex performance measurement system WFP negatively affects the adoption of Humanitarian supply chain information systems, which negatively affects the flexibility of the humanitarian operation					
4.4	The complex performance measurement system of the WFP negatively affects the adoption of Humanitarian supply chain information systems, which weakens the timely response of aid by WFP to the beneficiaries					

5	**Broad Range of Actors**	1	2	3	4	5
5.1	Working together with many stakeholders negatively affects the adoption of Humanitarian supply chain information systems which ultimately impairs the timely response of aid items by WFP					
5.2	The availability of different partners and stakeholders in the humanitarian operation negatively affects the adoption of Humanitarian supply chain information systems, which ultimately decreases the delivery of the right quality aid items at the right time with the right quantity for the right beneficiaries					
5.3	The broad range of stakeholders in the humanitarian operation negatively affects the adoption of Humanitarian supply chain information systems, which ultimately decreases ability to change the operation according to external conditions.					
5.4	Working together with many actors or stakeholders negatively affects the adoption of Humanitarian supply chain information systems, which ultimately becomes an obstacle towards the effort of developing the standardization of humanitarian procedures					
6	**Lack of Coordination**	1	2	3	4	5
6.1	The existence of insufficient coordination due to the high number of stakeholders negatively affects the adoption of Humanitarian supply chain information systems, which ultimately decreases the responsiveness of the humanitarian operation by WFP					
6.2	Lack of coordination among stakeholders negatively affects the adoption of Humanitarian supply chain information systems, which ultimately affects the timely delivery of aid item to the beneficiaries					
6.3	The availability of different working procedures between stakeholder's and partners office negatively affects the adoption of Humanitarian supply chain information systems, which ultimately becomes a challenge for WFP to coordinate its supplies and human capital					

6.4	Lack of coordination among stakeholders negatively affects the adoption of Humanitarian supply chain information systems, which ultimately becomes an obstacle in implementing the best quality information systems					
7	**Lack of Collaboration/ cooperation**	1	2	3	4	5
7.1	Lack of cooperation among stakeholders in WFP negatively affects the adoption of Humanitarian supply chain information systems, which ultimately decreases the response time of aid to beneficiaries by WFP					
7.2	Lack of cooperation among partners negatively affects the adoption of Humanitarian supply chain information systems, which ultimately becomes an obstacle for timely delivering quality humanitarian relief items to the beneficiaries					
7.3	Lack of cooperation among partners and stakeholders negatively affects the adoption of Humanitarian supply chain information systems, which ultimately affects sharing information, assets and equipment among partners					
7.4	Lack of cooperation among stakeholders negatively affects the adoption of Humanitarian supply chain information systems, which ultimately affects the adaptability to the changing conditions of the humanitarian operation					
8	**Limitation of Information Technology**	1	2	3	4	5
8.1	Weak integrated information system negatively affects the adoption of Humanitarian supply chain information systems, which ultimately affect the different procedures among partners					
8.2	Method of coordinating procedures is quite complicated due to inconsistencies of information systems within humanitarian partners					
8.3	Limited access to information technology negatively affects the adoption of Humanitarian supply chain information systems, which ultimately affects the delivery of goods to the beneficiaries by WFP					
8.4	Unavailability of information technology negatively affects the adoption of Humanitarian supply chain information systems, which ultimately weakens the coordination and collaboration of partners and stakeholders by WFP					

Part III: Humanitarian Supply Chain Information System Practices

Please put "√" mark on the box below that best represents your opinion, whereas, 1 = Strongly Disagree, 2 = Disagree 3 = Neutral 4 = Agree 5 = Strongly Agree

No.	**Humanitarian Supply Chain Information System practices**	Scale				
1	**Planning**	1	2	3	4	5
1.1	The WFP is using supply chain information system for planning and identifying the number of beneficiaries.					
1.2	The WFP is using supply chain information system for conducting need assessments					
1.3	The WFP employees are familiar of working with supply chain information system with the required skill and knowledge					
1.4	The WFP is adopting supply chain information system (such as COMET system) as the organization believed to strengthen the organization's planning capability					
2	**Budgeting and Forecasting**	1	2	3	4	5
2.1	The implementation of information system helps the organization to plan and forecast the necessary budget amount at the beginning of any emergency operation					
2.2	The information system that your organization using capable of handling change in funding amount due to different external situation					
2.3	The information system that the WFP using ensures accountability to donors and the public in general					
3	**Sourcing**	1	2	3	4	5
3.1	The implementation of information system at the WFP facilitates for ordering and purchasing of the necessary relief items such as food aid items from the suppliers					

3.2	The information system of WFP can compare the price of items from different suppliers					
3.3	The WFP's country office can choose the winning supplier for procuring items from the existing database of the organization					
4	**Logistics and Delivery**					
4.1	The supply chain information system helps WFP to track and trace the items while on their way to their destination					
4.2	The WFP uses a GPS system on each contracted and dedicated WFP truck in order to identify the whereabouts of each truck					
4.3	The supply chain information technology and system like bar coding and RFID(Radio Frequency Identification) are incorporated into each package to trace the progress of a specific bag/cartoon.					
5	**Warehouse system**					
5.1	The warehouse system you have helps you to easily access stock items in the warehouse					
5.2	The storekeepers in your organization are skill enough to use information technology to do their store keeping activities.					
5.3	The inspected items that checked by superintendents immediately feed in to the information system and available to all the concerned					
5.4	The information system currently you are using do check and balance of stock items stored in the warehouse					
6	**Utilization by End user**					
6.1	The information system of the WFP is capable of checking the delivered items to the right beneficiaries					
6.2	The information system of the WFP measures the satisfaction level of beneficiaries by implementing partners					
6.3	The information system of the WFP is designed to collect, analyze any other relevant information about beneficiaries					
7	**Monitoring and Evaluation**					

7.1	The information system of the WFP entertains feedback of timely delivery of aid items from field monitor					
7.2	The information system of the WFP can confirm items delivered and received with the right condition, quantity and delivered to the right beneficiaries					
7.3	The information system of the WFP collects information from transporters, NGOs and communities, and then crosschecked against each other and the same report will be delivered to donors.					
7.4	The information system of the WFP confirms the aid items delivered to the right beneficiaries with the right amount and it ensure the continuity of the aid operation until the emergency ends.					

Part IV: Humanitarian Supply Chain Performance Measurement

Please put "√" mark on the box below that best represents your opinion. Where, 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree and 5 = Strongly Agree

No	**Humanitarian Supply Chain Performance**	Scale				
1.	**Reliability (quality)**	1	2	3	4	5
1.1	WFP's supply chain management information systems facilitate the reliability of the delivery date by WFP					
1.2	WFP's supply chain management information systems facilitate the delivery of the right quality aid items to the beneficiaries					
1.3	WFP's supply chain management information systems facilitate the provision of quality services for beneficiaries and other stakeholders					
1.4	WFP's supply chain management information system has enabled processing of accurate reports to donors and other stakeholders					
2.	**Responsiveness**	1	2	3	4	5
2.1	WFP's supply chain management information systems helped to increase timely delivery of goods to the beneficiaries					

2.2	The adoption of supply chain management information systems minimized the time to purchase, time to transport and time to deliver goods to the staging area.					
2.3	The WFP's supply chain management information systems increase the delivery date reliability					
3.	**Flexibility**	1	2	3	4	5
3.1	The supply chain management information system has the ability to change according to external conditions.					
3.2	The supply chain management information system has the ability to change the variety and quantity of goods sent to the disaster area/beneficiary.					
3.3	The supply chain management information system has the flexibility to manage the balance of prepositioned goods at the local level.					
4.	**Cooperation/Standardization**	1	2	3	4	5
4.1	The WFP's supply chain management information system is helping to build high degree of information sharing between actors belonged to the WFP and partners involved in a disaster management.					
4.2	The WFP's supply chain management information systems are helping to build high degree of cooperation between actors belonged to the organization and partners involved in a disaster management.					
4.3	The WFP's supply chain management information systems have standardized procedures used during the resolution of the disaster in a coordinated effort.					
4.4	The WFP's supply chain management information system is capable to coordinate and share information between humanitarian actors					
4.5	The WFP's supply chain management information systems are capable to coordinate and share information between stakeholders					
4.6	The WFP's supply chain management information systems are capable to strengthen customer/beneficiary integration					
4.7	The WFP's supply chain management information systems are capable to strengthen supplier integration					

Annex 2: Correlation

*Correlation Analysis for factors affecting the Humanitarian Supply Chain Practices (PC=*Pearson Correlation*)*

Correlations										
		LS	**UD**	**LI**	**CM**	**BR**	**LCR**	**LCL**	**LIT**	**HSCP**
LS	PC	1	.346**	.413**	.113	-.072	.484**	.577**	.589**	**.136**
	Sig. (2-tailed)		.003	.000	.350	.548	.000	.000	.000	**.256**
	N	72	71	72	71	72	72	72	72	**72**
UD	PC	.346**	1	.360**	.589**	.173	.407**	.398**	.282*	**.075**
	Sig. (2-tailed)	.003		.002	.000	.148	.000	.001	.017	**.536**
	N	71	71	71	70	71	71	71	71	**71**
LI	PC	.413**	.360**	1	.260*	.227	.682**	.671**	.640**	**.169**
	Sig. (2-tailed)	.000	.002		.029	.055	.000	.000	.000	**.156**
	N	72	71	72	71	72	72	72	72	**72**
CM	PC	.113	.589**	.260*	1	.488**	.378**	.241*	.381**	**-.087**
	Sig. (2-tailed)	.350	.000	.029		.000	.001	.043	.001	**.469**
	N	71	70	71	71	71	71	71	71	**71**
BR	PC	-.072	.173	.227	.488**	1	.276*	.092	.292*	**-.226**
	Sig. (2-tailed)	.548	.148	.055	.000		.019	.442	.013	**.056**
	N	72	71	72	71	72	72	72	72	**72**
LCR	PC	.484**	.407**	.682**	.378**	.276*	1	.811**	.713**	**.028**
	Sig. (2-tailed)	.000	.000	.000	.001	.019		.000	.000	**.815**
	N	72	71	72	71	72	72	72	72	**72**
LCL	PC	.577**	.398**	.671**	.241*	.092	.811**	1	.678**	**.180**
	Sig. (2-tailed)	.000	.001	.000	.043	.442	.000		.000	**.130**
	N	72	71	72	71	72	72	72	72	**72**
LIT	PC	.589**	.282*	.640**	.381**	.292*	.713**	.678**	1	**-.019**
	Sig. (2-tailed)	.000	.017	.000	.001	.013	.000	.000		**.876**
	N	72	71	72	71	72	72	72	72	**72**
HSCP	PC	.136	.075	.169	-.087	-.226	.028	.180	-.019	**1**
	Sig. (2-tailed)	.256	.536	.156	.469	.056	.815	.130	.876	
	N	72	71	72	71	72	72	72	72	**72**

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Source: Own Computation June, 2020

Correlation Analysis for the role of the supply chain information system on humanitarian supply chain performance

Correlations									
		P	**BF**	**S**	**LD**	**WS**	**UE**	**ME**	**PHSC**
P	Pearson Correlation	1	.394**	.512**	.330**	.361**	.513**	.435**	**.560****
	Sig. (2-tailed)		.001	.000	.005	.002	.000	.000	**.000**
	N	72	72	72	72	71	71	71	**71**
BF	Pearson Correlation	.394**	1	.505**	.349**	.433**	.344**	.455**	**.493****
	Sig. (2-tailed)	.001		.000	.003	.000	.003	.000	**.000**
	N	72	72	72	72	71	71	71	**71**
S	Pearson Correlation	.512**	.505**	1	.450**	.437**	.552**	.507**	**.637****
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000	**.000**
	N	72	72	72	72	71	71	71	**71**
LD	Pearson Correlation	.330**	.349**	.450**	1	.398**	.473**	.420**	**.466****
	Sig. (2-tailed)	.005	.003	.000		.001	.000	.000	**.000**
	N	72	72	72	72	71	71	71	**71**
WS	Pearson Correlation	.361**	.433**	.437**	.398**	1	.477**	.649**	**.720****
	Sig. (2-tailed)	.002	.000	.000	.001		.000	.000	**.000**
	N	71	71	71	71	71	71	71	**71**
UE	Pearson Correlation	.513**	.344**	.552**	.473**	.477**	1	.658**	**.611****
	Sig. (2-tailed)	.000	.003	.000	.000	.000		.000	**.000**
	N	71	71	71	71	71	71	71	**71**
ME	Pearson Correlation	.435**	.455**	.507**	.420**	.649**	.658**	1	**.699****
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000		**.000**
	N	71	71	71	71	71	71	71	**71**
PHSC	Pearson Correlation	.560**	.493**	.637**	.466**	.720**	.611**	.699**	**1**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	
	N	71	71	71	71	71	71	71	**71**
**. Correlation is significant at the 0.01 level (2-tailed).									

Source: Own Computation June, 2020

Where,

Variables Name	Short hand
Lack of Standardization process	LS
Unpredictable demand	UD
Lack of infrastructure	LI
Complex performance measurement systems	CM
Broad Range of Actors	BR
Lack of Coordination	LCR
Lack of Collaboration / cooperation	LCL
Limitation of Information Technology	LIT
Planning	P
Budgeting and Forecasting	BF
Sourcing	S
Logistics and Delivery	LD
Warehouse system	WS
Utilization by End user	UE
Monitoring and Evaluation	ME
Humanitarian Supply Chain Practices	HSCP
Performance Humanitarian Supply Chain	PHSC

Annex 3: Test of Normality

	Skewness		Kurtosis	
		Std. Error		Std. Error
Lack of standardized procedures negatively affects in adopting Humanitarian Supply Chain Information System which ultimately decreases the flexibility of WFP's humanitarian operation	-1.412	.285	1.979	.563
Lack of standardized procedures negatively affects in adopting Humanitarian Supply Chain Information System, which ultimately affects the timely delivery of humanitarian aid items to the beneficiaries and implementing partners	-1.305	.283	1.451	.559
Lack of standardized procedures negatively affects in adopting Humanitarian Supply Chain Information System which ultimately creates a communication gap among and between humanitarian partners	-1.226	.285	1.061	.563

Lack of standardized procedures negatively affects in adopting Humanitarian Supply Chain Information System which ultimately creates a challenge in delivering humanitarian aid with short lead times	-1.394	.287	1.608	.566
The existence of sudden change of relief aid (in quantity and variety) negatively affects in adopting Humanitarian Supply Chain Information System which ultimately contribute to the untimely delivery of aid item to the beneficiaries	-.631	.287	-.606	.566
The existence of sudden request of goods negatively affects in adopting Humanitarian Supply Chain Information System, which ultimately decreases the reliability of the WFP delivery capability	-.313	.285	-.892	.563
The existence of unpredictable nature of humanitarian operation negatively affects in adopting Humanitarian supply chain information systems which ultimately weakens the cooperation and coordination of activities among partners and stakeholders	-.891	.285	.215	.563
The existence of uncertain demand negatively affects in adopting Humanitarian supply chain information systems which ultimately reduces the flexibility of partners and stakeholders	-.742	.285	-.252	.563
Lack of infrastructure negatively affects the adoption of Humanitarian supply chain information systems which negatively affects the reliability and reputation of WFP	-1.080	.285	.943	.563
Lack of technological infrastructure negatively affects the adoption of Humanitarian supply chain information systems which ultimately weakens the coordination and collaboration performance among partners	-1.115	.283	.929	.559
Lack of infrastructure negatively affects the adoption of Humanitarian supply chain information systems which ultimately decreases the flexibility of delivering humanitarian aid to the beneficiaries	-1.119	.283	2.444	.559
Unavailability of communication infrastructure negatively affects the adoption of Humanitarian supply chain information systems, which ultimately affects the responsiveness of the humanitarian operation.	-1.477	.283	2.942	.559

The complex performance measurement system of the WFP negatively affects the adoption of Humanitarian supply chain information systems, which negatively affects the coordination and collaboration among partners and stakeholders	-.012	.285	-.804	.563
The complex performance measurement systems of the WFP negatively affect the adoption of Humanitarian supply chain information systems, which affect the delivery of goods to the beneficiaries	.021	.287	-1.125	.566
The complex performance measurement system WFP negatively affects the adoption of Humanitarian supply chain information systems, which negatively affects the flexibility of the humanitarian operation	.106	.289	-1.226	.570
The complex performance measurement system of the WFP negatively affects the adoption of Humanitarian supply chain information systems, which weakens the timely response of aid by WFP to the beneficiaries	.000	.287	-1.250	.566
Working together with many stakeholders negatively affects the adoption of Humanitarian supply chain information systems which ultimately impairs the timely response of aid items by WFP	.450	.285	-.826	.563
The availability of different partners and stakeholders in the humanitarian operation negatively affects the adoption of Humanitarian supply chain information systems, which ultimately decreases the delivery of the right quality aid items at the right time	.676	.285	-.494	.563
The broad range of stakeholders in the humanitarian operation negatively affects the adoption of Humanitarian supply chain information systems, which ultimately decreases ability to change the operation according to external conditions.	.125	.287	-1.304	.566
Working together with many actors or stakeholders negatively affects the adoption of Humanitarian supply chain information systems, which ultimately becomes an obstacle towards the effort of developing the standardization of humanitarian procedures	.356	.287	-.919	.566
The existence of insufficient coordination due to the high number of stakeholders negatively affects the adoption of Humanitarian supply chain information	-.750	.283	-.401	.559

systems, which ultimately decreases the responsiveness of the humanitarian operation by WFP				
Lack of coordination among stakeholders negatively affects the adoption of Humanitarian supply chain information systems, which ultimately affects the timely delivery of aid item to the beneficiaries	-1.454	.285	3.041	.563
The availability of different working procedures between stakeholders and partners office negatively affects the adoption of Humanitarian supply chain information systems, which ultimately becomes a challenge for WFP to coordinate its supplies and human	-.753	.285	-.034	.563
Lack of coordination among stakeholders negatively affects the adoption of Humanitarian supply chain information systems, which ultimately becomes an obstacle in implementing the best quality information systems	-1.422	.283	3.002	.559
Lack of cooperation among stakeholders in WFP negatively affects the adoption of Humanitarian supply chain information systems, which ultimately decreases the WFP's response to beneficiaries	-1.060	.285	.989	.563
Lack of cooperation among partners negatively affects the adoption of Humanitarian supply chain information systems, which ultimately becomes an obstacle for timely delivering quality humanitarian relief items to the beneficiaries	-1.360	.283	2.382	.559
Lack of cooperation among partners and stakeholders negatively affects the adoption of Humanitarian supply chain information systems, which ultimately affects sharing information, assets and equipment among partners	-1.096	.289	1.343	.570
Lack of cooperation among stakeholders negatively affects the adoption of Humanitarian supply chain information systems, which ultimately affects the adaptability to the changing conditions of the humanitarian operation	-1.055	.283	1.591	.559
Weak integrated information system negatively affects the adoption of Humanitarian supply chain	-1.333	.283	1.610	.559

information systems, which ultimately affect the different procedures among partners				
Method of coordinating procedures is quite complicated due to inconsistencies of information systems within humanitarian partners	-.552	.285	-.257	.563
Limited access to information technology negatively affects the adoption of Humanitarian supply chain information systems, which ultimately affects the delivery of goods to the beneficiaries by WFP	-1.292	.287	1.784	.566
Unavailability of information technology negatively affects the adoption of Humanitarian supply chain information systems, which ultimately weakens the coordination and collaboration of partners and stakeholders by WFP	-1.346	.287	2.041	.566
The WFP is using a supply chain information system for planning and identifying the number of beneficiaries.	-1.109	.285	1.377	.563
The WFP is using supply chain information system for conducting need assessments	-.948	.283	.654	.559
The WFP employees are familiar of working with supply chain information system with the required skill and knowledge	-.998	.283	1.833	.559
The WFP is adopting supply chain information system as the organization believed to strengthen the organization's planning capability	.017	.285	-.601	.563
The implementation of information system helps the organization to plan and forecast the necessary budget amount at the beginning of any emergency operation	.086	.283	-.522	.559
The information system that your organization using capable of handling change in funding amount due to different external situation	-.389	.287	.812	.566
The information system that the WFP using ensures accountability to donors and the public in general	-.358	.285	-.659	.563
The implementation of information system at the WFP facilitates for ordering and purchasing of the necessary relief items such as food aid items from the suppliers	-.379	.285	.093	.563
The information system of WFP can compare the price of items from different suppliers	-.260	.285	.047	.563

The WFP's country office can choose the winning supplier for procuring items from the existing database of the organization	-.256	.283	-.104	.559
The supply chain information system helps WFP to track and trace the items while on their way to their destination	-1.246	.283	3.409	.559
The WFP uses a GPS system on each contracted and dedicated WFP truck in order to identify the whereabouts of each truck	-.127	.285	-1.104	.563
The supply chain information technology and systems like barcoding and RFID (Radio Frequency Identification) are incorporated into each package to trace the progress of a specific bag/cartoon.	-.308	.287	-.636	.566
The warehouse system you have helps you to easily access stock items in the warehouse	-1.204	.289	1.956	.570
The storekeepers in your organization are skilled enough to use information technology to do their store keeping activities.	-1.303	.287	3.431	.566
The inspected items that checked by superintendents immediately feed in to the information system and available to all the concerned	-.804	.285	.701	.563
The information system currently you are using do check and balance of stock items stored in the warehouse	.001	.285	-.910	.563
The information system of the WFP is capable of checking the delivered items to the right beneficiaries	-1.109	.285	1.377	.563
The information system of the WFP measures the satisfaction level of beneficiaries by implementing partners	-.234	.285	-.837	.563
The information system of the WFP is designed to collect, analyze any other relevant information about beneficiaries	-.569	.287	-.322	.566
The information system of the WFP entertains feedback of timely delivery of aid items from field monitor	-.774	.289	.624	.570
The information system of the WFP can confirm items delivered and received with the right condition, quantity and delivered to the right beneficiaries	-1.097	.289	2.285	.570

The information system of the WFP collects information from transporters, NGOs and communities, and then cross checks against each other and the same report will be delivered to donors.	-.593	.287	-.347	.566
The information system of the WFP confirms the aid items delivered to the right beneficiaries with the right amount and it ensures the continuity of the aid operation until the emergency ends.	-.828	.285	.622	.563
WFP's supply chain management information systems facilitate the reliability of the delivery date by WFP	-1.115	.287	2.601	.566
WFP's supply chain management information systems facilitate the delivery of the right quality aid items to the beneficiaries	-.988	.287	1.290	.566
WFP's supply chain management information systems facilitate the provision of quality services for beneficiaries and other stakeholders	-.919	.287	1.152	.566
WFP's supply chain management information system has enabled processing of accurate reports to donors and other stakeholders	-.818	.285	1.457	.563
WFP's supply chain management information systems helped to increase timely delivery of goods to the beneficiaries	-1.225	.285	2.231	.563
The adoption of supply chain management information systems minimized the time to purchase, time to transport and time to deliver goods to the distribution area.	-.562	.285	-.146	.563
The WFP's supply chain management information systems increase the delivery date reliability	-.521	.285	.159	.563
The supply chain management information system has the ability to change according to external conditions.	-.252	.285	-.059	.563
The supply chain management information system has the ability to change the variety and quantity of goods sent to the disaster area/beneficiary.	-.643	.285	-.067	.563
The supply chain management information system has the flexibility to manage the balance of prepositioned goods at the local level.	-.805	.287	.129	.566
The WFP's supply chain management information system is helping to build a high degree of information	-.528	.289	.833	.570

sharing between actors belonging to the WFP and partners involved in disaster management.				
The WFP's supply chain management information systems are helping to build a high degree of cooperation between actors belonging to the organization and partners involved in disaster management.	-.355	.285	.271	.563
The WFP's supply chain management information systems have standardized procedures used during the resolution of the disaster in a coordinated effort.	-.373	.285	.568	.563
The WFP's supply chain management information system is capable to coordinate and share information between humanitarian actors	-.443	.285	1.146	.563
The WFP's supply chain management information systems are capable to coordinate and share information between stakeholders	-.602	.285	1.022	.563
The WFP's supply chain management information systems are capable to strengthen customer/beneficiary integration	-.784	.287	1.138	.566
The WFP's supply chain management information systems are capable to strengthen supplier integration	-.639	.285	.582	.563

Source: Own Computation June, 2020