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**FLEET MANAGEMENT PRACTICE AND ITS IMPLICATION FOR FLEET
PERFORMANCE IN ETHIOPIAN PHARMACEUTICAL SUPPLY
AGENCY**

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Abstract

Fleet Management Practice and its Implication for Fleet Performance in Ethiopian Pharmaceutical Supply Agency

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Fleet management is a component of transportation management that gives due concerns to the work of vehicles in the supply chain management pipeline. The general objective of this study is to assess the fleet management practice, its implication for fleet performance, and associated challenges of the Ethiopian pharmaceutical supply agency. Institution based descriptive and explanatory cross-sectional study designs were employed in this study. Sampling was done purposively both for the agency's branch selection and study participant selection. Data collection and analysis was accomplished with mixed quantitative & qualitative research approaches, and document review. The relationship and predictability between the dependent and independent variables were determined with Spearman correlation and ordinal logistic regression analysis methods. Qualitative data were analyzed using thematic analysis technique. The descriptive findings reveal that vehicle routing & tracking (Mean=3.59) is the most practiced fleet activity. The correlation and regression analysis show that maintenance & repair ($\rho=0.559$, $p=.000$), fuel ($\rho=0.458$, $p=.000$), and routing & tracking management ($\rho=0.421$, $p=.000$) have a significant association and predictive power for the fleet performance of the agency. The qualitative findings shows that delay of vehicle maintenance & repair due to the absence of spares was the major challenge for the agency. Though there is significant and positive association between all fleet practices and fleet performance, driver management do not significantly predict fleet performance of the agency. The researcher recommends that EPSA higher officials need to build well-organized workshop and give more concern for fuel, tracking and maintenance activities.

Key Words: *Fleet management practice, Fleet management challenges, Fleet performance.*

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Abbreviations/Acronyms

3-PL	Third - Party Logisticians
AAU	Addis Ababa University
ADAS	Advanced Driver Assistance System
AFMS	Automatic Fuel Management System
Auto-ID	Automatic Identification
CRM	Customer Relationship Management
DFM	Distribution and Fleet Management
EC	Ethiopian Calendar
EFDA	Ethiopian Food and Drug Administration
EPSA	Ethiopian Pharmaceutical Supply Agency
ETB	Ethiopian Birr
FM	Fleet Management
FMOH	Federal Ministry of Health
GIS	Geographic Information System
GPS	Global Positioning System
GS	General Service
HCs	Health Commodities
HCMIS	Health Commodities Management Information System
ICT	Information Communication Technology
IPLS	Integrated Pharmaceuticals Logistics System
KPIs	Key Performance Indicators
OBSMS	On-Board Safety Monitoring Systems
OLR	Ordinal Logistic Regression
PFSA	Pharmaceutical Fund and Supply Agency
PHARMED	Pharmaceutical and Medical Supplies Importer and Wholesale Distributor
PSLD	Pharmaceutical Supply and Logistics Department
PSTP	Pharmaceuticals Supply Transformation Plan
RDF	Revolving Drug Fund
RFID	Radio Frequency Identification
SCM	Supply Chain Management
SOPs	Standard Operating Procedures
UNDP	United Nations Development Program
USAID	United States Aid

Chapter One

1 Introduction

This chapter includes the background of the study, statement of the problem, research questions, research objective, significance, and scope of the study.

1.1 Background of the Study

The integration of two or more logistical systems within a network to produce value, efficiency, and customer satisfaction is known as supply chain management (SCM). Logistics is a component of SCM that regulates the movement and storage of products and services from point of origin to point of consumption. The logistics cycle is an important aspect of the field involving product selection, quantification, procurement, storage & distribution, and serving customers. Transportation management is one component of the logistics cycle that involves the ability to transport goods quickly, safely, economically, and reliably (Debela, 2013).

Transportation management includes commercial motor vehicles such as cars, ships, vans, and trucks, as well as rail cars (Ayoma, 2013). It also ensures vehicle efficiency, safety, cost-effectiveness, prevention of vehicle misuse, protecting natural resources, improving public health, strengthening energy security, training of drivers, and insurance of vehicle security. Fleet Management (FM) is a component of transportation management that gives due concerns to the work of vehicles in the SCM pipeline. A well-performing FM system in logistics activities may provide attributes like; better logistics efficiency, reduced operation cost, and promote service quality (Debela, 2013).

In the health care settings of Ethiopia, policymakers and administrators give priority to other components of logistics rather efficient and responsive health service depends on always having medicines available when and where they are needed. This can be true when there is proper transport of HCs which contributes nearly a third of the operating cost of a supply chain pipeline (Hugos, 2011). Ideally; better-performing FM should ensure reliability, safety, effectiveness, accountability, timeliness, affordability, and sustainability but FM is a difficult task to plan and manage. Allocation, scheduling, routing, use, and driver management represent large share of FM expenses showing that the sector should be given due concern by administrators (Kunz *et al.*, 2015).

Several activities are involved in the FM of a certain organization. The major activities include maintenance & repair management, fuel management, vehicle routing & tracking management, driver management, and overall vehicle lifecycle management. However, giving attention to a single type of FM activity could result in a false generalization of the performance of a certain institution. The establishment of effective administration of FM program can have a positive impact on the effectiveness and efficiency in fleet operation and must be a priority for organizations (Martinez and Wassenhove, 2012).

A study done by Mare (2016) assessed the determinant factors affecting FM of EPSA and how those factors influence the service delivery of EPSA however the present study had gone further and sought to analyze the FM practice and performance of EPSA with their predictability power to one another. Weak vehicle spare part management, fuel monitoring system, tracking technologies, and driver monitoring systems are challenges encountered by most organizations around the globe. These issues are believed to have significant impact on effectiveness and efficiency of an organization (Ampiah, 2018). The key instruments for improving the responsiveness, efficiency and effectiveness of organization and services are practice, performance, and challenge assessment. Furthermore, performance measurement with the use of key performance indicators (KPIs) can enhance the FM planning, programming, and budgeting process (Kaare *et al.*, 2012).

1.2 Statement of the Problem

Transportation is the second-largest cost to humanitarian organizations after personnel. International Humanitarian Organizations fight routinely to improve the persistence of aging fleets, lack of spare parts, excessive fleet sizes, low fleet standardization, and excessive service delays (Martinez and Wassenhove, 2012). The truck fleet in Ethiopia is old, inadequate as compared to modern standards, slow to load and unload, and expensive to operate (UNDP, 2017).

The study by Alemu (2019) on EPSA, Addis Ababa branch indicated that there is no accurate schedule for distribution of pharmaceuticals to health facilities. The majority of the deliverer and store managers did not believe that the vehicles available to transport pharmaceuticals are enough because vehicles stay longer during maintenance and there is poor implementation of controlling mechanisms like global positioning system (GPS). When vehicles enter maintenance they took at least more than a month. As a result, the cost incurred elevates highly which ends up in insufficient service provisions for health facilities. It is estimated that 30 % of vehicle days are currently unused by EPSA (EPSA, 2015, 2018).

These days; public organizations face poor timing of vehicle maintenance, huge expenses for the fleet, lack of vehicle spare parts, and a shortage of vehicles serving the branches and health facilities (EPSA, 2015; Teketel, 2017). The number of health facilities is increasing from time to time which threatens the on-time delivery of HCs to the hubs and health facilities. The delivery time of HCs to EPSA hubs and health facilities is very crucial to maintain the aim of the agency. According to EPSA's six months' report of the year 2019, nine days are required to dispatch pharmaceuticals from EPSA head office to the branches including all the procedures from the request up to dispatch. On the contrary, two days on average was planned to be the goal of distribution to the hubs. (EPSA, 2019a).

The ultimate consequences of a previously mentioned transportation problems are delay (EPSA, 2018; Monnerat, Dias, and João, 2019), frequent stock out (Mudzteba, 2014) of HCs, and inefficient services. An efficient FM can reduce and minimize overall costs by using available resources effectively. Large number of vehicles stay in the garage for extended period of time due to shortage of spare parts and the limited working capacity of the internal general service (GS) providers. Maintenance & repair are provided jointly with the internal and third-party logisticians (3-PL). However, 3-PL does not give the services with the intended time period as a result delay of services is common (Mare, 2016). These identified gaps can be considered as primary reasons to conduct this research.

1.3 Research Questions

This study addresses the following research questions:

- I. What is the fleet management practice of EPSA in terms of fleet management activities?
- II. What is the fleet management performance of EPSA evaluated in terms of fleet management KPIs?
- III. To what extent the dimension of fleet management practices influences the fleet performance of EPSA?
- IV. What are the challenges of fleet management practices and performance of EPSA?

1.4 Research Objectives

1.4.1 General objective

The general objective of the study is to assess the fleet management practice, and its implication for fleet performance in Ethiopian pharmaceutical supply agency.

1.4.2 Specific Objectives

The specific objectives of the study were:

- To assess the fleet management practices of EPSA in terms of fleet management activities.
- To evaluate the fleet performance of EPSA in terms of fleet management KPIs.
- To determine implications of the dimensions of fleet management practices for the fleet performance of EPSA.
- To identify the challenges of fleet management practices and performance of EPSA.

1.5 Significance of the study

There are few studies conducted on FM (Mare, 2016) and this study would be motivational and contributory for researchers of the area. Most importantly, EPSA directorates could use the findings of the study for further service improvements. The finding of the study would figure out the FM practice, performance, associations between fleet practice and performance, and FM challenges of EPSA. Moreover, government policymakers would benefit from the outcome of the research since it could assist them in considering the current policies towards the FM situations of public health sectors.

1.6 Scope of the study

The study covers the head office of EPSA and the selected branches in Ethiopia. During the FM performance measurement of EPSA, the mode of transport that has been taken for the study was road transport and the transport mechanisms include vehicles used to distribute HCs from EPSA's head office to branches and health facilities (outbound flow). All transportation management KPIs were not included for performance measurement only those related to responsiveness, effectiveness, and efficiency of FM were included. Hence, FM KPIs that were involved in the study include average delivery time, percentage vehicle downtime, percentage of delivery vehicle availed, and total fleet operating costs. Eventually, the findings of the study could be generalized to EPSA as a public serving institution.

1.7 Organization of the Study

The study is organized with five chapters. The first chapter highlights introduction which included background of the study, statement of the problem, research questions, research objectives, significance and scope of the study, and operational definitions. The second chapter outlines related literature review organized as theoretical literature, empirical literature and conceptual frame work. The third chapter involves methodology of the study organized as description of the study setting, study design and approach, eligibility criteria, sampling techniques and procedure, data collection methods and instrument, data sources, variables of the study, data quality assurance, data entry and analysis, reliability and validity, ethical consideration, and dissemination plan. The fourth chapter involves a detailed presentation of results, and discussion. Finally, the fifth chapter highlights summary, conclusion, recommendations based on the study findings, and limitations of the study.

1.8 Operational Definitions

- **Fleet management:** is an administrative function that coordinates the operations of vehicles to guarantee efficiency, effectiveness, responsiveness, and compliance towards government requirements.
- **Fleet management practice:** is the repetition of fleet activities (i.e., vehicle maintenance, fuel, tracking and driver coaching) to help improve the performance of an organization.
- **Fleet management performance:** is the measurement of a firm's fleet performance against a predefined target using indicators of responsiveness, effectiveness, efficiency, and regulatory compliance.

Chapter Two

2 Related Literature Review

This chapter consists of literature reviews organized as theoretical reviews, empirical reviews, and conceptual frameworks. It gives an insight about FM definitions, activities, and challenges. On the other hand, FM practices and the performance measuring KPIs are also explored.

2.1 Theoretical Literature Review

2.1.1 Fleet Management Concepts

FM is an administrative function that coordinates the operations of vehicles to guarantee efficiency, effectiveness, responsiveness, and compliance with government requirements. Vehicle finance, vehicle maintenance, vehicle telematics (tracking and diagnostic), driver management, and fuel management are all part of FM. It is also concerned with all areas of vehicle acquisition, disposal, maintenance, training, operation, safety, scheduling, and inventory issues that arise when an organization maintains a fleet of vehicles (Hamzi *et al.*, 2013).

FM majorly involves minimization of risks associated with vehicle investment, improving efficiency, enhancing productivity, and reduction of overall transportation costs. Vehicle FM takes good care of the organization's vehicle assets which include light vehicles, heavy vehicles, and motor vehicles (Giathi and Karanja, 2016). Generally speaking, FM comprises histories of vehicles starting from vehicle procurement up to disposal or replacement majorly mileage, fuel consumption, and spare part management (Begashaw, 2018).

A good fleet manager should know how to run fleet operations which include: analyzing staff, organizational structures, and business practices; developing programs on vehicle disposal and replacement, parts management, and fuel management; evaluating green initiatives and be open to cost-effective innovations; preventive maintenance and mechanic certification; considering factors such as fuel economy, life cycle costs and improved productivity (Rollins, 2012).

2.1.2 Fleet Management Practices

FM practice is made up of a number of tasks that are all connected in some way. These include repair & maintenance management, fuel management, vehicle routing & tracking management, and driver management. Most of the FM solutions of fleet companies focus on vehicle location tracking, however, the rest of the activities should be given equal concern because of the increased interest in those factors. Fleet systems have been used to deliver very fundamental services like

planning and scheduling, as well as more sophisticated duties in the most effective and efficient way feasible. These technologies are designed to eliminate, alleviate, and control difficulties that fleet firms experience. Fleet companies are initiated to seek new solutions because of exaggerated expenses (Alsobhi, 2018).

2.1.2.1 Vehicle Life Cycle Management

The vehicle life cycle includes all the time of the vehicle starting from vehicle acquisition to disposal. At a national level, vehicle acquisitions or procurements do not have formalized procedure of how long the process could take and enough data about the vehicle to be acquired. Overall, fleet operations lack KPIs and tracking information for key steps in the acquisition process (Luna *et al.*, 2018).

Vehicle disposal and replacement are related to the end of the vehicle life cycle. The replacement policy of vehicles relies on age, mileage, repair limit and even extends to total vehicle failure. There are several disposal methods available which include private sale, auction, and the employment of disposal services. The disposal procedure should be governed by two goals: minimizing administrative expenses and increasing vehicle residual values. There is no nationwide vehicle replacement policy (Martinez and Wassenhove, 2012).

2.1.2.2 Vehicle Maintenance and Repair Management

Maintenance & repair are differentiated based on the timing of interventions during malfunctions of vehicles. Maintenance is a scheduled preventative measure taken before a vehicle fails to work whereas repair is an unplanned measure that takes place after the vehicle malfunctions occur. Maintenance & repair involve the issue of an oil change, routine servicing, maintenance schedules, and majorly spare part management (Badkook, 2016). Maintenance saves an organization from operational interruptions due to vehicle failures, and also could save money incurred as a consequence of total vehicle failure (Torrey and Murray, 2014).

Maintenance strategies could be divided into three based on the timing of interventions given for vehicles. Proactive maintenance involves predictive and preventive maintenance measures. Reactive (corrective) maintenance involves waiting for a vehicle until total failure occurs. Aggressive maintenance involves improving the design of the existing and new equipment to increase availability and efficiency as well as reducing maintenance costs and time (Amirah *et al.*, 2014; Eruguz, Tan and Houtum, 2015). In general, criteria for replacement of old vehicles should comprise age, mileage, annual maintenance cost, and use of vehicles. Concerning vehicle

replacement, it is identified that older vehicles require more frequent and costly maintenance than newer vehicles (Rollins, 2012).

Maintaining correct tire pressures are very important for several reasons: fuel economy, tire life, and safety. Drivers, on the other hand, should perform daily or weekly physical vehicle checks to verify that concerns such as low tire pressure or malfunctioning lights are not present. Between regular maintenance, worsening performance can be detected by monitoring fuel economy, allowing any necessary remedial action to be implemented before the next scheduled service. Poor vehicle maintenance can endanger vehicle safety and raise the likelihood of an accident. Effective and efficient fleet maintenance management highly reduces costs associated with vehicle maintenances and also facilitates the timely deliveries of commodities (Momec *et al.*, 2012).

2.1.2.3 Vehicle Fuel Management

These days, fuel management is given due attention since it has a significant role in the economy and sustainability of the entire supply chain. Fuel management relates to fuel sourcing, fuel monitoring, fuel use, and mileage where the success of the FM depends on. Fuel inefficiency may occur due to bad driving, poor maintenance, theft, and engine problems (Martinez and Wassenhove, 2012). From the overall vehicle life cycle, 20-30% of costs are attributed to fuel management issues. Fuel cost savings of 10% or more are common in fleets that have adopted fuel efficiency initiatives. Different technological inventions helped fleet managers to lower their energy consumption and researchers across the world marked their contributions for such advances (Carpatorea, 2017; Alsobhi, 2018).

Fuel Management Systems (FMS) are systems that monitor a specific organization's transportation fuel use. Manual monitoring systems are difficult for 90% of people and not accurate to calculate and analyze fuel consumption rate which could lead to huge financial losses of an organization. These days, Automatic Fuel Management System (AFMS) are used which are electronic systems mounted on vehicle tankers for measurement and monitoring of fuel volume. Additionally, GPS and Geographic Information System (GIS), for example, monitor the quantity of fuel released when placed into a tank, as well as when fuel is stolen or leaked, and then send that measured data for analysis and further statistics (Komal *et al.*, 2018).

Fuel efficiency and safety are highly linked and many of the techniques for improving both are similar: regulating speed (mainly 90km/h), predicting the scenario ahead, minimizing aggressive driving, monitoring tire pressures, vehicle maintenance, and decreasing the quantity of trip.

Driving more fuel efficiently can also help to prevent road pollution by reducing tire and brake wear. The difference in fuel consumption between a competent driver and a poor driver can be up to 35%. Variations in road speed, gear selection, accelerator and brake use, and the amount of time the driver leaves the car idling account for the majority of the disparity. Poorly tuned engines can consume up to 50% more gasoline than well-tuned engines. Additionally, air filter clogging can increase fuel consumption by up to 10% (Baas, 2012).

2.1.2.4 Vehicle Routing and Tracking Management

Routing & tracking are very important tasks for a company to ensure operational efficiency while minimizing overall cost most importantly in humanitarian relief operations (Huang *et al.*, 2012). Although several solutions involving the use of different algorithms have been developed, planning and routing remain a trial for any fleet company since they are difficult tasks to perform properly (Alsobhi, 2018). FM of a certain company involves generating methods to manage the fleet operation through control of the different variables involved in the process. For instance, vehicle tracking has a major objective of relating product location with other variables related to the performance of the assets and the professional staff involved. On the market, there are a number of FM software solutions. The primary objective of any FM software system are to offer information to increase efficiency, minimize downtime and in-service breakdowns, reduce inventory, cut ownership costs, and eliminate waste (Rollins, 2012).

In the modern world, various technologies are used to track and trace the movement of goods. This consists of Automatic Identification (Auto-ID), GPS, GIS, Radio Frequency Identification (RFID), and Electronic Data Interchange (EDI). The most widely used technologies of recent times are RFID which gives information about the safe transit of goods obtained through radio frequency and GPS which helps to track the whereabouts of the vehicle, minimizes overall costs, and mitigates vehicle theft issues (Jalba *et al.*, 2010).

These days, a real-time monitoring system is being necessary for companies' FM operations and installed on vehicles to achieve high utilization and rapid responses to customer needs. This technology needed to support real-time logistics requires mobile communication, GPS, and GIS, combined with information systems (Vivaldini *et al.*, 2012). The real-time data that will be generated from GPS involves mileage, location, fuel consumption, driving speeds, route selection, maintenance, repair time control, and weight control. Therefore, GPS implementation is currently part of the strategic plan in EPSA (EPSA, 2015).

2.1.2.5 Driver Management

One of the most crucial actors in FM are drivers where the efficient and effective fleet performance largely depends. Driver management involves careful driver hiring processes, formal reward systems, vehicle inspection and maintenance training, supervision, and planning. Drivers involve in the last step of the supply pipeline but the safety of HCs (i.e., especially vaccines) to be delivered relies majorly on type of cares taken by drivers (Sekar *et al.*, 2014).

Important ways to enhance driver performance in terms of behavior and education include: strengthening driver recruiting procedures, including the use of pre-employment external examinations, educating, and coaching drivers about vehicle standards and visual inspections, and compiling monthly feedback reports on individual driver performance. Concerning vehicles: drivers should enhance their understanding of optimum speed, fuel economy, and appropriate driving tactics when it comes to vehicles. Related to driver rewards: individuals' safety behavior, customer service, the extent of fuel use, honest reporting, and incident rates should be used to determine the degree of incentives for drivers. There should also be punishment measures for bad driving, speed, and accidents (Baas, 2012).

Road safety consisted of the use of preliminary measures taken by drivers and passengers to avoid accidents. The most important road safety measures include the mandatory use of safety belts, only 8 hours of driving per day, driving only during daylight time, and taking intervals every 4 hours. In the modern world, very tight systems are being invented to improve the driver safety problem but behavior-related issues are the number one challenges yet not resolved (Sekar *et al.*, 2014). As a result, numerous scholars have been working hard to develop answers to this problem. Integration of Advanced Driver Assistance Systems (ADAS) with On-Board Safety Monitoring Systems (OBSMS) is a popular approach of boosting fleet safety (Alsobhi, 2018).

2.1.3 Fleet Management Performance

FM performance refers to the process of quantifying responsiveness, efficiency, and effectiveness of actions. The benefit of quantifying activities is to reduce cost, improve timely and effective service delivery (Kunz *et al.*, 2015). Measurement is the initiative that results in control and eventually to improvement. Generally, transport activities can be measured in three major ways namely traffic, mobility, and accessibility (Litman, 2006). Computer-generated FM systems were developed as a performance measuring tool that could help to monitor, control, and improve everyday operations and work towards long-term goals. However, measuring FM performance is a very difficult task for organizations due to difficulty to obtain accurate data, limited information

technology, exhaustive nature of the task, and limited motivation of professionals. However, FM remains the primary contributing activity for larger expenses of organizations (Yang, 2013).

Information about fuel, accidents, maintenance, insurance, kilometers driven, and cost per kilometer are KPIs of vehicle performance which can be found in drivers' logbook (Martinez, Stapleton and Wassenhove, 2010). However, driver's logbooks and other necessary documents are not properly filled in EPSA which makes the performance assessment difficult. FM performance of EPSA can be better explained with KPIs which can be categorized with responsiveness, effectiveness, and efficiency dimensions.

Responsiveness involves the timely accomplishment of tasks to fulfill organizational goals. Effectiveness refers to the extent to which a firm's requirements are met, while efficiency is a measure of how economically the firm's resources are utilized. Responsiveness KPIs include average delivery time and percentage vehicle downtime while effectiveness KPI encompasses the percentage of delivery vehicles availed whereas efficiency KPI encompasses total FM operating cost (USAID | Deliver Project, 2010a; EPSA, 2019b).

Average delivery time is defined as the average time it takes to deliver an order to EPSA hubs and facilities. Monitoring average transit times for a specific region, route, or facility can help managers improve response time with efficiency and reduce wastage. Generally, the value for this indicator depends on route selection and distance traveled hence it is difficult to set a target value (EPSA, 2019b).

Vehicle downtime is the period during which a vehicle was not ready for operational activities due to the vehicle being serviced or other operational issues including maintenance. This indicator helps to improve the FM by identifying reasons for downtime thereby keeps vehicles on proper utilization. The target value for the percentage of vehicle downtime of vehicles in EPSA is 14 % (EPSA, 2019a). According to the survey done in the Adama EPSA branch, the vehicle downtime due to maintenance and servicing is about 18% in the 12-week sample taken which is a bit higher than the target value (EPSA, 2015).

Percentage of delivery vehicles availed refers to the percentage of vehicles availed based on agreed time as per the specified vehicle for distribution. This indicator helps to fulfill vehicle demand for the timely and efficient distribution of HCs. For EPSA, 95-100 % of vehicles should be availed to say the fleet is performing well (EPSA, 2019a, 2019b).

Total FM operating cost refers to the sum of all fleet costs during a specified period including fuel, tires, driver cost, maintenance, and acquiring & staffing a fleet if outsourced. Calculating overall fleet operating costs can help managers monitor these costs overtime to follow trends and to make budgetary and operational decisions about delivery schedules, use of vehicles, routing, and outsourcing (USAID | Deliver Project, 2010a). Fuel purchase and depreciation costs of vehicles contribute to the major expenses and complexity (Lejda and Zielińska, 2013).

Table 2.1: FM KPIs developed from (USAID | Deliver Project, 2010a) & (EPSA, 2019b)

Categories	KPIs	Description
Responsiveness	Average delivery time	Sum of the total number of hours/days spent to deliver the assigned hubs/facility orders from dispatch to receipt at destination ÷ Total number of hub/facility order delivered.
	Percentage vehicle downtime	Number of days a vehicle was not ready for operational activities ÷ Total number of days in the review period.
Effectiveness	Percentage of delivery vehicle availed	Number of delivery vehicles availed on time based on agreed schedule ÷ Total number of delivery vehicles requested as per agreed schedule.
Efficiency	Total fleet operating cost	Sum of all fleet operating costs during a specified period including outbound transport: fuel, per diem, maintenance, outsourcing (rent) and labor cost.

2.2 Empirical Literature Review

2.2.1 Fleet Management Practice

Mare (2016) did a study on FM practices of EPSA and found that routine servicing, fleet administration & costing, and dispatching are some of the most important determinant factors of FM on service delivery and should be given priority by the agency. However, the author of this thesis disagrees with the methodology of the study in such a way that it did not explicitly explore what the FM practice looks like as it is seen from the FM activities (repair & maintenance, fuel, vehicle tracking, and driver management) it only explores the importance of the activities to the agency.

Ambaye (2019) did a study on FM practice in drinking water companies and its implication for operational performance: the case of Aqua Addis drinking water company-Asku Plc. The study shows that all of the FM activities influence operational performance of the organization. However, vehicle tracking contributes the most to the operational performance of the company followed by fuel management.

Ayenew (2016) did a study on logistics practices in Ethiopian medium and large leather footwear manufacturing firms and conclude that in the globalized world producing quality footwear only is not a guarantee to be competitive. Building a mutual relationship with suppliers and customers through on-time delivery of finished footwear to customers, making the custom processes efficient, and having reliable transportation systems are among the other factors that contribute to the creation of a good image in the eyes of potential customers and suppliers.

2.2.2 Fleet Management Performance

Martinez *et al.* (2010) did a study on field vehicle FM in humanitarian operations: a case-based approach and developed a model illustrating the impact of FM on country program performance in humanitarian operation. They found that fleet utilization for in-country initiatives at the national and field levels can account for half of overall fleet expenses, and that enhancing fleet operations will further minimize costs and boost fleet effectiveness.

Giathi and Karanja (2016) argued that information communication technology (ICT) is even more important than customer relationship management (CRM) for SCM performance enhancement. Fleet tracking and application of fleet telematics improves supply chain safety, reduced cycle times and costs. With the use of ICT, the organization's predetermined performance indicators, car costs, and corporate expenses have shown a decrease of 25% (Aydin *et al.*, 2015). In addition

to cost savings, the application of ICT played a significant role in promoting safety by use of tachographs and digital speed governors which helps in keeping supply chain costs down by preventing losses through accidents. CRM involving timely delivery of supplies, proper management of customer complaints, and safety of customer consignments also could enhance supply chain performance by reducing cycle times and costs.

Wassan and Nagy (2014) argued that the vehicle routing problem with deliveries and pickups contributes to most of the logistics problem. Developing the best vehicle routing models considers cheapest routes, least time and resource-consuming routes. Hence, identifying the core problems of an organization during the delivery of goods helps to include major variables in routing model preparation.

2.2.3 Fleet Management Practice Implications for the Fleet Performance

FM practice is the repetition of fleet activities to help improve the performance of an organization. However, FM performance is the measurement of a firm's performance against a predefined target using indicators of responsiveness, effectiveness, efficiency, and environmental responsibility such as cycle time, waste reduction, and regulatory compliance. That means if there are no measures, there will be no performance investigation. Generally, findings of performance measurement are directly related to organizational practices like financial, responsiveness, and effectiveness of activities. The ultimate goal of logistics operations are to ensure product availability and customer service at the right time and right location, which enhances an organization's efficiency and effectiveness (Chopra and Meindl, 2016).

The implication of FM practices on fleet performance is an investigation to find out the influences of FM practice on fleet performance. The investigation could be through vehicle fuel management, vehicle maintenance & repair management, vehicle routing & tracking management, and driver management. The implications (influences) of FM practice on fleet performance could be positive or negative (Giathi and Karanja, 2016). Poor FM practices may show manifestations like stock out and delay of HCs due to the unavailability of vehicles (Kunz *et al.*, 2015). The current fuel management practices are causing social, environmental, and economical influences. Hence, transport cost assessment associated with fuel, maintenance, tracking, and driver expenses helps to achieve an efficient and environmentally sound transport system (Jakob, Craig and Fisher, 2006).

An efficient and effective fleet could be ensured through proper vehicle maintenance & repair (Torrey and Murray, 2014). Proactive and aggressive maintenance strategies are expected to be

associated with improved performance whereas reactive maintenance strategy is expected to be associated with lower performance. Regression analysis confirms that reactive strategy has a marginally significant negative relationship with the performance measures whereas proactive and aggressive strategies have significant positive relationships with the performance measures. In general, higher fleet performance would not be ensured with poorly managed maintenance assets even if expensive technologies are established (Eruguz, Tan and Houtum, 2015).

Concerning vehicle tracking, GPS-based FM systems are very important to the transportation sector. These technologies could improve operating efficiency, effectiveness, maintenance performance (Jalba *et al.*, 2010), responsiveness (Popovic and Habjan, 2012), and overall quality of the transportation sector in a certain organization (Hu *et al.*, 2015). Generally, the use of technology in transportation would result in more effective transportation coordination which in turn influences organizational performance (Kuswantoro *et al.*, 2014).

From a driver management perspective, driver behavior and educations are found to be critical issues for maintaining improvements in fleet performance. Studies reveal that excessive speed and aggressive fuel-inefficient driving techniques increase fuel consumption and increase accident rates (Adebambo, Omolola and Victor, 2016). Moreover, driver safety measures influence the fleet performance of an organization to great extent especially during the delivery of HCs to health facilities (Sekar *et al.*, 2014).

Begashaw (2018) did a study on the effect of FM in fleet efficiency from the perspective of employees: the case of the world health organization (WHO). Accordingly, the analysis of the study shows that the major determining factors of fleet efficiency identified were fuel management, vehicle tracking, and driver training, which had a significant effect on fleet efficiency. Hence, the FM system of WHO in Ethiopia is not at the required level of efficiency according to its employees. Regarding the correlation finding, it is possible to conclude that there is a strong and positive relationship among the four fleet areas maintenance & repair, fuel, vehicle tracking, and driver management with fleet efficiency.

Gitahi and Ogollah (2014) did a study on the influence of FM practices on service delivery to refugees in the United Nations high commissioner for refugees Kenya program. The study only assessed the influence of the FM activities on service delivery but does not explain how the practice looks like. They found that repair & maintenance had the highest influence on service delivery, followed by fuel management, then vehicle tracking while driver management and training had the least effect on the service delivery.

2.2.4 Fleet Management Challenges

FM service delivery of an organization will be optimized when there is a proper schedule of an oil change, routine servicing, spare part management, and driver training. Due to lack of sufficient training and improper oil change delays, inconveniences and eventually great losses may happen to an organization (Martinez and Wassenhove, 2012). Another major difficulty for FM is the unpredictability of client requests, which causes delays in service delivery for long-distance transportation. Therefore, equipment must be moved to meet needs before they are recognized. FM challenges could be attributed largely by government transport policies, import duties, taxation, road infrastructure condition, mode of usage, and lack of driver training (Ampiah, 2018).

Vehicles are not allocated to drivers on a long-term basis at Kenyatta University. Accordingly, more than one vehicle per week were allocated for 72.7% of drivers. Such allocation does not support responsibility and accountability among drivers. This leads to high vehicle breakdown and consequently high repair costs (Ayoma, 2013). The transport section of Kumasi Campus in Ghana faced the major challenges which include vehicle breakdowns as a result of accidents, financial difficulties, traffic congestion, and poor vehicle scheduling (Ampiah, 2018). Companies in Pakistan are highly challenged with fuel stealing due to unaffordable AFMS available on the market (Komal *et al.*, 2018). Humanitarian organizations encounter plenty of challenges but majorly poor maintenance, and spare parts management, over-aged vehicles, and limited attention for proper disposal of old vehicles are common (Kunz *et al.*, 2015).

In general, transport sector challenges can be explored with six dimensions: challenges related to geography (traffic congestion, road changes, higher distances, geographical location of some places), demography (aging population and growing concentration of population), environment (climate changes, green logistics, seasonal problems, natural disasters like cyclones and floods), legislation (transport regulations and funding disagreements), technology (costly new technology, lack of integrated system, resistance to change, dependency on technology) and other challenges (rising fuel prices, security issues, delay due to maintenance of roads) (Stewart, 2011).

2.3 Conceptual Framework of the Study

The conceptual framework was developed based on theories of FM from literature which presented the association between FM practice and service delivery (Gitahi and Ogollah, 2014). This study examined the association and prediction power between FM practices (Maintenance & repair, fuel, routing & tracking and driver management) and fleet performance in EPSA. Challenges of FM practices and challenges hindering fleet performance enhancement of the agency were also identified.

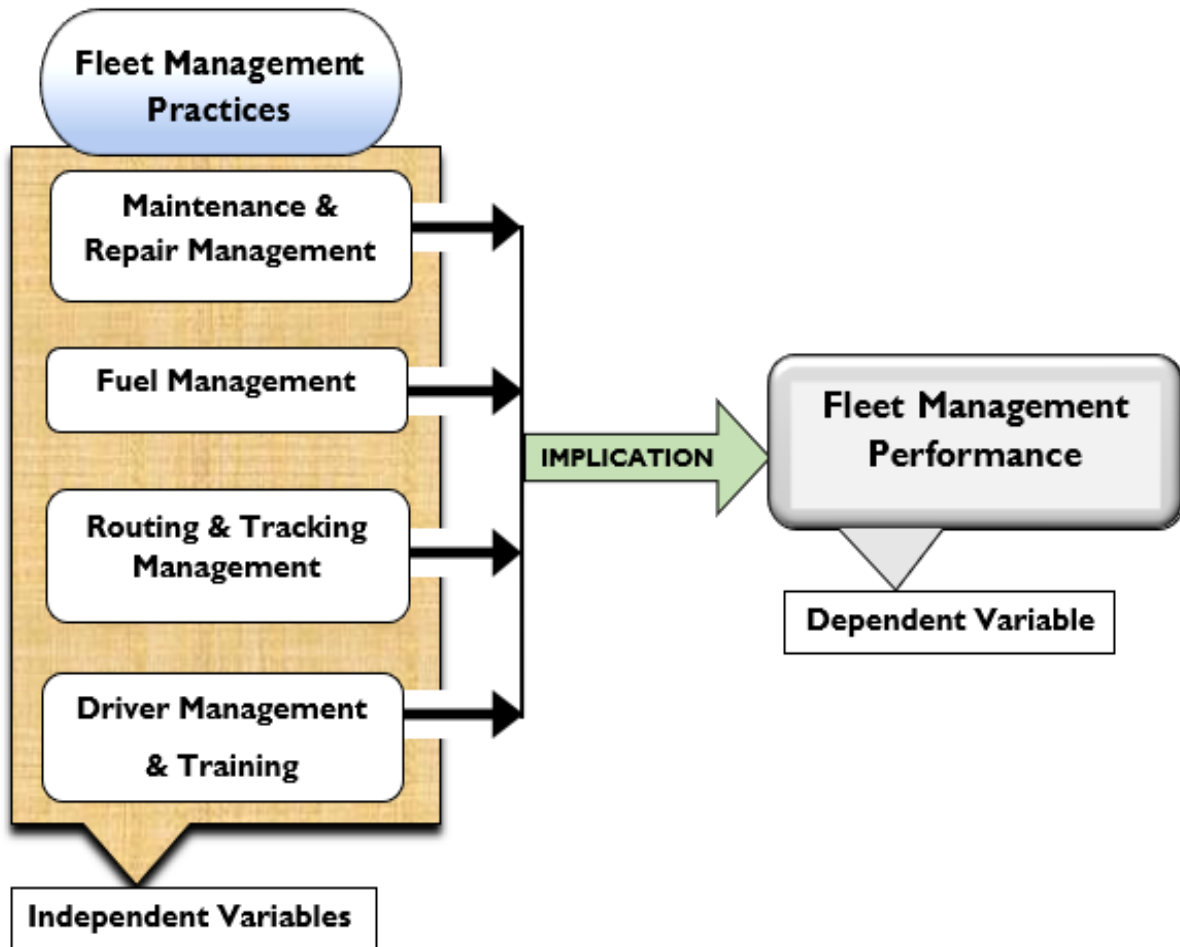


Figure 2.1: Conceptual Framework Adapted From, Gitahi and Ogollah (2014) & EPSA (2019b)

Challenges related to fleet practice – lack of spare parts, lack of proper fuel monitoring, manual tracking methods, and lack of driver training. (Kunz *et al.*, 2015)

Challenges related to fleet performance – high vehicle downtime, and excessive fleet operating expenses. (Martinez and Wassenhove, 2012)

Chapter Three

3 Methods of the Study

This chapter consists of study setting and period, study design and approach, study population, eligibility criteria, sampling techniques, data collection techniques, data sources, data entry and analysis, study variables, data quality, ethical consideration, operational definitions, and dissemination plan.

3.1 Description of the Study Setting and Period

The study was conducted in EPSA, which was first established in 1947 with a capital of 80 million birrs under the name “the main pharmacy.” Pharmaceutical and Medical Supplies Importer and Wholesale Distributor (PHARMED) was transformed into a pharmaceutical fund and supply agency (PFSA) in 2007 with the aim of bringing efficiency to the pharmaceutical supply chain. Again in 2019, the agency was renamed as EPSA. Currently, EPSA has a total of more than 200 vehicles serving the 19 branches and the seven clusters they are included in. EPSA’s head office is found in Addis Ababa region, Addis Ketema sub-city in front of Paulos Hospital. The agency provides both programs and RDF HCs for public and private health facilities (EPSA, 2016). The data collection was held starting from October, 2020 to January, 2021 in EPSA head office and selected branches of EPSA.

3.2 Study Design and Approach

Institution-based descriptive and explanatory cross-sectional study design was employed on individuals working in EPSA for the quantitative study. In the descriptive section, fleet practice and performance were described quantitatively using perception of the concerned staffs. Again, for the quantitative study, explanatory design was used to show the correlation and predictive effect of fleet practice for the fleet performance of EPSA using the perceptions of concerned staffs. Document reviews were also used for the study, however, the KPI values found through document reviews were not used for correlation or regression analysis instead used to substantiate the perception findings of the study.

The study employed convergent (concurrent) parallel mixed quantitative and qualitative study approaches for data collection and analytical procedures in similar research design used for this study. The study assessed FM practices and performance of the agency quantitatively whereas challenges of the FM were assessed qualitatively.

3.3 Population and Sample Design

3.3.1 Eligibility Criteria for Quantitative Study

Inclusion criteria involved being staff of EPSA specifically those involved in distribution, FM, GS, finance departments, and large van drivers of EPSA. From drivers, large van drivers were included because they were involved in most of the HCs transportations and travel relatively greater distances. The staffs which are able to communicate with Amharic/English, and the age groups ≥ 18 were also included. The staffs of EPSA having six months of work experience and above were included in the study. Since, workers in the agency become permanent members within 6 months. Exclusion criteria involved the staffs of EPSA not willing to participate in the study and staffs that are not available during the data collection period.

3.3.2 Eligibility Criteria for Document Review

Inclusion criteria comprised data sources of the year 2012 Ethiopian Calendar (EC). One year data was preferred (USAID | Deliver Project, 2006) since it can capture enough data needed for future generalization. The outbound flow of HCs from EPSA head office and the branches were included in the document review. Exclusion criteria involves the measurement of fleet performance of EPSA where some transportation performance measuring KPIs (percentage of shipments where quantity dispatched equals quantity received, kilometers between accidents, a ratio of transportation cost to the value of the product, container capacity utilization, and the average number of stops per route) were excluded to go in line with the objective of the study.

3.3.3 Eligibility Criteria for Qualitative Study

Inclusion criteria consisted of directors working in DFM department. Exclusion criteria consisted of staffs of EPSA not willing to participate in the study and staffs that are not available during the data collection period.

3.4 Sampling Technique and Procedure

3.4.1 Sampling Technique and Procedure for the Quantitative Study

Six branches of EPSA and the head office were selected through maximum variation purposive sampling technique from a total of 19 EPSA branches. EPSA branch selection was based on four criteria such as distance from EPSA head office, cluster variation, number of health facilities served by the branch and population coverage. Branches which are comparatively near, average distances, far distances, those included in different clusters, those branches serving a greater number of health facilities (hospitals & health centers), and with higher population coverage were

selected purposively. Those branches which fulfil the four criteria at the same time were selected and were found to be six. The detailed profiles of the 19 EPSA branches is presented on **Annex IV**. This helps to understand the practice and performance of FM services of EPSA with distance variations, cluster variation, health facility, and population coverage variations. Accordingly, the six branches selected include Addis Ababa Hana Mariam (Central cluster), Adama (Adama cluster), Jimma (Western cluster), Hawassa (Southern cluster), Gondar (North western cluster), and Mekelle (Northern cluster) branches. The selected six branches comparatively fulfill the maximum variation sampling criteria.

Then from the selected six branches and the head office, responsible stakeholders of FM were selected. Hence, the study units included distribution and FM (DFM) officers, GS officers, finance coordinators, and large van drivers which are the major stakeholders of FM issues. From drivers, only large van drivers were selected because they are thought to have better understanding of fleet issues as they are involved in most distant HCs distributions. Finally, by using census method all the study units were included in the study. Accordingly, a total of 35 distribution and FM officers, 22 GS officers, 18 finance coordinators, and 27 large van drivers of EPSA were selected. Therefore, a total of 102 participants were included for the quantitative study.

Table 3.1 : Study Unit

Department	HO	Branches						Study Unit
		AA1	A	J	H	G	M	
DFM officers	8	5	5	4	5	4	4	35
GS officers	5	4	3	3	2	2	3	22
Finance coordinators	4	3	3	2	2	2	2	18
Large van drivers	7	4	4	3	3	3	3	27
Total								102

**HO- Head office*

**AA1- Addis Ababa,1 Hana Mariam Branch*

**A- Adama Branch*

**J- Jimma Branch*

**H- Hawassa Brach*

**G- Gondar Branch*

**M- Mekelle Branch*

3.4.2 Sampling Technique and Procedure for the Document Review

There was a document review to evaluate the fleet performance of EPSA using appropriate KPIs in order to substantiate data found with perception of the study participants. The aim was to enhance the reliability of the perception finding with the actual measured performance at the agency. The sample raw data reviewed was taken from 2012 EC records at EPSA. Although sufficient raw data were not found for the document review, the researcher tried to triangulate findings from the quantitative (in this case perception study) with the document review and qualitative findings.

3.4.3 Sampling Technique and Procedure for the Qualitative Study

For the qualitative study, a total of seven DFM department directors were selected from the head office and the six branches with homogenous purposive sampling method (i.e., one director from each branch and the head office). Directors (managerial sections) were selected since they are found to be best experienced on FM issues as compared to other concerned staffs. There by the directors were only 7 and even samples size saturation was obtained too early since the study participants are homogenous in nature and the scope of the study is narrow enough.

3.5 Data Collection Methods and Instruments

Both close and open-ended questions were used to collect the primary data from participants of the study. Self-administered questionnaire was drafted using the FM issues stated in transport assessment tool by USAID | Deliver Project (2010b) and research work of Martinez, Stapleton and Wassenhove (2010). The parts of the questionnaire comprise of FM practice and performance issues. In FM practice there are four practices stated namely; maintenance & repair, fuel, routing & tracking, and driver management issues. Each of the four practices has its own activities to be performed. On the other hand, four fleet performance measuring activities are included in the questionnaire. Data abstraction format was drafted from measuring supply chain performance guide of USAID | Deliver (2010a), and monitoring & evaluation framework of EPSA (2019b). Four KPIs were included in the data abstraction format namely average delivery time, percentage vehicle downtime, percentage vehicle availability, and total fleet operating cost. Semi structured interview guides were drafted majorly using the research work by Martinez, Stapleton and Wassenhove (2010). Thereby challenges related to the four FM practices, and fleet performance are requested on the interview guide.

3.5.1 Data Collection Procedure for the Quantitative Study

The researcher distributed the self-administered questionnaires for DFM officers, GS officers, finance coordinators, and large van drivers to assess the FM practice and performance perception wise. Three data collectors participated in the quantitative data collection.

3.5.2 Data Collection Procedure for the Document Review

The researcher made a document review of selected data sources to measure the FM performance of EPSA by collecting documents from the documentation unit of EPSA's head office and the selected EPSA branches. The personal investigator reviewed documents of the year 2012 EC for the selected branches and the head office.

3.5.3 Data Collection Procedure for the Qualitative Study

The researcher also conducted semi-structured interviews with DFM directors of the selected branches and the head office to identify the challenges of FM practice and performance at EPSA. The personal investigator and three data collectors participated in qualitative data collection. In order to mitigate the effect of variations in the way of interview deliveries; semi structured guides were provided for the data collectors, orientation was given on the overall objectives of the study, and rehearsal trials were evaluated for the three data collectors and given feedbacks. Hence, there was no major variation in the perception of the data collectors as viewed from the results.

3.6 Data Sources

Primary data sources included self-administered questionnaires, and semi structured interview guides. The self-administered questionnaires were used for used to assess the fleet practice and performance perceptions of the study participants. Interview guides were used to identify the challenges of fleet practice and performance of EPSA with study participants' perception. Secondary data sources included literature, books, journals, raw data documents, and annual reports where the raw data documents were used to evaluate fleet performance of EPSA with KPIs. The raw data sources for document review of FM performance measurement included delivery vehicle availability tracking sheet, vehicle request & approval form, maintenance records, financial statements, and GPS tracking records.

3.7 Variables of the Study

There are four FM activities considered as independent variables in this study. This included vehicle maintenance & repair management, fuel management, routing & tracking management, and driver management. These activities were used to assess the FM practices of EPSA. On the

other hand, fleet performance is the dependent variable. There are four important KPIs that can be used to measure the FM performance of a certain organization like that of EPSA. Those KPIs included average delivery time, percentage vehicle downtime, percentage of delivery vehicle availed, and total fleet operating costs.

3.8 Data Entry and Analysis

3.8.1 Data Entry and Analysis for the Quantitative Study

The primary data collected were checked for completeness of the information. Then quantitative data were encoded and analyzed using software called statistical packages for social science (SPSS) version 20. The study used a 5-point Likert scale to measure the responses given by the study participants about FM practices and performance. Both descriptive, and inferential analysis were employed for the perception of the study participants.

In general, mean values that ranges from 1 - 1.80, 1.81 - 2.6, 2.61 - 3.4, 3.41 - 4.2 and 4.21 - 5.00 represented respondents' perceptions of strong disagreement, disagreement, neutrality, agreement and strong agreement respectively. A mean value of 0.8 is used as a range between each scale of judgement as the rule of thumb and it is found by dividing the subtracted value of 5 (maximum value) and 1 (minimum value) by 5 (maximum value) (Jalagat, Al-Habsi and Amur, 2017). In this study; mean, standard deviation, count and percentage values were used for the descriptive analysis. In the result section, the abbreviations on the tables **Sd, D, N, A, Sa** stand for strongly disagree, disagree, neutral, agree, and strongly agree respectively. Inferential statistics that involved correlation and regression analysis were employed to study the relationship and predictability power between independent (FM practices) and dependent (FM performance) variables from participant's view point.

3.8.1.1 Inferential Statistics

There are three types of bivariate correlations which include Pearson, Kendall's tau-b, and Spearman rho. According to literature and books for ordered or ranked type of data where the gap between the ranks is not known, Spearman rho is the appropriate technique of figuring out correlations between two ordinal variables. Similarly, there are many types of regression analysis based on the type of data used in a study, for an ordinal and non-normally distributed type of data ordinal logistic regression (OLR) is the appropriate type of regression for analysis (Sullivan and Artino, 2013).

3.8.1.1.1 Spearman Correlation Analysis

Correlation analysis is a way of establishing a relationship between two variables and without assuming a cause and effect situation. Spearman rho is the preferable measure of correlation when the data is expressed as rank or ordinal data just like Likert type data presented in this study. It produces a coefficient between -1.00 up to 1.00. In general, Spearman's rho correlation coefficient (ρ) value with 0 indicates no relationship, 0 to ± 0.3 indicates weak positive or negative relationship; from ± 0.3 to ± 0.7 indicates moderate positive or negative relationship; those between ± 0.7 to ± 1 indicates a strong positive or negative relationship; ± 1 perfect positive or negative linear relationship (Ratner, 2017). Moreover $p < 0.05$ indicates a statistically significant relationship (Schumacker and Lomax, 2010; Pallant, 2011).

3.8.1.1.2 Ordinal Logistic Regression Analysis

Regression analysis may be classified into several forms based on the nature of the dependent and independent variables. Likert scale (ordinal data) is used to describe both the dependent and independent variables in this study. As a result, the researcher analyzed the data using an ordinal logistic regression model.

Moreover, before running regression analysis there should be a decision of which testing techniques to use as per the type of data included in a study. Parametric testing techniques e.g., t-tests, and analysis of variance are appropriate for interval and ratio data types and make a number of assumptions about the population from which the sample has been drawn (e.g., normality, linearity, multi-collinearity, homoskedasticity of distributed scores, etc). On the other hand, non-parametric testing techniques (e.g., Kruskal-Wallis, Mann-Whitney U, and Chi-square) are appropriate for ordinal types of data and do not have as such stringent assumptions (e.g., test of parallel lines and multi-collinearity test). In this study, nonparametric testing techniques were used as far as ordinal data types are concerned (Pallant, 2011).

OLR is a technique for estimating an ordinal dependent variable given one or more independent variables. When linear regression assumptions are considerably ignored and the data is categorical or ordinal, this is the suitable sort of regression. The pseudo-R square (Nagelkerke) value for ordinal regression is mostly acceptable to be $\geq 70\%$ but there is no clear guideline of interpretation in literature. The major implications of the ordered log-odds coefficient is that given a one-unit increase in the predictor variable, the level of the response variable is predicted to vary by its respective regression coefficient in the ordered log-odds scale while the other variables in the

model are maintained constant (Gay, Mills and Airasian, 2012). OLR can be represented by the following formula:

**p_i = Probability of an outcome* **log[p_i/(1-p_i)] = Dependent variable*
**a_i = Intercept of an outcome* **x_j = Independent variables*
**β_j = Estimates/ coefficients of outcome variable*

$$\log[p_i/(1-p_i)] = a_i + \beta_1x_1 + \beta_2x_2 + \dots \beta_jx_j$$

3.8.2 Data Analysis for the Document Review

In the document review, the average value was computed to find cumulative fleet performance measures. Then the researcher computed performance results and compared to the respective target values (i.e., if available). The descriptive and inferential analysis were not employed for the document review findings instead the findings were used to support the perception findings about the fleet performance.

3.8.3 Data Analysis for the Qualitative Study

The researcher analyzed qualitative data using thematic analysis technique. The thematic analysis for the qualitative findings follows deductive reasoning approach which aims at testing existing theory about FM. The codes were identifies using the theoretical framework as a base for generating and classifying the issues raised by the study participants. Therefore, the data did not lead the codes instead the preexisting FM theory lead the articulated codes. First the interview was conducted in Amharic language then it was transcribed and translated to English where the coding procedure was performed in English. The personal investigator coded responses of participants to a couple of similar ideas which are short and explanatory then only five themes were extracted from the codes. The themes for this study were about maintenance & repair management, fuel management, routing & tracking management, driver management and fleet performance issues.

In order to manage different opinions raised by the respondents during interviews, scope of the study was limited to issues entertained by the theoretical framework using deductive reasoning approach. One advantage of using semi structured interview is guiding respondents to limited scopes using probes to intervene deviating issues during the actual interview. Actually, since the study samples for the qualitative study were homogenous most of the responses were in line with theoretical framework. It was also simple to manage the responses as the study sample size was only seven but in depth and rich information were gathered.

3.9 Reliability, Validity and Data Quality Assurance

Reliability stands for the measure of the extent of consistency of the results of the study and representativeness of the study population. Cronbach's alpha test is the most widely used technique to measure the reliability of the study. Cronbach's alpha value ranges between 0 and 1 where the degree of acceptability is stated as: unacceptable ($\alpha < 0.5$), poor ($\alpha > 0.5$), questionable ($\alpha > 0.6$), acceptable ($\alpha > 0.7$), good ($\alpha > 0.8$) and excellent ($\alpha > 0.9$) (Lovelace and Brickman, 2013). Pretest was conducted on 10 individuals who are not included in the study population but from the same organization. The Cronbach's alpha test results for the pretest mentioned in table 3.2 shows that the overall reliability of the study is good ($\alpha=0.83$).

Table 3.2 : Reliability Test

Dimensions	Cronbach's alpha value (α)	N of items
Maintenance and repair Management	0.94	8
Fuel management	0.78	7
Routing and tracking management	0.90	8
Driver management	0.83	7
Fleet management performance	0.71	4
Average	0.83	34

Source: Pretest Own Study Findings (2021)

Validity refers to the extent of strength and understandability of the instrument towards achieving the researcher's aim (Zegeye *et al.*, 2009). Construct, content, and face validity of the instrument were ensured by comparing the tool in line with the specific objectives of the study, forwarding the draft tool to the advisor, the research team of EPSA head office, and the most experienced staffs of EPSA on FM areas and taking the comments. Additionally, comments of pretest respondents on the flow and clarity of the tool were also included in the final tool.

The tools were pretested on 10 % of the samples in EPSA, Addis Ababa Jakros branch in order to check the clarity, validity, ambiguity, and readability of the statements and questions. Prior to data collection training and orientation were given to data collectors on the objective of the study, data collection process, and relevance of the study. Collected questionnaires have been checked routinely to figure out inconsistencies. Throughout the data collection period, the three data collectors were given proper supervision and support.

3.10 Ethical Consideration

Initially, the researcher obtained ethical approval from the research and ethics review committee of the school of pharmacy, Addis Ababa University (AAU). Then, the researcher obtained a permission letter from the review committee and the EPSA head office director. The EPSA head office branch director also prepared permission letters to the selected EPSA branches, and the branch directors approved them. Participants were asked to offer verbal agreement before participating in the study and were notified that they might withdraw at any time.

Over the approval process, the researcher told participants about the research's purpose and assured of the confidentiality of the information obtained during the course of the study, which was accomplished by eliminating personal identifiers to ensure anonymity and analyzing data in aggregates. In case of the interviews, the identities of the respondents and the organization were not included in the data analysis, and interviewees were assured that the information they supplied would be handled only by the study team.

Chapter Four

4 Results and Discussion

This chapter reports findings of the study categorized into three major sections. In the first part, the response rate is presented. In the second section, socio-demographic characteristics are summarized. The third section presents qualitative results supplemented with quantitative results and document reviews for making the overall findings strong and easily understandable. Additionally, important findings are discussed and argued with empirical data from the literature integrated in the third section.

4.1 Response Rate

Totally out of 102 questionnaires disseminated to DFM officers, GS officers, finance coordinators, and large van drivers; 98 questionnaires were returned back. Hence, the response rate is 96.1% which is in the very acceptable range as of $\geq 60\%$ (Fincham, 2008). This helps to overcome biases during generalization of the overall findings of this study.

Table 4.1: Response Rate

Study unit	Number	Percentage
Total number of questionnaires allocated	102	100%
Returned questionnaires	98	96.1%

Source: Own Study Questionnaire (2021)

4.2 Socio Demographic Characteristics

The questions of the demography were about the current position or title, age, gender, educational level, and years of experience of the respondents. The frequency and percentage of occurrence of the above characteristics can be demonstrated in table 4.2.

Table 4.2: Demographic Information

	Characteristics	Frequency	Percentage (%)
Gender	Male	80	81.6
	Female	18	18.4
	Total	98	100
Age	18-30	29	29.6
	31-40	49	50.0
	41-50	9	9.2
	>50	11	11.2
	Total	98	100
Position	DFM officer	34	34.7
	GS officer	19	19.4
	Finance coordinator	17	17.3
	Large van driver	28	28.6
	Total	98	100
Education	Primary	2	2.0
	Secondary	16	16.3
	Preparatory	5	5.1
	College/University	52	53.1
	Post-graduate	23	23.5
	Total	98	100.0
Experience	6 months – 5 years	38	38.8
	6 – 10 years	45	45.9
	11 – 15 years	6	6.1
	>15 years	9	9.2
	Total	98	100

Source: Own Study Questionnaire (2021)

Table 4.2 shows that from 98 participants 81.6% are male and the rest are female. From the age group, 50% of the respondents range from 31-40 showing that adults are dominant age groups. Only 9.2% of the respondents range from 41-50 years. Most of the respondents are DFM officers which account for 34.7% whereas finance coordinators are 17.3% which is the minimum score comparatively. Those completing college and university account for 53.1% which means

understandability of the research tool for this study is good. A relatively high number of post-graduate participants (23.5 %) are accounted, the rest are preparatory and below. 45.9 % of the respondents have 6-10 years of work experience which could have a positive impact on the research outcome since it is believed that they are well aware of the area of interest. Oppositely, 6.1 % of the respondents had 11-15 years of work experience which is the minimum score.

From the data it can be inferred that most participants of the study are well experienced and qualified to run this study which helps the achievement of better results. There is a 5:1 ratio of male to female participants but gender has no feasible influence on the fleet performance of the agency. The data also indicates that participants do have familiarity with this study concept and capable of understanding at least major issues mentioned about FM conditions at EPSA. Therefore, the feasibility of the study is not at stake.

4.3 Mixed Quantitative and Qualitative Results

4.3.1 Fleet Management Practice and Challenges

According to the first objective of this study on FM practices and the fourth objective on fleet challenges of EPSA, the following mixed results of quantitative and qualitative data are presented. The descriptive statistics used in this study are mean, standard deviation, counts, and percentages to uniformly interpret and compare the result with existing guidelines where major findings are summarized. The data are integrated to make the overall finding strong and easily understandable.

Data about the challenges of FM were obtained from seven DFM coordinators through interviews. Those DFM coordinators or key informants (KI) were given codes to easily identify which ideas are coming from which interviewee. Accordingly, the seven interviewees were given codes starting from KI-1 up to KI-7 without revealing their identity (i.e., KI-1, KI-2, KI-3, KI-4, KI-5, KI-6 and KI-7). The KIs were interviewed through audio recording and a thematic analysis was employed, quotations were used for their responses. The findings of the seven interviews have five themes (i.e., maintenance & repair, fuel, routing & tracking, driver management and fleet performance issues) which are addressed with subsections as follows.

In the following section, the descriptive (quantitative) findings are reported first followed by qualitative findings supplemented with quantitative data about the four FM activities and the fleet performance KPIs. The document review, fleet KPI findings are reported in the fleet performance section (4.3.3.2) to support the descriptive and qualitative findings.

4.3.1.1 Vehicle Maintenance and Repair Management Practice

In repair & maintenance, eight important activities are included. The level of agreement by the total respondents are presented on these activities with their mean, standard deviation, percentages scores, and counts (n) in bracket.

Table 4.3 : Vehicle Maintenance & Repair Activities

Activities	Mean	Standard Deviation (SD)	Percentage Score (n=98)				
			Sd [1]	D [2]	N [3]	A [4]	Sa [5]
Assigned body are available to control maintenance and repair of vehicles.	3.67	1.12	7.1 (7)	9.2 (9)	13.3 (13)	50.0 (49)	20.4 (20)
Regular maintenance & repair schedule for vehicles available.	3.16	1.12	13.3 (13)	14.3 (14)	25.5 (25)	36.7 (36)	10.2 (10)
Sufficient safety stock of vehicle spare parts available in EPSA's garage.	2.04	0.97	34.7 (34)	34.7 (34)	24.5 (24)	4.1 (4)	2.0 (2)
Qualified mechanics complete vehicle maintenance without delay.	2.60	1.19	21.4 (21)	28.6 (28)	23.5 (23)	21.4 (21)	5.1 (5)
Contingency plan available during vehicle shortage.	3.08	1.09	7.1 (7)	24.5 (24)	30.6 (30)	28.6 (28)	9.2 (9)
Finance officers control maintenance and repair expenditures of vehicles.	3.29	1.06	5.1 (5)	20.4 (20)	25.5 (25)	38.8 (38)	10.2 (10)
Guidelines available for maintenance & repair of vehicles.	2.60	1.22	23.5 (23)	24.5 (24)	27.6 (27)	17.3 (17)	7.1 (7)
Maximum period of time in garage is designed.	2.83	1.29	20.4 (20)	21.4 (21)	23.5 (23)	24.5 (24)	10.2 (10)
Grand Mean	2.90						

Table 4.3 shows that the activity about availability of assigned body to control maintenance & repair of vehicles has been given the highest mean score obtaining the only agree score with (Mean=3.67, SD=1.12). On the contrary, most of the respondents disagree with availability of sufficient safety stock of vehicle spare parts which was given the poorest score of agreement with (Mean=2.04, SD=0.97). About 30.6% of the total respondents neither agreed nor disagreed with contingency plan availability during vehicle shortage which is the highest percentage score.

According to Kidane (2016), which worked on assessment of truck transport management practices in Ethiopian ministry of national defense logistics main department, 3.4 % of the total respondents strongly disagree with contingency plan availability during vehicle shortage which is lower than 7.1 % for this study. This shows that contingency plans are available at EPSA during shortage of delivery vehicles.

4.3.1.2 Vehicle Maintenance and Repair Management Challenges

All the interviewees reported that there are two kinds of maintenance & repair at EPSA; maintenance provisions given internally (in the agency) and externally (outside the agency). Simple services are provided in the mini garage of EPSA, however, there is little or no spare part stock in the garage as only 2% of the total respondents strongly agreed about the spare part availability in EPSA. Prolonged time is also consumed to procure the spare part as a result there is a delay in the maintenance provisions. KI-1 added that there is shortage of mechanics, and insufficient capability of mechanics whereby only 5.1% of the respondents strongly agreed about the capability of the maintenance personnel and poor garage infrastructures are also the main reasons for low service provisions internally.

Moreover, the maintenance & repair delays in the external maintenance-providing companies again are due to unavailability of spare parts. KI-1 gives stress that concerning the economy, there is a thought that having a self-administered garage helps to save costs incurred for maintenance & repair since it is highly correlated with the fleet performance of the agency as compared to the other FM practices. KI-3 elaborated that a shortage of vehicles is experienced at most branches since vehicles are sent to the head office in Addis Ababa for maintenance & repair. However, KI-5 said that:

“Mechanics of the agency are well skilled even if suitable conditions are not provided”.

There is a delay both inside and outside the agency as 28.6% of disagreement shown in the descriptive findings. KI-5 said:

“Maintenance works are left for external maintenance personnel mostly our malfunctioning vehicles are given to AMCE where there is congestion of services. Even two vehicles stayed for more than two years that will have its own cost!”

KI-1 also said that:

“...monthly a minimum of 11 vehicles from the head office stay up to 30 days in a garage...”

The challenges that contribute to maintenance & repair delay include:

- Outsourcing maintenance & repair activities. KI-2 said:

“Outsourcing by itself, not having garage owned by the agency made the works delayed...”

- Mainly lack of spare parts for vehicles. KI-1 said:

“...when we ask our technicians, they said often vehicle spares are not found.”

- Overcrowded services are given by external maintenance providing companies’ mechanics and priorities given for private customers than public organizations like EPSA. KI-1 said:

“The time consumed by companies is prolonged since the agency is public, priority is given for individuals.”

- According to KI-7, lack of well-organized infrastructure for the agency’s internal maintenance personnel (mechanics).
- Absence of EPSA’s controlling body on the work of external maintenance personnel. 50% of the respondents agreed on availability maintenance & repair controlling body but external controls are very poor. KI-3 said:

“The problem is not because of the maintenance providing company it is because there is no control...”

- External Maintenance provider companies complain about the scarcity of hard currency. KI-1 said:

“By saying I have no dollar and I do not have anything to procure, vehicles stay for long time at maintenance providing company.”

The qualitative findings of this study reveal that delay of maintenance & repair due to the absence of spares is the major challenge for EPSA. This finding agrees with Kunz *et al* (2015) such that long duration of downtime because of maintenance is observed due to old age of the vehicles, congestion at the repair companies, inadequate capacity of the maintenance team, lack of spare parts in the market, and shortage of competent maintenance service providers in the local market are amongst the main challenges in the sector. The other basic challenge for EPSA is the absence of a workshop owned by the agency. This forces vehicles to travel long distances for maintenance & repair as stated by Martinez *et al.* (2010). This occasion holds true for vehicles used by EPSA's branches where the vehicles have to travel to the head office of EPSA and followed by private maintenance providing personnel this procedure could take several days even to years.

4.3.1.3 Vehicle Fuel Management Practice

Fuel management includes seven important activities. The respondents gave their level of judgment on these activities with corresponding mean, standard deviation, percentages scores, and counts (n) in bracket.

Table 4.4: Fuel Management Activities

Activities	Mean	Standard Deviation (SD)	Percentage Scores (n=98)				
			Sd [1]	D [2]	N 3]	A [4]	Sa [5]
Assigned body available to control vehicle fuel.	3.58	1.23	11.2 (11)	8.2 (8)	13.3 (13)	45.9 (45)	21.4 (21)
Regular follow up of vehicle fuel consumption.	3.41	1.23	10.2 (10)	14.3 (14)	18.4 (18)	38.8 (38)	18.4 (18)
Standard available for fuel consumption rate per vehicle.	3.42	1.15	8.2 (8)	13.3 (13)	23.5 (23)	38.8 (38)	16.3 (16)
Sufficient budget allocated for vehicle fuel expenditures.	3.57	1.08	8.2 (8)	5.1 (5)	24.5 (24)	45.9 (45)	16.3 (16)
Kilometers traveled per liter calculated for vehicles.	3.60	1.09	5.1 (5)	12.2 (12)	19.4 (19)	43.9 (43)	19.4 (19)
Potential vehicle fuel sources available.	3.12	1.22	14.3 (14)	15.3 (15)	24.5 (24)	35.7 (35)	10.2 (10)
Finance officers control fuel expenditures.	3.79	0.92	2.0 (2)	8.2 (8)	18.4 (18)	52.0 (51)	19.4 (19)
Grand Mean	3.49						

Table 4.4 shows that only availability of potential vehicle fuel sources was given neutral mean score (Mean=3.12, SD=1.22) by the respondents. The respondents agreed on the rest of the FM activities with all mean scores between the range of 3.41 to 4.2. However, the maximum mean score is given for the presence of finance officers to control fuel expenditures with (Mean=3.79, SD=0.92). About 21.4% of the total respondents strongly agreed on the availability of a controlling body for fuel management which is the highest percentage. Only 5.1% of the total respondents strongly disagreed on the availability of traveled kilometers calculation, showing that all fuel inspections are done based on kilometers traveled by vehicles.

In general, all the KIs revealed that sufficient budget is allocated for fuel expenditures which is similar with descriptive finding where 45.9% of the total respondents agreed with this issue and with Ampiah (2018).

4.3.1.4 Vehicle Fuel Management Challenges

Even though 45.9% of the total respondents agreed on the availability of vehicle fuel controlling body, there is no well-organized fuel monitoring system where KI-2 said:

“...drivers say the fuel is not enough for the delivery of HCs, there will also be wastage of fuel”.

However, according to KI-6, to monitor the fuel management the costs are measured based on kilometers traveled by the vehicles and dividing with the kilometers per liter of the vehicle which is based on the model type of the vehicles. GPS fuel monitoring systems are not fully launched in the agency. KI-2 said:

“Fuel monitoring is not applied in the agency since baseline data are not provided for the GPS like fuel cost and consumption”.

According to KI-7, fuel logs are present in the vehicles but not well filled by the drivers in some EPSA branches. Currently, the only monitoring system is the calculation of kilometers per liter of fuel consumption. KI-1 said:

“Concerning fuel usage, there is a normalization done previously so it is going that way as I said only manual method is used to calculate the fuel consumption”.

Monitoring systems are not implemented well and most KIs said that applying GPS is not acceptable by the drivers. KI-2 emphasized that:

“GPS has features for fuel consumption...But drivers are not willing about the practicability of GPS since nowadays there is a conflict about the issue of reward and punishment system of the GPS. Within this setup, in fear of occurrence of other problems the agency delayed the implementation of GPS for fuel consumption”.

4.3.1.5 Vehicle Routing and Tracking Management Practice

Vehicle routing and tracking management include eight important activities. These activities are presented with their mean, standard deviation, percentages scores, and counts (n) in bracket as per the responses of the total study participants.

Table 4.5: Vehicle Routing & Tracking Activities

Activities	Mean	Standard Deviation (SD)	Percentage Scores (n=98)				
			Sd [1]	D [2]	N [3]	A [4]	Sa [5]
Assigned body available to control routing and tracking of vehicles.	3.70	1.09	3.1 (3)	14.3 (14)	14.3 (14)	45.9 (45)	22.4 (22)
Vehicle tracking technologies are available.	3.70	1.06	5.1 (5)	10.2 (10)	17.3 (17)	43.9 (43)	23.5 (23)
Vehicle tracking technologies control speed, fuel consumption, and maintenance scheduling.	3.28	1.32	9.2 (9)	25.5 (25)	17.3 (17)	24.5 (24)	23.5 (23)
Vehicle actual trips are compared to scheduled trips.	3.59	1.07	0 (0)	20.4 (20)	24.5 (24)	30.6 (30)	24.5 (24)
Agency provides immediate solutions for problems in vehicle routing and tracking.	3.61	1.08	4.1 (4)	11.2 (11)	26.5 (26)	35.7 (35)	22.4 (22)
Vehicle damage records of health commodities are kept during transportation.	3.68	0.94	1.0 (1)	10.2 (10)	27.6 (27)	41.8 (41)	19.4 (19)
Best vehicle routing models are used during the delivery of health commodities.	3.73	0.87	0 (0)	8.2 (8)	29.6 (29)	42.9 (42)	19.4 (19)
Amount of time calculated and recorded for vehicles usable and unusable histories.	3.45	1.23	9.2 (9)	15.3 (15)	16.3 (16)	39.8 (39)	19.4 (19)
Grand Mean	3.59						

Table 4.5 shows that most of the routing & tracking activities are agreed but the maximum mean score was recorded for the use of best vehicle routing models used during the delivery of HCs with (Mean=3.73, SD=0.87). However, only one of the activities about availability of vehicle tracking technologies to control speed, fuel consumption, and maintenance scheduling was given the minimum mean score in the neutral range (Mean=3.28, SD=1.32). About 24.5% of the total respondents strongly agreed that the vehicle actual trips are compared to scheduled trips which is the highest percentage value. 29.6% of the respondents neither agreed nor disagreed about best vehicle routing models are used during the delivery of HCs which is the highest percentage score. Only 1% of the respondents strongly disagreed about vehicle damage records of HCs are kept recorded during transportation which is a very small percentage score.

According to Wodaje (2019), which worked on the practice, challenges and performance of humanitarian logistics in plan international Ethiopia, availability of best routing model during delivery of commodities, none (0 %) of the total respondents strongly disagree. This was found to be equivalent with this study which means that best routing models are used all the time at EPSA.

4.3.1.6 Vehicle Routing and Tracking Management Challenges

KI-4 and KI-7 informed that previously the tracking procedures were done manually with excel and paper works but these days GPS is installed to all vehicles of the agency as stated in the descriptive data whereby 43.9% of the total respondents agreed. The GPS holds all the necessary features like location, speed, maintenance & repair history, fuel consumption, and costs incurred for running the vehicles. It is just a matter of feeding baseline data for the GPS that could result the FM activities to be transparent and neat. Currently, the agency is using the GPS monitoring system only to know the exact location of the vehicles as most KIs said.

Vehicle tracking technologies like GPS are installed on most of the vehicles but most important features like fuel monitoring and expense issues are not analyzed through the technology which is confirmed with the descriptive data where 25.5% of the respondents disagreed with full implementation of the GPS. KI-5 reported that performing transportation KPIs is difficult due to poor organization and documentation of the logbooks and fuel logs even there is no monitoring system of the logbooks when received in addition to partial implementation of GPS.

The challenges encountered during the implementation of GPS include:

- Lack of awareness of the responsible staff about the GPS. KI-1 said:
“...the presence of other features of GPS are not being taken aware of in the agency”.
- According to KI-2 and KI-6, the drivers complain that the measurements given by the GPS are not accurate it falsely reports fuel consumptions and the like.
- KI-4 informed that there is a fluctuation in the status of the GPS since it is not completely owned by the agency instead run by foreign partners. KI-2 said:
“The problem is not within the agency; it is a payment issue and not secured there was once stoppage of GPS operation due to unresolved payment issues”.

KI-1 and KI-5 informed that for the head office, route optimization is not done since the location of the branches are already optionless so the respondents said that there is no best option. However, route optimization is done at the branch level since plenty of health facilities are present with optional routes of delivery. Therefore, the best routes of delivery were selected and examined especially for the Adama EPSA branch, as observed from the descriptive data where none of the total respondents strongly disagree with the availability of the best routes. KI-1 added that:

“Route optimization...we have defined area of delivery for the head office but route optimization is done at branches.”

In general, the manual monitoring systems in EPSA are exposed to fraud and abuse especially for fuel. This challenges are also faced by companies in Pakistan where by fuel stealing is common due to lack of modern technology for tracking the overall FM activity (Komal *et al.*, 2018).

4.3.1.7 Driver Management Practice

Driver management has seven important activities where all of which focus on the practices related to drivers. The mean, standard deviation, percentages scores, and counts (n) in bracket as per the response of the total participants are presented in the following section.

Table 4.6: Driver Management

Activities	Mean	Standard Deviation (SD)	Percentage Scores (n=98)				
			Sd [1]	D [2]	N [3]	A [4]	Sa [5]
Agency has supervision and performance evaluation method for drivers.	2.92	1.20	17.3 (17)	18.4 (18)	24.5 (24)	34.7 (34)	5.1 (5)
Periodic training available to upgrade knowledge and skills of drivers.	2.45	1.17	25.5 (25)	30.6 (30)	21.4 (21)	18.4 (18)	4.1 (4)
Habit available to motivate and reward exemplary drivers.	2.5	1.28	30.6 (30)	22.4 (22)	17.3 (17)	25.5 (25)	4.1 (4)
Logbooks available on vehicles and used properly.	2.82	1.20	14.3 (14)	31.6 (31)	20.4 (20)	25.5 (25)	8.2 (8)
Drivers perform routine investigations on vehicles' condition.	3.35	1.02	5.1 (5)	16.3 (16)	26.5 (26)	42.9 (42)	9.2 (9)
Drivers hired with careful procedures.	3.21	1.35	16.3 (16)	17.3 (17)	11.2 (11)	38.8 (38)	16.3 (16)
Drivers carefully implement road safety measures.	3.14	1.28	13.3 (13)	20.4 (20)	20.4 (20)	30.6 (30)	15.3 (15)
Grand Mean	2.91						

Table 4.6 shows that the highest mean score is in the neutral scale (Mean=3.35, SD=1.02) which is about drivers perform routine investigations on vehicles' conditions giving stress that every driver routinely checks the performance of vehicles. While minimum mean score was obtained for availability of habit to motivate and reward exemplary drivers with (Mean=2.5, SD=1.28) and periodic training availability to upgrade knowledge and skills of drivers with (Mean=2.45, SD=1.17) were disagreed by the respondents. The highest strong agreement scores of 16.3% of the total respondents was obtained for careful hiring of drivers with appropriate procedures. Only, 18.4% of the total respondents agreed on the fact that periodic trainings are available to upgrade knowledge and skills of drivers which is the minimum score. This shows that there is a low motive to give training and appreciate well-performing drivers in EPSA.

According to Kidane (2016), 46.4% of the total respondents agree about implementation of road safety measures by drivers which is higher than 30.6% of this study. This implies that road safety measures are implemented well at EPSA.

4.3.1.8 Driver Management Challenges

KI-5 explained that drivers are the last but very important actors in the supply chain due to this the freedom of drivers is respected by the agency. Most respondents said that the salary of drivers is very low and there is no intention of putting pressure on the drivers to help the delivery of HCs go well. Especially, KI-2 said:

“Related to the drivers since their salary is small, often they prefer works done at distant fields. There is a selection of those deliveries with good incentives”.

KI-4 described that the challenges related to drivers are mostly behavioral. There is a conflict of interest in delivering HCs to preferred delivery sites. KI-1 said:

“There is no problem with the fleet management the major problem is related with driver's behavior. Drivers become upset when they are ordered for short-distance delivery sites, a problem related to per diem”.

Additionally, drivers get lost when needed for work, problem of driver's addiction is also the other challenge. All these problems related to the driver may be due to lack of motivational rewards for exemplary drivers. Similarly, 30.6% of the total respondents strongly disagreed with availability of rewards for exemplary drivers as expressed in the descriptive data.

KI-1 and KI-4 reported that even though there was no specified schedule, there was unorganized few trainings given for the drivers especially about the methods of handling of sensitive HCs like that of vaccines. This finding holds true with the descriptive findings where 30.6% of the total 98 respondents disagreed with the availability of periodic training.

On the other hand, trainings on behavioral changes of drivers are not given much concern. KI-5 said:

“Behavioral coaching trainings were not given but it was planned at the end of 2011 EC but it failed because that year our distribution works elevated and also COVID-19 outbreak evolved so attentions were shifted”.

According to KI-4, logbooks are present and sent with the drivers but they are not filled well. 31.6% of the study participants disagree with availability of logbooks and proper use as stated in the descriptive data. KI-3 supported this issue and said that:

“Yes, drivers take logbooks when they depart for delivery. Records are on and off they are not filled by every driver”.

Most KIs reported that drivers are told to take good care of HCs during transportation otherwise some of the road safety measures are violated with some kind of reasons this finding holds true with the descriptive data where 20.4% of the total respondents disagreed with the implementation of road safety measures. Normally, drivers are not permitted to drive at night time but they drive at night to deliver the HCs timely and to find suitable places for spending the night since remote areas would be found on their way. Moreover, driving eight hours per day and having a break after four hours of driving are also violated. Actually, KI-7 explained that there is no mechanism to know the activities of the driver during driving especially at night since the GPS only controls the daytime activities, and also the agency has no intention to put much pressure on the drivers. KI-2 said:

“Road safety measures are designed by the agency but we do not know if the drivers are following it or not as I said before, the GPS is not accurate. Some drivers travel day and night there is no awareness...”.

On the contrary, KI-3 revealed that:

“Most drivers do not drive at night because of security issues...”.

Monnerat, Dias and João (2019) argued that FM cost minimization can be obtained through the proper vehicle and driver assignment measures. The most important thing here is to determine the best assignment model of vehicles and drivers for the planned trips to minimize the total cost. Costs involved in trips include resource, vehicle operating, and driver assignment costs, unlike drivers' salary. Resource assignment of trips should consider variables like time, distance, and the uncertainty associated with the vehicle requisitions. The finding supported this study that most of the expenses in FM areas of EPSA are related to improper resource assignment for vehicles but they are definitely avoidable. Extended downtimes of vehicles are observed in the agency which are associated with unplanned rather huge costs. On trip expenses like parking, grease and tires are also barely monitored in the agency.

4.3.2 Summarized Fleet Activities Practicability Levels

Practicability of Fleet Activities

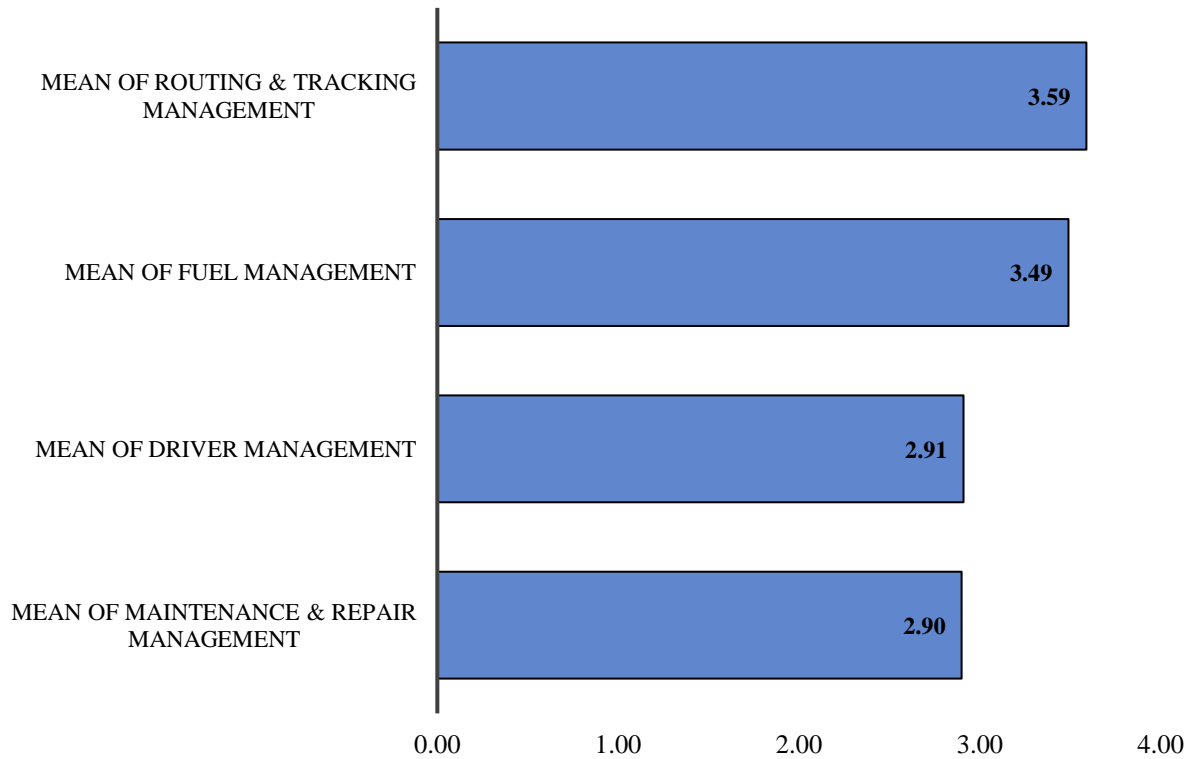


Figure 4.1: Summarized Fleet Activities Practicability

Source: Own Study findings (2021)

According to the grand mean values stated in **Figure 4.1** the descriptive findings of this study show that there is almost a similar finding with Ambaye (2019) where Ambaye reported that vehicle routing & tracking management is the most practiced FM activity followed by vehicle fuel management. The findings of this study reveal that vehicle routing & tracking management with (Grand mean=3.59) is the most implemented FM practice in EPSA. The least employed activity is maintenance & repair management with (Grand mean=2.9). This shows clearly where the areas of intervention should lie in sequence of the activities practiced in EPSA. Additionally, all the fleet activities are important components of fleet practice for EPSA as Mare (2016) studied the importance of these activities for service delivery of the agency.

4.3.3 Fleet Management Performance

Fleet management performance has four important activities namely percentage vehicle downtime, average delivery time, percentage vehicle availability, and total FM operating cost. The mean, standard deviation, percentages scores, and counts (n) in bracket obtained from the total respondents are presented in the following section.

Table 4.7: Fleet Management Performance

Activities	Mean	Standard Deviation (SD)	Percentage Scores (n=98)				
			Sd [1]	D [2]	N [3]	A [4]	Sa [5]
The fleet management is responsive during the delivery of health commodities.	3.85	0.86	1.0 (1)	7.1 (7)	18.4 (18)	53.1 (52)	20.4 (20)
Downtime of vehicles is low during maintenance and repair of vehicles.	2.56	1.04	16.3 (16)	34.7 (34)	27.6 (27)	19.4 (19)	2.0 (2)
A sufficient amounts of delivery vehicles are availed for shipment as scheduled.	3.44	1.06	2.0 (2)	22.4 (22)	20.4 (20)	39.8 (39)	15.3 (15)
Total fleet operating cost is low or approximate as compared to the budget.	3.76	0.77	0 (0)	6.1 (6)	26.5 (26)	53.1 (52)	14.3 (14)
Grand Mean	3.40						

Table 4.7 shows that the maximum agreed activity by the respondents with (Mean=3.85, SD=0.86) is about the FM is responsive during delivery of HCs to EPSA branches and health facilities showing that the agency has given much concern on minimizing the average delivery time of vehicles. The minimum mean score is found in the neutral range (Mean=2.56, SD=1.04) which is about downtime of vehicles is low during maintenance & repair. About 53.1% of the total respondents agree on the fact that total fleet operating cost is low or approximate as compared to the budget which is the highest percentage score other than average delivery time. Only 2% of the total respondents strongly agreed about the low percentage vehicle downtime of vehicles during maintenance & repair whereby the minimum percentage is recorded.

According to Alemu (2019), who studied factors affecting effectiveness of pharmaceutical distribution in EPSA Addis Ababa branch, found that 29% of the total respondents agree on responsiveness of the agency during delivery of HCs. This finding is very low as compared to this study which is 53.1% showing that the agency is very responsive during delivery.

4.3.3.1 Fleet Management Performance Challenges

KI-6 reported that average delivery time and percentage of delivery vehicles availed are found in the desirable range of scores compared to the target where KPI findings show that only an average delivery time of 4.2 days is needed to deliver HCs from EPSA head office to the branches. The agency has set a fixed number of days to complete back and forth movements of vehicles from the very distant branch at Shire to the very nearest branch at Addis Ababa and also from the branches to the respective health facilities. All the respondents said that most of the time HCs are delivered to aimed branches and health facilities early or in time, excluding occasions of accidents and technical problems during travel. This was also agreed in the descriptive data where only 1% of the total 98 respondents strongly disagreed with the responsiveness of the agency. KI-5 said:

“...most delaying factors are office works which are beyond our control otherwise the average delivery time is so small.”

KI-3 reported that by default if there is less average delivery time, the availability of delivery vehicles would be high. Hence, the percentage of delivery vehicles availed is more than 85% for most of the branches which is approximate to the plan. KPI findings from Hawassa and Gondar EPSA branches also confirmed that 94.4% and 96.2% (see tables: 4.11 and 4.12) of the total vehicles were available when needed respectively. KI-1 exclaimed that:

“Percentage of delivery vehicles availed is always 100%!”

On the other hand, KI-4 reported that the percentage of vehicle downtime is higher than the target because plenty of times are consumed for purpose of maintenance & repair this holds true with the finding in the descriptive data where 34.7% of the total respondents disagreed about low vehicle downtimes. KI-3 said that there is a condition where vehicles stay more than one year at an external company's garage. This can be supported with the KPI finding where percentage vehicle downtime of vehicles for EPSA head office, Addis Ababa, Adama, Hawassa, and Gondar branches were 17.86%, 28.6%, 16.74%, 39.9%, and 17.56% respectively (see tables: 4.8, 4.9, 4.10, 4.11, and 4.12) where all the percentage scores are greater than 14% (i.e., the standard for EPSA).

Concerning total fleet operating cost, the budget is formulated based on previous years' expenses and some margins are added related to current situations. KI-5 said,

“Budget exceeding does not occur because the budget is formulated based on previous years' trend”.

However, KI-4, KI-5, and KI-7 reported that even if budget is not exceeded, there is a strong belief that large costs could be saved if there is a well-organized garage owned by the agency at least at the head office and if effective tracking systems of vehicles like GPS is fully operated. This holds true with the descriptive data where none of the total respondents strongly disagreed about low total fleet operating costs.

KI-2 reported that there is a plan to provide quality services with the existing capability even if there are problems of infrastructure and manpower, especially in the fleet areas. KI-5 described that large amount of expenses are contributed from the fleet especially maintenance and fuel expenses, where higher officials of EPSA should give due to concerns for these issues. Since the supply chain is the interlink between multiple actors, if there is a tiny failure at some point it would affect the whole process. KI-1 said:

“...the most prevailing challenge in the agency is lack of commitment on planned activities by each actor in the fleet management”.

In the following section document reviews (KPI findings) are presented across EPSA head office and the four branches of EPSA (Gondar, Hawassa, Addis Ababa1, and Adama).

4.3.3.2 KPI results of EPSA Head Office and the Branches

As per the second objective of this study, the FM performance of EPSA is presented in the following section. The KPI results of EPSA head office and the branches are presented to substantiate the findings from the qualitative and quantitative approaches. All the results were gathered from reports, financial statements, and documentations found in DFM, finance, GS, and dash boards of IT department. The KPI findings are significantly different within each branch of the agency as well as the head office. The possible reasons for all these differences are variations in range of tasks and distance variations of the branches and the head office. The task of the head office is distributing HCs to the 19 branches but the task of EPSA branches is delivering HCs to all health facilities (hospitals and health centers) in Ethiopia. For instance, average delivery time is different between EPSA branches and the head office since there is distance difference between the sites of delivery for the head office and the branch.

Percentage vehicle downtime, percentage vehicle availability and fleet operating cost also varies among the branches based on the number of vehicles managed by each branch and actual performance of the branches. Adama branch as a center of excellence has the most advanced work environment among the branches hence the KPI findings also show best scores. Generally, the head office has many vehicles for the inbound and outbound services and the range of tasks are also broader than the branches so the KPI findings also varies significantly.

4.3.3.2.1 KPI Results for EPSA Head Office

Table 4.8: EPSA Head Office KPI Results

S. no	Month	Average delivery time	Percentage vehicle downtime	Percentage vehicle availability
1	December	3.48 days	18.5%	60%
2	January	4.45 days	11%	79%
3	February	5.03 days	23%	96%
4	March	3.96 days	18.8%	63.5%
5	April	4.1 days	18%	80.2%
Average KPI results		4.2 days	17.86%	75.74%

Source: EPSA head office monthly reports of DFM office and GPS (2012 EC)

Table 4.8 shows document reviews of five months 2012 EC for three fleet indicators. The findings show that the average delivery time is 4.2 days which is performing well as compared to the most distant travel to Shire consuming 10 days. Percentage vehicle availability is 75.74% which is lower than the agency's standard (>95%). This indicates that vehicles are not available as needed.

Percentage vehicle downtime is 17.86% which is higher than the standard set by the agency (<14%). This is an indication of poor utilization of vehicles where the vehicles stay longer for maintenance & repair.

4.3.3.2.2 KPI Results for Addis Ababa Hana Mariam (Addis Ababa1) EPSA Branch

Table 4.9: KPI Results of Addis Ababa Hana Mariam Branch

S. no	Month	Percentage vehicle downtime	
		Expected working time	Out of operation time
1	January-March	1080	377
2	April-May	540	246
3	June	240	149
4	July-December	2700	531
Total		4560	1303
Average result			28.6%

Source: Addis Ababa1 EPSA summarized monthly reports (2012 EC)

Table 4.9 shows document reviews of the year 2012 EC for percentage vehicle downtime. The downtime was found to be 28.6% which is very high as compared to the agency's standard (<14%). This indicates that vehicles stay without operation for plenty of days. In the document review, the researcher observed that there was one vehicle that stayed for a maximum of six months in a garage.

4.3.3.2.3 KPI Results for Adama EPSA Branch

Table 4.10: KPI Results of Adama EPSA

S. no	Month	Percentage of vehicle availability
1	September	78.85%
2	October	72.83%
3	November	75.35%
4	December	73.65%
5	January	68.64%
6	February	78.09%
7	March	72.22%
8	April	70.31%
9	May	47.61%
10	June	53.33%
11	July	48.92%
12	August	89.23%
13	Pagume	94.44%
Total		923.47%
Average result		71.04%

Source: Adama EPSA summarized monthly reports (2012 EC)

Table 4.10 shows results of percentage vehicle availability for Adama branch in 2012 EC. Although, Adama branch is performing well with all process level KPIs the FM issue is challenging as the rest of the branches. This is because vehicle maintenance is largely outsourced at the agency standards. Here, the percentage of vehicle availability is 71.04% which is much lower than the agency’s standard (>95%) and Adama branch standard (75%). This shows that vehicles are not available exactly at the time of request however the distribution team leader clarified that the vehicles may be available in the next days of inquiry. Moreover, the summarized average delivery time of vehicles is 3.8 days which is good as compared to the most distant places delivery days (12 days) and the percentage vehicle availability is 16.74% which is a bit higher than the target 14%.

4.3.3.2.4 KPI Results of Hawassa EPSA Branch

Table 4.11: Hawassa EPSA KPI Results

Sr. No.	Name of the KPIs	Quarterly target	Formula (Numerator/Denominator)		
			Numerator	Denominator	KPI Result
1	Average delivery time	NA	40	15	2.7 hrs
2	Percentage vehicle down time	20%	3680	9216	39.9%
3	Percentage of delivery vehicles availed	90%	119	126	94.4%

Source: Hawassa EPSA summarized quarterly reports (2012/2013 EC)

Table 4.11 shows quarterly reports of the KPIs for the Hawassa branch. The average delivery time is 2.7 hrs which is very small when compared to the longest route which consumes 8 days. This shows that vehicles complete assigned routes without being late from the intended schedules. The percentage of vehicle downtime is 39.9% which is way over than the branch’s target (20%) and the agency’s target (<14%). This is an indication that vehicles stay plenty of days in the garage. However, the percentage of vehicles availed is performing well (94.4%) as compared to the branch’s target (90%). This means vehicles are available as needed.

4.3.3.2.5 KPI Results for Gondar EPSA Branch

Table 4.12: Gondar EPSA KPI Results

S. no	Month	Average delivery time		Percentage vehicle downtime		Percentage vehicle availability	
		Total time taken (hrs)	Total no of HF	Expected working time	Out of operation time	Total no of vehicle requested	Total no of vehicle availed
1	September	245.62	59	1092	337	14	13
2	October	217.62	55	1092	337	18	16
3	November	166.6	64	819	195	9	9
4	December	148.48	76	546	117	9	9
5	January	195.33	85	1092	20.5	13	13
6	February	233.25	58	1092	0	16	16
Average KPI Results		3.04 hrs		17.56%		96.2%	

Source: Gondar EPSA summarized monthly reports (2012 EC)

Table 4.12 shows that the data review was made for the first six months of the year 2012 EC and the KPI results were found. From the findings, the average delivery time is 3.04 hours that is very small as compared to the most distant route. This shows that HCs are delivered on time and even early. Percentage vehicle downtime is 17.56% which is higher than the agency's standard (<14%). This indicates that vehicles stay out of operation for an extended period either for service or maintenance. Percentage vehicle availability is 96.2% which in line with the standard set by the agency (>95%). Actually, percentage vehicle availability is directly proportional to the average delivery time of vehicles.

4.3.3.2.6 Fleet Operating Cost Findings Summarized

Table 4.13: Total Fleet Operating Cost (2012 EC)

Branches	Fleet Management Operating Costs (in ETB)										
	Vehicle Maintenance & repair cost		Vehicle Fuel consumption cost		Per diem cost		Vehicle Outsourcing cost (rent)		Labor cost (loading or unloading)		Total Expense
	E	B	E	B	E	B	E	B	E	B	
EPISA head office	7,253,225 .18	6,762,2 87.54	15,687, 769.52	13,69 0,496	3,591,9 00	NA	8,296,3 61.94	5,547,1 80	335,768 .3	14,763,969.7 5	35,165,024.94
Addis Ababa 1	1,897,567 .96	832,67 0.04	1,059,9 39.76	1,324, 912.2	346,60 2.34	723,8 09.88	NA	NA	488,170	402,819.3	3,792,280.06
Adama	2,516,000 .46	2,552,7 60.96	8,689,3 32.24	3,000, 000	2,307,6 01.67	322,3 95	NA	NA	1,782,1 50.52	NA	15,295,084.89
Jimma	1,622,534 .98	NA	2,050,2 82.06	NA	3,655,5 57.74	NA	569,00 0	NA	384,802 .4	NA	8,282,177.18
Hawassa	1,223,671 .17	2,050,6 63.91	2,643,8 86.42	2,845, 477	4,381,6 09.41	4,926, 644.8	213,48 3	NA	269,987 .2	NA	8,732,637.2

* E - Expenses *B - Budget *NA - Data Not available *ETB - Ethiopian Birr

Source: Operating costs of five EPISA offices from DFM, finance and GS annual report (2012 EC)

Table 4.13 shows summarized fleet operating cost data collected for the year 2012 EC. The data was gathered from EPSA head office, Addis Ababa Hana Mariam (Addis Ababa 1), Adama, Jimma, and Hawassa branches where Gondar and Mekelle branches were left behind due to the absence of complete data. The total costs are very high but comparable to the yearly budget since the fiscal budget year is planned based on past records. However, there exists some exceeding costs as compared to the yearly budget like in maintenance & repair, fuel and per diem expenses as viewed in the table. According to the data the total fleet operating cost for each of the five offices vary considerably this was due the variation in range of tasks of the head office and the branch. EPSA head office invests more than 35 million ETB yearly for major fleet operating activities which is the highest expense. The detailed monthly fleet operating expenses and travelled Kilometer data of EPSA head office are presented as follows for better understanding of the results.

Source: EPSA head office, from DFM department half year reports (2012 EC)

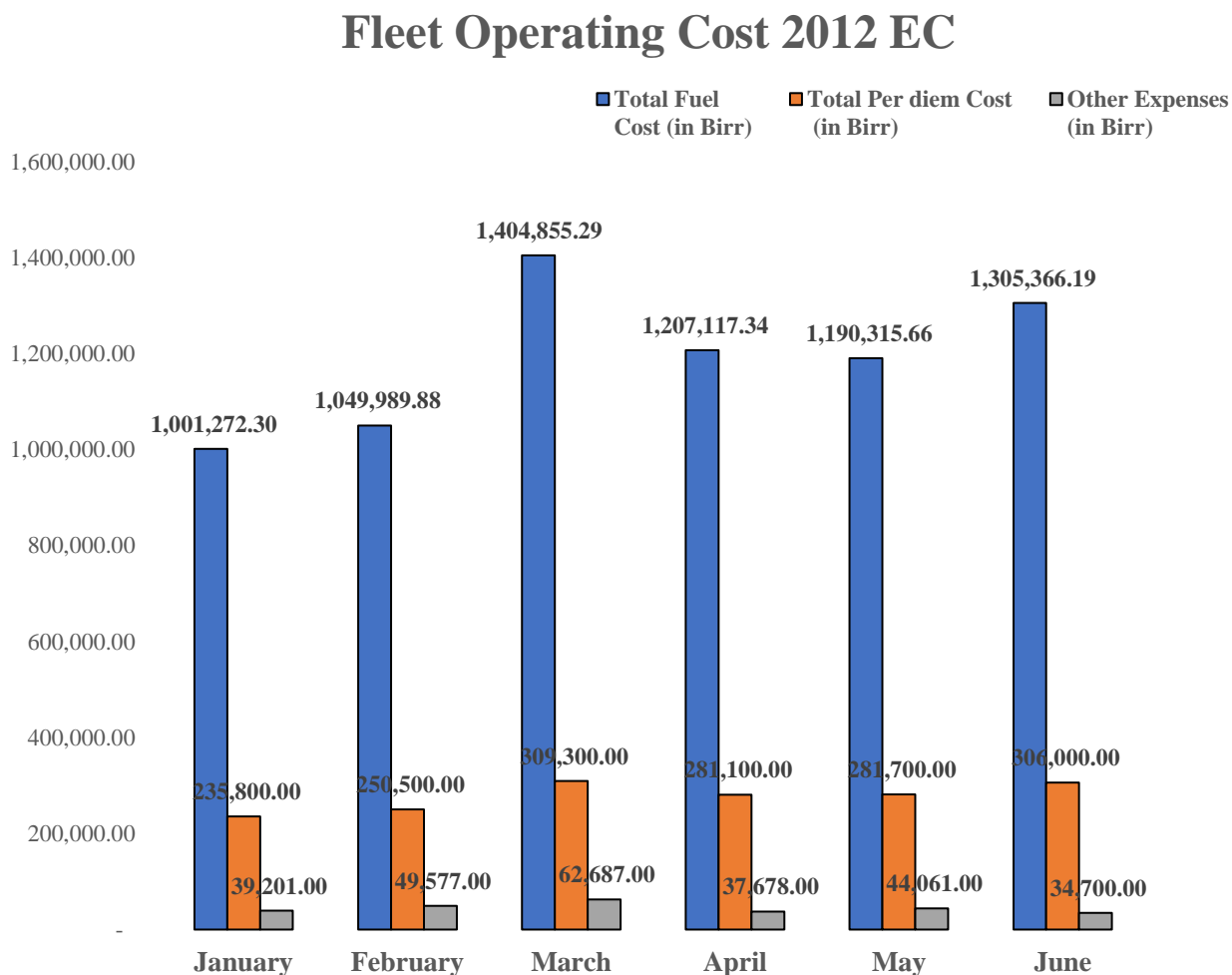


Figure 4.2: Fleet Operating Costs for EPSA Head Office

In Figure 4.2; total fuel costs, per diem costs and other expenses are represented by the first, second, and third bars respectively. The figure indicates that fuel costs are the highest and show nonlinear increment throughout the year. This may be due to increasing costs of fuel on market and increasing flow of vehicles due to contingency plans like the COVID-19 outbreak. The highest fuel cost was recorded on March (1,404,855.29 ETB) followed by June (1,305,366.19 ETB). Other expenses include minor costs like parking and grease which are to be used for sudden requirements for vehicles. Per diem costs are calculated based on the days scheduled for the back-and-forth movement of vehicles to a certain place multiplied with 300 ETB the daily wage set for the agency. Accordingly, the per diem cost and other costs were also the highest in March which was 309,300.00 ETB and 62,687.00 ETB respectively, the same was true for the rest of the months. This shows that there is a direct relationship between fuel cost, per diem cost, and other expenses.

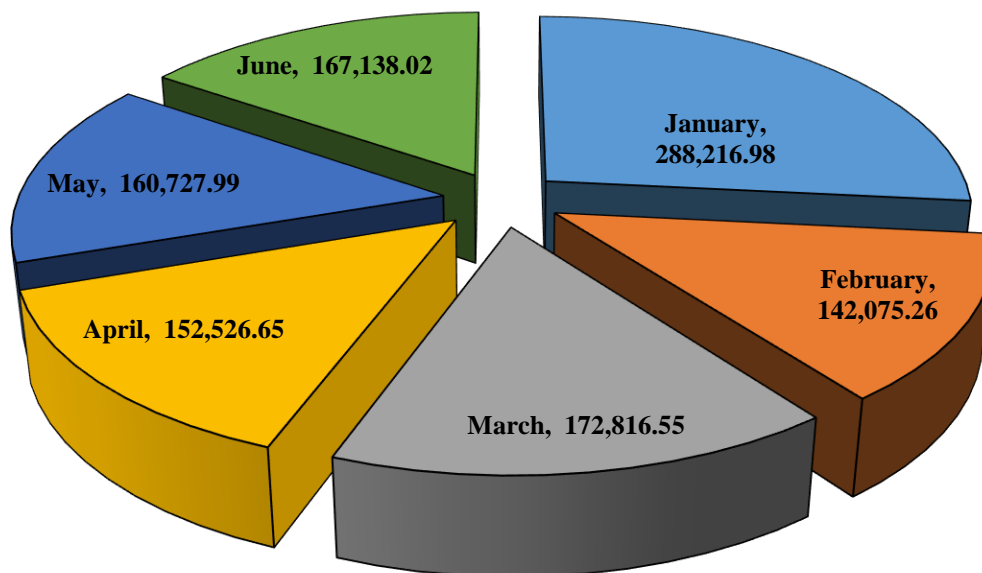


Figure 4.3: Vehicle Distance Travelled (in Km) for EPSA Head Office

Source: EPSA head office, from DFM department and GPS reports (2012 EC)

Figure 4.3 shows the total kilometers traveled per month in 2012 EC. Fuel costs are calculated based on total kilometers traveled by the vehicle divided by the kilometers per liter model of the vehicle and then multiplied with the current monetary value of fuel per liter. The highest kilometers were recorded on January 288,216.98 Km but the total fuel expense is not the highest in January which is 1,001,272.30 ETB (from figure 4.2). This shows that there are also other factors affecting vehicle fuel cost in addition to kilometers traveled.

The cost analysis result reveals that maintenance & repair are the practices where the majority of operational fleet expenditures are spent. This finding is similar with the findings of Martinez and Van Wassenhove (2012), who reported that maintenance costs for humanitarian field fleets are quite high for a variety of reasons. According to Eruguz, Tan and Houtum (2015), the issue of maintenance & repair should be given close attention because it accounts for a significant portion of transportation cost. Another issue resulting in high prices is the lack of standardization of vehicle to Ethiopian specification. Without regard for standards, a considerable number of vehicles are donated to EPSA. Generally, fleet operating costs majorly include fuel, maintenance & repairs, per diem, loading & unloading, and outsourcing costs of vehicles (USAID | Deliver Project, 2010a, 2013). However, cost data are very challenging to track and are absent lately becoming limitations for most studies (Amirah *et al.*, 2014) this study also faced the same drawback.

4.4 Inferential Analysis

Based on the third objective of this study, implications of FM practices on the fleet performance of EPSA is presented in this section. Correlation analysis shows the strength and direction of the relationship between two variables whereas regression analysis shows the predicting power (estimates) of the independent variables over the outcome variable (Gay, Mills and Airasian, 2012). The inferential statistics conducted in this study include Spearman's correlation and OLR.

4.4.1 Correlation Analysis

Preliminary assumptions tests (i.e., monotonicity and ordinal nature) for Spearman correlation were satisfied as stated in **Annex V**. Therefore, Spearman correlation was used to determine the association between mean score of maintenance & repair management, mean score of fuel management, mean score of routing & tracking management, and mean score of driver management against mean score of fleet performance. The guideline for spearman correlation coefficient value interpretation is elaborated in chapter three, data entry and analysis technique section (**3.8.1.1.1**).

Table 4.14: Spearman Correlation Analysis

			Maintenance & Repair Management	Fuel Management	Routing & Tracking Management	Driver Management
Spearman's rho	Maintenance & Repair Management	Correlation Coefficient	1.000			
		Sig. (2-tailed)	.			
	Fuel Management	Correlation Coefficient	.530**	1.000		
		Sig. (2-tailed)	.000	.		
	Routing & Tracking Management	Correlation Coefficient	.443**	.305*	1.000	
	Sig. (2-tailed)	.000	.002	.		
	Driver Management	Correlation Coefficient	.195**	.066**	.159**	1.000
		Sig. (2-tailed)	.054	.522	.117	.
	Fleet Performance	Correlation Coefficient	.559**	.458**	.421**	.246**
		Sig. (2-tailed)	.000	.000	.000	.015

Own Study findings (2021)

Table 4.14 shows that there is a statistically significant positive and moderate degree of relationship, between FM performance and maintenance & repair management with ($\rho=0.559$, $p=0.000$), between FM performance and fuel management with ($\rho=0.458$, $p=0.000$), between FM performance and routing & tracking management with ($\rho=0.421$, $p=0.000$). Similarly, there is a statistically positive and weak degree of association between FM performance and driver management with ($\rho=0.246$, $p=0.015$). Overall, it can be generalized that an increase or decrease in implementation level of FM practices like maintenance & repair, fuel, routing & tracking, and driver management are directly related to an increase or decrease in the FM performance (i.e., when FM practices are implemented well the FM performance would be enhanced and vice versa).

The correlation analysis of this study shows that there is a statistically significant and positive relationship between FM performance and all the FM practices. This finding holds true with Begashaw (2018) where the four FM practices are positively correlated with the fleet performance. According to Giathi and Karanja (2016), vehicle tracking technologies significantly and positively influence the fleet performance. Cost minimization, fuel controls, cycle times minimization, fleet safety, driver tracking, and maintenance controls can be strengthened with the use of ICT. This in turn helps to enhance the fleet performance of a certain organization.

4.4.2 Regression Analysis

In this study, the assumption tests for linear regression were not satisfied since the data were not normally distributed and ordinal data were involved in the study (Hanusz and Tarasińska, 2015). Therefore, the researcher proceeded to test the assumptions for ordinal logistic regression.

4.4.2.1 Preliminary Assumption Test Results

Preliminary assumptions were set and those assumptions were tested using SPSS before running OLR model which are elaborated in **Annex VI**. The tests include; multi-collinearity, and test of parallel lines (Schumacker and Lomax, 2010; Pallant, 2011). The two tests were conducted and assumptions were totally met which permits to conduct ordinal logistic regression. Hence:

- ✓ Assumption one: there is no multi-collinearity problem.
- ✓ Assumption two: there are proportional odds or parallel lines.

4.4.2.2 Ordinal Logistic Regression

The prediction power of mean score of maintenance & repair management, mean score of fuel management, mean score of routing & tracking management, and mean score of driver management against mean score of fleet performance was determined using OLR analysis. Quality of fit statistics, pseudo-R-square, and parameter estimates are all illustrated in this section.

4.4.2.2.1 Quality of fit statistics and Pseudo R-square

Table 4.15: Model Information

Test statistics	Chi-Square	df	Sig.
Omnibus Tests of Model Fitting Information	44.870	4	.000
Hosmer-Lemeshow Goodness of Fit Test	1155.827	1160	.529
Pseudo R-Square (Nagelkerke, Cox & Snell)	0.878, 0.865		

Source: Own Study finding (2021)

According to **Table 4.15**, the following three results could be obtained. Based on the model fitting information, the chi-square statistic ($X^2(4) = 44.870$, $p < .05$) indicates that the final model has significant improvement over the baseline intercept-only model. Therefore, this result implies that there is a significant difference between the baseline model and the final model. The goodness of fit test shows that the chi-square statistic ($X^2(1160) = 1155.827$, $p > .05$) where the Pearson significant value is 0.529. Here, the null hypothesis implies that the observed data is having a good fit with the

proposed model. Therefore, the data used in this study significantly fit the model proposed indicating the model has a good fit. Pseudo R-square (Nagelkerke) shows that its value is 0.878. In percentage, about 87.8% of the total variability in FM performance is explained by maintenance & repair, fuel, routing & tracking, and driver management while only about 12.2% are left unexplained by the model. This implies that the proposed model has a good predictability power for fleet performance where the majority of the variabilities were explained.

4.4.2.2.2 Parameter Estimates

Parameter estimates describe the most crucial detailed relationship between the outcome and predictor variables including how much each predictor variable contributes to the dependent variable.

Table 4.16: Parameter Estimates

Parameter	β	Std. Error	df	Sig.	Odds ratio, Exp(β)
Maintenance & Repair Management	1.136	.3744	1	.002	3.115
Fuel Management	.636	.3162	1	.044	1.890
Routing & Tracking Management	.846	.4072	1	.038	2.331
Driver Management	.526	.4742	1	.267	1.691

**Dependent Variable: Fleet Performance*

**Independent Variables: Maintenance & Repair Management, Fuel Management, Routing & Tracking Management, Driver Management*

Source: Own Study Findings (2021)

Table 4.16 shows that all the significant values for maintenance & repair, fuel, and routing & tracking management are less than 0.05 meaning that there is a significant prediction of the three practices towards fleet performance. However, driver management has a significant value greater than 0.05 indicating that driver management was not a significant predictor in the model. Odds ratios (exponents of the estimates) are used for interpretation instead of the estimates. According to the odds ratio, interpretations and significance levels could be stated as follows:

- ❖ Maintenance & repair practices were a significant positive predictors of FM performance in the model. The odds ratio indicates that the odds of being in a higher-level of FM performance increases by a factor of **3.115** for every one-unit increase in maintenance & repair activities, holding all other variables constant.
- ❖ Fuel management practices were a significant positive predictors of fleet performance in the model. The odds ratio indicates that the odds of being in a higher-level of FM performance increases by a factor of **1.890** for every one-unit increase in fuel management activities, holding all other variables constant.
- ❖ Routing & tracking practices were a significant positive predictors of fleet performance in the model. The odds ratio indicates that the odds of being in a higher-level of FM performance increases by a factor of **2.331** for every one-unit increase in routing & tracking activities, holding all other variables constant.
- ❖ Driver management practices were not a significant predictors of FM performance in the model but it has positive predicting power. The odds ratio indicates that the odds of being in a higher-level of FM performance increases by a factor of **1.691** for every one-unit increase in driver management activities, holding all other variables constant.

It can be generalized that all the FM practices are positive predictors of fleet performance. Maintenance & repair activities have the highest positive predicting power for FM performance of EPSA followed by routing & tracking and fuel management activities. Driver management practices have the least positive predicting power in addition to insignificant values of the prediction.

According to Gitahi and Ogollah (2014), all the four FM practices have statistically significant predictive power for the dependent variable. Overall, this study reveals that the predictive power of maintenance & repair management for FM performance is the highest followed by vehicle routing & tracking and fuel management respectively. Similarly, Gitahi and Ogollah reported that driver management is the least to predict service delivery and also holds true for maintenance & repair management where both findings reveal that it has better-predicting power. The study emphasized that a well-maintained and managed vehicle can result in 20-30% or more cost savings.

Chapter Five

5 Summary, Conclusion, Recommendation, and Limitation

This is the final part of this study which includes summary, conclusion, recommendation, limitations, and way forwards which are drawn based on the results of the study.

5.1 Summary

The descriptive analysis shows that all the four fleet activity dimensions were practiced with a grand mean value of (Mean>2.5). The most practiced activities are routing & tracking with (Mean=3.59) and fuel management with (Mean=3.49) and the least practiced activities are driver management with (Mean=2.91) and maintenance & repair (Mean=2.9) where poor spare part management takes the lead. Average delivery time is the highest fleet performance for the agency with (Mean=3.85) while percentage vehicle downtime is the least performance for the agency with (Mean=2.56).

With regard to the correlation and regression analysis, the study shows that there is a positive and significant relationship between the four fleet practices and the FM performance. Even if there is a significant positive association between driver management and FM performance, driver management does not have significant predicting power ($\beta=.526$, $p=.267$) for FM performance. Maintenance & repair ($\beta=1.136$; $p=.002$), routing & tracking ($\beta=.846$; $p=.038$), and fuel management ($\beta=.636$; $p=.044$) have significant and most predicting powers for the fleet performance of EPSA respectively. This implies that, in EPSA when maintenance & repair, fuel, and routing & tracking management show deterioration or improvement, the FM performance deteriorates or improves directly.

The extent of influence of fleet practices can be triangulated with FM performance KPIs. Accordingly, the implication of fleet maintenance & repair is supported with fleet KPIs measurement findings where percentage vehicle downtime of vehicles was very high at EPSA, mostly greater than 14%. Additionally, maintenance & repair is the most frequent contributing factor for overall fleet-related costs followed by fuel costs. Results of this study shows that mostly the expenses of maintenance & repair and fuel exceed the fiscal budget year. Overall; the fleet responsiveness, effectiveness, and efficiency of EPSA are compromised with the actual poor fleet practices on the ground.

The findings on FM challenges at EPSA shows that delay in maintenance & repair, driver behavioral problems, use of manual routing & tracking methods, and unjustified fuel consumption reports are encountered. The delay in maintenance can be explained by two categories as internal and external challenges. In EPSA maintenance services are provided internally for only minor tasks like oil changes however most vehicle services are outsourced. Internally the challenges are lack of well-skilled technicians, absence of spare workshops, and lack of well-organized infrastructure for the garage. External challenges related to maintenance providing companies include lack of vehicle spare parts, hard currency shortage, lack of EPSA's controlling body at private company's garage, and service congestion.

The outcome of the challenges could be triangulated with the fleet performance. This means if vehicle maintenance services are mostly outsourced there is a huge amount of cost implication where it could have been saved internally. The other major challenge is the manual routing & tracking system, this could be resolved with modern technologies like GPS where all important features in the fleet are included. The GPS is not fully implemented in the agency due to lack of awareness among concerned staffs and conflict of interest with the drivers. Generally, the final consequences of these FM challenges in EPSA were delayed, ineffective, and inefficient performances of the services they provide.

5.2 Conclusion

As per the study findings and literature, the researcher came up with some major conclusions about this study. The researcher concludes that maintenance & repair activities are poorly practiced in EPSA when compared to other FM activities. This was due to large investments needed to carry on complete maintenance & repair activities whereby outsourcing services was taken as an immediate solution in case of vehicle breakdown. On the contrary, fuel management was given better concern by EPSA whereby expenses and normalizations of all the distribution routes are formulated and monitored.

The fleet KPI findings of EPSA are the results of the actual FM practices in the agency whereby the findings showed that vehicle downtime is very high as a result of poor practices of maintenance & repair, like delays during service provisions. The average delivery time in EPSA is low as a result of high percentage of vehicle availability, this indicates that the agency is using available and functioning vehicles effectively. However, the efficiency of the agency is in question since unnecessary large expenses were reported related to especially fuel and outsourced maintenance & repair management activities.

All the four FM practices have a positive and significant association with fleet performance. However, driver management failed to have significant predicting power for fleet performance even if there are some kinds of associations between the two factors. This implies that fuel, routing & tracking, and maintenance & repair management played the leading role in maintaining the current fleet performance of EPSA as compared to driver management.

The critical fleet challenges of EPSA are those related to maintenance & repair which includes absence of well-organized workshops and lack of spare parts for vehicle maintenance & repair. The other major challenge is little or no training provided to drivers for developing their skills concerning the transportation of sensitive medications and behavioral problems. Concerning tracking technology, GPS is implemented on all vehicles of the agency but the only functional feature of the technology is the vehicle position feature.

5.3 Recommendations

The following recommendations are drawn based on the study findings and conclusions:

- ❖ Directors of EPSA and the federal ministry of health (FMOH) need to work together to establish well-organized workshop for EPSA which can accommodate qualified technicians and sufficient spare part stock as much as possible.

- ❖ DFM director need to present records of, high percentage vehicle downtime and high fleet operating costs for discussion with EPSA higher officials in order to come up with immediate and long-term solutions.
- ❖ Fleet managers of EPSA should give more concern for maintenance & repair, fuel, and routing & tracking management since these three fleet practices have the highest and significant predicting power for the agency's fleet performance.
- ❖ EPSA director should work with the IT department to practically transform the routing & tracking methods from outdated manual tasks to more updated technologies like GPS by creating awareness among FM actors in the agency.
- ❖ Capacity building department of EPSA need to provide regular trainings and reward packages for drivers towards developing safe delivery of medicines, mitigation of vehicle breakdowns and shaping driver's behavioral problems.
- ❖ In general, government policy makers should give due concern for those FM tasks where the highest expenses in logistics are attributed nationally.

5.4 Limitations of the Study and Way Forwards

The major limitation of this study is that the FM performance measures are only confined to data available in the agency. Hence, most of the raw data required for the KPIs were neither available nor routinely recorded by the staffs and this made the performance measurement incomplete. During the data collection period, the absence of the majority of staffs (study participants) in each department is the other limitation which was due to the COVID-19 outbreak and the formulated protocols. This resulted with missing some of the study participants during the data collection period. Homogenous sampling method was used for the qualitative study due to limited number of experienced contributors for the study, however, biases may occur due to similar nature of the respondents. The final limitation is the scarcity of strong empirical data needed to support or argue the findings of this study with appropriate statistical analysis.

The researcher suggests further studies on the role and implementation challenges of GPS for the FM of public health care provider institutions. Moreover, assessment of FM performance before and after implementation of GPS is also a very interesting area to work on, since the future FM will be supported with updated technologies but steel its outcome should be well investigated in public health care provider institutions along with the current set up in Ethiopia.

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INFORMATION SHEET

Annexes

Annex I: Information Sheet (English Version)

A. Consent Form

Dear Sir;

My name is Mr. Habtamu Solomon and I am a postgraduate student at Addis Ababa University Department of Pharmaceutics and Social Pharmacy. I am conducting a study on “Fleet management practice, its implication on fleet performance and associated challenges in Ethiopian Pharmaceutical Supply Agency (EPSA)” for the partial fulfillment of a Master’s degree in Health Supply Chain Management. I would like to express my deepest appreciation to you and your company for the willingness and cooperation in undertaking this valuable study. Taking part in this study will contribute towards enhancing the fleet management performance of EPSA. The questions will not take you more than half an hour. The information you provide is totally confidential and will not be disclosed to anyone other than being used for research purposes. Your name, address, and other personal information will be removed from the instrument, and only code will be used to connect your name and your answers without identifying you. Your participation is voluntary and you can withdraw from the study after having agreed to participate.

Are you willing to participate?

Yes: _____

No: _____

Questionnaire Code: _____

Data collector: _____

Signature: _____

Data collection date: _____

✚ If you have any questions about the study, you can contact the interviewer otherwise, you can communicate the principal investigator with the following address:

Habtamu Solomon

Email- habtamu2383@gmail.com

Phone- +251967676064

B. Self-administered Questionnaire

Part I: Demographic Information

1. Current position /title _____
2. Age
 - a. 18-30 years
 - b. 31-40 years
 - c. 41-50 years
 - d. More than 50 years
3. Sex
 - a. Male
 - b. Female
4. Educational level
 - a. Primary school completed
 - b. Secondary school completed
 - c. Preparatory school completed
 - d. College/University completed
 - e. Postgraduate degree completed
5. Years of experience in the agency
 - a. 6 months - 5 years
 - b. 6-10 Years
 - c. 11-15 Years
 - d. More than 15 years

Part II: The following questions focus on what the fleet management practices and performance of EPSA looks like as observed from important fleet management activities and key performance indicators. Please mention the level of your agreement using (√) on the following statements based on your experience in your organization. The ratings are interpreted as follows:

[1 – Strongly Disagree, 2 – Disagree, 3 – Neutral, 4 – Agree, 5 – Strongly Agree]

S. no	Fleet Management Practices	1	2	3	4	5
1	Vehicle Maintenance and Repair Management					
1.1	There is well organized assigned body to control maintenance and repair management of vehicles.					
1.2	The agency has regular maintenance and repair schedule for vehicles.					
1.3	The agency has sufficient safety stock of spare parts when a vehicle fails to work.					
1.4	Qualified mechanics complete maintenance procedures without delay.					
1.5	There is a contingency plan in case the unpredictable happens (i.e., vehicles not functioning and shortage. Ex: Using third party logisticians).					

1.6	Finance officers with transport responsibilities monitor maintenance and repair expenditures.					
1.7	Guidelines are used for procurement of new vehicles and replacement or disposal of old vehicles.					
1.8	There is a planned maximum period of time for vehicles to stay in garage.					
2	Vehicle Fuel Management					
2.1	There is well organized assigned body to control vehicle fuel management.					
2.2	There is a regular follow up of fuel consumption.					
2.3	The agency has set a standard on fuel consumption rate per vehicle.					
2.4	For each vehicle, the number is calculated for kilometers traveled per liter of fuel.					
2.5	The agency has potential fuel sources (suppliers) all over the regions.					
2.6	The agency allocates sufficient budget for fuel expenditures.					
2.7	Finance officers with transport responsibilities monitor fuel expenditures.					
3	Vehicle Routing and Tracking Management					
3.1	The agency is using the vehicle tracking technologies for fleet management. i.e., GPS, GIS...					
3.2	The agency has assigned a person to monitor and manage the routing and tracking system.					
3.3	The agency supervises speed limits, fuel consumption and maintenance scheduling of vehicles using the tracking system.					
3.4	Best routing models are used during delivery of health commodities to EPSA hubs and lower-level health facilities.					
3.5	The agency provides immediate solution for problems encountered in vehicle routing and tracking system.					
3.6	There is a routine analysis to compare actual trips to the scheduled trips.					
3.7	Records are kept for damages incurred on vehicles during transportation of health commodities.					

3.8	For each vehicle, the amount of time calculated and recorded for when it was unusable, undergoing maintenance and ready for use.					
4	Vehicle Driver Management					
4.1	The agency has supervision and performance evaluation method for drivers.					
4.2	Drivers are hired with careful procedures. i.e., vehicles are operated only by a licensed driver.					
4.3	There is a habit to motivate and reward an exemplary driver.					
4.4	Each vehicle operator performs routine daily checks on the vehicle and reports anything that requires attention.					
4.5	There are periodic trainings to upgrade knowledge and skills of drivers.					
4.6	Log books are kept in every vehicle and they are routinely used.					
4.7	Drivers carefully implement road safety measures. i.e., only 8hrs driving per day, only 4hrs of without resting driving time, wearing seat belts and only daylight driving.					
Fleet Management Performance		1	2	3	4	5
1	The fleet management is responsive (timely) during delivery of health commodities to EPSA hubs and health facilities. i.e., low average delivery time.					
2	The downtime of vehicles in the agency is low during the time of maintenance and repair. i.e., low average number of days for vehicles service and average number of days for vehicles maintenance and repair.					
3	Sufficient amounts of delivery vehicles are availed in the agency for shipment as scheduled.					
4	Total fleet operating costs are low or approximate as compared to the budget planned by the agency.					

C. Semi-structured Interview Guide

Interviews with EPSA distribution and fleet management directors about the challenges of fleet management practices and performance of EPSA.

1. What are the challenges of fleet management practices of EPSA related to maintenance and repair of vehicles?
 - 1.1. Is there delay during vehicle maintenance and repair inside and outside the agency?
 - 1.2. If yes; what challenges contribute for the delay?
2. What fleet management practice challenges are encountered by EPSA related to fuel management of vehicles?
 - 2.1. What mechanisms are used to monitor the fuel consumption of vehicles?
 - 2.2. What about the extent of their implementation?
3. What fleet management practice challenges are encountered by EPSA related to vehicle routing and tracking management of vehicles?
 - 3.1. Are records filled by drivers; like vehicle logs, delivery logs, fuel logs and other documents used? If so, how are they monitored?
 - 3.2. What are the challenges encountered during global positioning system (GPS) implementations (if available)?
 - 3.3. How do you see the effectiveness of the selected routes of delivery?
4. What are the challenges of fleet management practices of EPSA related to driver management of vehicles?
 - 4.1. What interventions are used to upgrade knowledge and skills of drivers?
 - 4.2. What are the preliminary road safety measures that drivers take during travel?
5. In general, what are the challenges hindering the desirable fleet management performance of EPSA with respect to key fleet performance indicators of the agency?
 - 5.1. Average delivery time
 - 5.2. Percentage vehicle downtime
 - 5.3. Percentage of delivery vehicles availed
 - 5.4. Total fleet management operating cost
6. If there is anything you want to add about the fleet management of the agency; let me give you the opportunity?

Thank you for your time and support!

Annex II: Information Sheet (Amharic Version)

ሀ. በመጠይቁ ለመሳተፍ የፈቃደኝነት መጠየቅያ ቅጽ

ስሜ አቶ ሀብታሙ ሰሎሞን ይባላል፤ የአዲስ አበባ ዩኒቨርሲቲ የፋርማሲውቲክስና ሶሻል ፋርማሲ የትምህርት ክፍል የድህረ ምረቃ ተማሪ ነኝ። በኢትዮጵያ መድሃኒት አቅርቦት ኤጀንሲ ውስጥ የሥምሪት አገልግሎት ተግባራት በሥምሪት አፈጻጸሙ ላይ ያላቸውን ተጽእኖ አንዲሁም ተግዳሮቶችን በተመለከት ለሁለተኛ ድግሪ ማሟያ ጥናታዊ ጽሁፍ እየሰራሁ እገኛለሁ። የእርስዎ ድርጅት ለዚህ ጥናት ፈቃደኛ በመሆኑ በጣም ደስ ይለኛል። በዚህ ጥናት ላይ መሳተፍ የድርጅቱን የሥምሪት አገልግሎት አፈጻጸም ለማሻሻል እንዲሁም ችግሮችን ለመለየት ይጠቅማል። በመጠይቁ መሳተፍ ከግማሽ ሰዓት ያልበለጠ ጊዜ ይወስዳል። እንዲሁም በዚህ የመጠይቅ ሂደት ውስጥ የሚገኙ ማናቸውም መረጃዎች በምስጢር የሚጠበቁ ይሆናል። ይህም ማለት የሚሰጡንን መረጃ ከጥናት ቡድኑ አባላት ውጭ ለማንም ግልፅ የማደናደርግ ሲሆን የሚዘጋጁ የመጠይቅ ዘገባዎችም እርስዎን እንደ መረጃ ሰጪ የማይጠቅሱ ይሆናል። እርስዎ መናገር ስለማይፈልጉት ነገር ለመናገር እንደማይገደዱ እና መጠይቁን በማንኛውም ጊዜ ማቋረጥ እንደሚችሉም ላስታውስዎት እወዳለሁ። በመጠይቁ ለመሳተፍ ፈቃደኛ ነዎት?

አዎ: _____ አይደለሁም: _____

የመጠይቁ መለያ: _____

መረጃ ስብሰባ: _____ ፊርማ: _____

መረጃ የተሰበሰበበት ቀን: _____

ለ. መጠይቅ

ክፍል ፩: የግለሰብ መረጃ

1. የሚሠሩበት የሙያ መደብ _____

2. እድሜ

ሀ. ከ18-30 ዓመት ለ. 31-40 ዓመት ሐ. 41-50 ዓመት መ. ከ50 ዓመት በላይ

3. ጾታ

ሀ. ወንድ ለ. ሴት

4. የትምህርት ደረጃ

ሀ. የመጀመሪያ ደረጃ ትምህርት ያጠናቀቀ	መ. የኮሌጅ/ ዩኒቨርሲቲ ትምህርት ያጠናቀቀ
ለ. የሁለተኛ ደረጃ ትምህርት ያጠናቀቀ	ሠ. የድህረ ምረቃ ትምህርት ያጠናቀቀ
ሐ. የመሰናዶ ትምህርት ያጠናቀቀ	

5. በኤጀንሲው ውስጥ ያካበቱት የሥራ ልምድ

ሀ. 6 ወር - 5 ዓመት ለ. 6-10 ዓመት ሐ. 11-15 ዓመት መ. ከ15 ዓመት በላይ

ክፍል ፪፡ የሚከተሉት ጥያቄዎች የሚያተኩሩት የኢትዮጵያ መድሃኒት አቅርቦት ኤጀንሲ የሥምሪት አገልግሎት ተግባራት እና የሥምሪት አገልግሎት አፈጻጸም በዋና ዋና ተግባራት አንዲሁም በቁልፍ አፈጻጸም መለኪያዎች አንጻር ሲታዩ ምን ይመስላሉ በሚለው ላይ ነው። በኤጀንሲው ውስጥ ካሉት የሥራ ልምድ አንጻር በሚከተሉት ሀሳቦች ላይ የተስማሙበትን መጠን ያክል በ(✓) ምልክት ያሳዩ። የቁጥሮቹ ውክልና እንደሚከተለው ነው፡-

[1 – እጅግን አልሰማማም 2 – አልሰማማም 3 – ገለልተኛ 4 – እስማማለሁ 5 – እጅግን እስማማለሁ]

ተ.ቁ.	የሥምሪት አገልግሎት ተግባራት	1	2	3	4	5
1	የመኪና ጥገናና እድሳት ተግባራት					
1.1	በድርጅቱ ውስጥ የጥገናና እድሳት አገልግሎቱን የሚቆጣጠር አካል አለ።					
1.2	ድርጅቱ የመኪና ጥገናና እድሳት አገልግሎት የሚሰጥበት መደበኛ የጊዜ ሰሌዳ አለው።					
1.3	ድርጅቱ ለመኪና ጥገናና እድሳት አገልግሎት የሚውል በቂ የመለዋወጫ ክምችት አለው።					
1.4	የድርጅቱ የጥገናና እድሳት አገልግሎት ሰጪዎች በብቃትና አገልግሎቱን ባለማዘግየት ያከናውናሉ።					
1.5	በድርጅቱ ውስጥ ሥምሪትን በተመለከተ ለድንገተኛ አጋጣሚዎች የሚሆኑ እቅዶች ተቀርጸዋል። ለምሳሌ መኪናዎች ቢበላሹና እጥረት ቢያጋጥም የመከራየትና ሌሎችም ርምጃዎች ይወሰዳሉ።					
1.6	የሥምሪት አገልግሎት የሚመለከታቸው የሂሳብ ክፍል አባላት ለጥገናና እድሳት የሚውሉ ወጪዎችን ይቆጣጠራሉ።					
1.7	አዲስ መኪናዎችን ለመግዛትም ይሁን ያረጁ መኪናዎችን ለማስወገድ የተዘጋጁ መመሪያ ሰነዶች ይገኛሉ።					
1.8	በድርጅቱ ውስጥ መኪናዎች የጥገናና እድሳት ክፍል ሊቆዩ የሚገባቸው የመጨረሻ የጊዜ ገደብ አለ።					
2	የመኪና ነዳጅ አገልግሎት ተግባራት					
2.1	በድርጅቱ ውስጥ የመኪና ነዳጅ ፍጆታን የሚቆጣጠር አካል አለ።					
2.2	የመኪና ነዳጅ ፍጆታ ምን ያህል እንደሆነ በመደበኛነት ክትትል ይደረጋል።					
2.3	ድርጅቱ አንድ መኪና በምን ያህል ፍጥነት ምን ያህል የነዳጅ ፍጆታ መኖር እንዳለበት የሚያመለክት መለኪያ መስፈርት አለው።					
2.4	ለአያንዳንዱ መኪና በምን ያህል ሊትር ነዳጅ ምን ያህል ኪሎ ሜትር እንደተጓዘ ይሰላል።					
2.5	ድርጅቱ የነዳጅ አቅረቦቶችን በተፈለገው የሥምሪት ቦታ ላይ ያገኛል።					
2.6	ድርጅቱ ለነዳጅ ግዢ የሚውል በቂ ገንዘብ ይመድባል።					
2.7	የሥምሪት አገልግሎት የሚመለከታቸው የሂሳብ ክፍል አባላት ለነዳጅ ግዢ የሚውሉ ወጪዎችን ይቆጣጠራሉ።					
3	የመኪና ሥምሪትና አጠቃላይ የመኪና ሁኔታዎችን የመቆጣጠር ተግባራት					
3.1	ድርጅቱ ወይም የድርጅቱ ቅርንጫፍ የመኪናዎችን አጠቃላይ ሁኔታ የሚቆጣጠሩ መሳሪያዎችን ይጠቀማሉ። ለምሳሌ ጂፒኤስ					

3.2	በድርጅቱ ውስጥ የመኪናዎችን ሥምሪትና አጠቃላይ ሁኔታዎችን አመለካከት መሳሪያዎችን ተጠቅሞ የሚቆጣጠር አካል አለ።					
3.3	ድርጅቱ የመቆጣጠሪያ መሳሪያዎችን (ጂ.ፒ.ኤስ) በመጠቀም የመኪናዎችን ፍጥነት፣ ነዳጅ ፍጆታ እና የጥገና ቆይታዎችን ይለካል።					
3.4	ድርጅቱ መድሃኒቶችን እና የህክምና መገልገያ መሳሪያዎችን ወደ ቅርንጫፎች እና ጤና ተቋማት ለማዳረስ ውጤታማ የሥምሪት አማራጮችን ይጠቀማል።					
3.5	ድርጅቱ የመኪናዎችን ሥምሪትና አጠቃላይ ሁኔታዎችን በተመለከተ የሚያጋጥሙ ችግሮችን በአፋጣኝ ሁኔታ ይፈታል።					
3.6	የታቀደው የመኪናዎች ሥምሪትና በተግባር ላይ የዋሉ ሥምሪቶች በንጽጽር ቀርበው ይመረመራሉ።					
3.7	በጉዞ ወቅት ያጋጠሙ የመድሃኒትና የህክምና መገልገያ መሳሪያዎች ብልሽት ሲኖር በአግባቡ ይመዘገባሉ።					
3.8	ማንኛውም መኪና ከአገልግሎት ውጪ የነበረበት፣ በጥገና ላይ የነበረበትና ሥራ የጀመረበት ጊዜ ይመዘገባል።					
4	የመኪና አሽከርካሪ አገልግሎት ተግባራት					
4.1	ድርጅቱ የእያንዳንዱን አሽከርካሪ ተግባራት የሚቆጣጠርበት እና አፈጻጸሙን የሚገመግምበት ስልት አለው።					
4.2	የአሽከርካሪዎች ቅጥር መመሪያውን ተከትለው ይፈጸማሉ። ለምሳሌ የመንጃ ፈቃድ ያላቸው አሽከርካሪዎች ብቻ መኪናዎችን ያንቀሳቅሳሉ።					
4.3	በድርጅቱ ውስጥ መልካም አፈጻጸም ያላቸው አሽከርካሪዎችን የማበረታታት ልምዶች አሉ።					
4.4	እያንዳንዱ አሽከርካሪ የመኪናዎችን ቴክኒካዊ ብቃት ሁል ጊዜ ይከታተላሉ ችግር ሲኖርም ለሚመለከተው ያሳውቃሉ።					
4.5	ድርጅቱ የተወሰኑ ጊዜያትን መደብ ለአሽከርካሪዎች ሥልጠናና የብቃት ማሳደጊያ ትምህርቶችን ይሰጣል።					
4.6	በአሽከርካሪዎች የሚሞሉ መደበኛ የጉዞ ማስታወሻዎች መኪና ውስጥ በማንኛውም ጊዜ ይቀመጣሉ እንዲሁም በአግባቡ በአሽከርካሪዎች ይሞላሉ።					
4.7	አሽከርካሪዎች ጉዞ ላይ የሚደረጉ ጥንቃቄዎችን በአግባቡ ይተገብራሉ። ለምሳሌ በቀን ለ8 ሰአታት ብቻ ማሽከርከር፣ ያለ እረፍት የሚደረጉ ጉዞዎች ቢበዛ ለ4 ሰአታት ብቻ ማሽከርከርና በቀን (በብርሃን) ብቻ ማሽከርከር።					
	የሥምሪት አገልግሎት አፈጻጸም	1	2	3	4	5
1	ድርጅቱ መድሃኒቶችን እና የህክምና መገልገያ መሳሪያዎችን ወደ ቅርንጫፎች እና ጤና ተቋማት በታቀደው የጊዜ ገደብ ያደርሳል። ለምሳሌ አነስተኛ አማካኝ የአቅርቦት ጊዜ ይጠቀማል።					
2	በሰርቪስ፣ ጥገናና እድሳት ምክንያት መኪናዎች ከሥራ ውጪ የሚሆኑባቸው አማካኝ ጊዜያት አነስተኛ ናቸው።					
3	ለሥምሪት የሚውሉ መኪናዎች በተመደቡላቸው ጊዜ ለጭነት አገልግሎት በበቂ መጠን ይገኛሉ።					
4	ከሥምሪት አገልግሎት ጋር የተገናኙ ጠቅላላ ወጪዎች ድርጅቱ ከመደበው አጠቃላይ የሥምሪት አገልግሎት ገንዘብ ጋር ሲነጻጸር አነስተኛ ወይም ተመጣጣኝ ናቸው።					

ሐ. ቃለ መጠይቅ

የኢትዮጵያ መድሃኒት አቅርቦት ኤጀንሲ የሥምሪት ተግባራትና አፈጻጸማቸውን በተመለከተ ከሥምሪት እና ሥርጭት ሀላፊዎች ጋር የሚደረግ ቃለ ምልልስ።

1. በኢትዮጵያ መድሃኒት አቅርቦት ኤጀንሲ ውስጥ የመኪና ጥገናና እድሳት ተግባራትን በተመለከተ ምን ምን አይነት ችግሮች ይታያሉ?
 - 1.1. በኤጀንሲው ውስጥም ሆነ ውጪ የመኪና ጥገናና እድሳት አገልግሎቶች ከታሰበላቸው ቆይታ ይዘገያሉ?
 - 1.2. እውነት ከሆነ፤ ለመዘግየታቸው ምን ምን አይነት ችግሮች ምክንያት ይሆናሉ?
2. በኢትዮጵያ መድሃኒት አቅርቦት ኤጀንሲ ውስጥ የነዳጅ አጠቃቀም አገልግሎት ተግባራትን በተመለከተ ምን ምን አይነት ችግሮች ይታያሉ?
 - 2.1. የመኪናዎችን የነዳጅ ፍጆታ ለመቆጣጠር ምን ምን አይነት መንገዶችን ትጠቀማላችሁ?
 - 2.2. ተግባራዊነታቸው ስምን ያህል ነው?
3. በኢትዮጵያ መድሃኒት አቅርቦት ኤጀንሲ ውስጥ የመኪና ሥምሪትና አጠቃላይ የመኪና ሁኔታዎች የመቆጣጠር አገልግሎት ተግባራትን በተመለከተ ምን ምን አይነት ችግሮች ይታያሉ?
 - 3.1. በአሽከርካሪዎች የሚሞሉ መደበኛ የጉዞ ማስታወሻዎች፣ የነዳጅ ፍጆታ ማስታወሻዎች እና ሌሎች መረጃዎች ተግባር ላይ ይውላሉ? ከሆነስ ምን ያህል ቁጥጥር ይደረግባቸዋል?
 - 3.2. የመኪናዎችን አጠቃላይ ሁኔታ የሚቆጣጠሩ መሳሪያዎችን (ጂፒኤስ) አተገባበር ላይ ምን ምን አይነት ችግሮች ይታያሉ (ጂፒኤስ ካለ)?
 - 3.3. የተመረጡት የሥምሪት አማራጮች ውጤታማነታቸውን እንዴት ይመለከቱታል?
4. በኢትዮጵያ መድሃኒት አቅርቦት ኤጀንሲ ውስጥ የመኪና አሽከርካሪዎች አገልግሎት ተግባራትን በተመለከተ ምን ምን አይነት ችግሮች ይታያሉ?
 - 4.1. የአሽከርካሪዎችን ግንዛቤና ክህሎት ለማዳበር ምን ምን አይነት ድጋፎች ይደረጋሉ?
 - 4.2. በጉዞ ወቅት አሽከርካሪዎች የሚወስዷቸው መሰረታዊ ጥንቃቄዎች ምን ምን ናቸው?
5. በጠቅላላው በኢትዮጵያ መድሃኒት አቅርቦት ኤጀንሲ ውስጥ የታቀደው የሥምሪት አገልግሎት አፈጻጸም ላይ ከመድረስ የሚያደናቅፉ ችግሮች ምን ምን ናቸው? (ከድርጅቱ ቁልፍ አፈጻጸም መለኪያዎች አንጻር ሲታዩ)
 - 5.1. የመድሃኒትና የህክምና መገልገያ መሳሪያዎችን ለማዳረስ የሚፈጅው አማካኝ ጊዜ
 - 5.2. መኪናዎች ከአገልግሎት ውጪ የሚሆኑባቸው ጊዜያት (ለሰርቪስ፤ ጥገናና እድሳት)
 - 5.3. ለሥምሪት የሚውሉ መኪናዎች በተመደበላቸው ጊዜ ለጭነት አገልግሎት በበቂ ሁኔታ የመገኘት መጠን
 - 5.4. ከሥምሪት አገልግሎት ጋር የተገናኙ ጠቅላላ የመኪናዎች ወጪዎች
6. በኢትዮጵያ መድሃኒት አቅርቦት ኤጀንሲ ውስጥ የሥምሪት አገልግሎቱን በተመለከተ ከዚህ በተጨማሪ ሊነግሩኝ የሚፈልጉት ነገር ካለ እድሉን ለርስዎ ልሰጥ?

ስለ ሰጡኝ ጊዜና ስላደረጉልኝ ትብብር ከልቤ አመሰግናለሁ።

Annex III: Data Abstraction Format

A. Fleet Key Performance Indicators

Data abstraction format for fleet management performance measurement (in 2012 EC) of the out bound health commodities flow from EPSA Head Office, Addis Ababa Hana Mariam, Adama, Jimma, Hawassa, Gondar and Mekelle branches respectively.

Categories	Key Performance Indicators	Formula	Data Sources	Targeted Performance	1 Year Performance (Average)
Responsiveness	Vehicle average delivery time	<i>Sum of total number of hours/days spent to deliver the assigned hub orders from dispatch to receipt at destination ÷ Total Number of hub orders delivered</i>	- Vehicle logs - GPS reports	TBD (to be determined)	
	Percentage vehicle down time	<i>Number of days a vehicle was not ready for operational activities ÷ Total number of days in the review period</i>	- Vehicle logs - Maintenance records - GPS reports	14 %	
Effectiveness	Percentage of delivery vehicles availed	<i>Number of delivery vehicles availed on time based on agreed schedule ÷ Total number of delivery vehicles requested as per agreed schedule</i>	- Delivery vehicle availability tracking sheet - Vehicle request and approval form	95-100 %	
Efficiency	Total fleet management operating cost (in ETB)	<i>Sum of all FM operating costs during a specified period in case of outbound transport: fuel, per diem, maintenance, outsourced, and labor costs.</i>	- Receipts, financial statements - Fuel logs - Maintenance logs	TBD	

B. Fleet Management Operating Cost

Data Abstraction Format for total fleet management operating cost data (in 2012 EC) of distribution vehicles of EPSA head office, Adama, Jimma, Addis Ababa Hana Mariam (Addis Ababa 1), Hawassa, Gondar and Mekelle branches of EPSA.

Branch	Total Fleet Management Operating Cost (in ETB)										
	Maintenance & repair cost		Fuel consumption cost		Per diem cost		Outsourcing (Rent) cost		Labor cost (loading or unloading)		Total Expense
	E	B	E	B	E	B	E	B	E	B	
EPSA											
Head office											
Addis Ababa 1											
Adama											
Jimma											
Hawassa											
Gondar											
Mekelle											
Total											

* *E - Expense*

* *B - Budget*

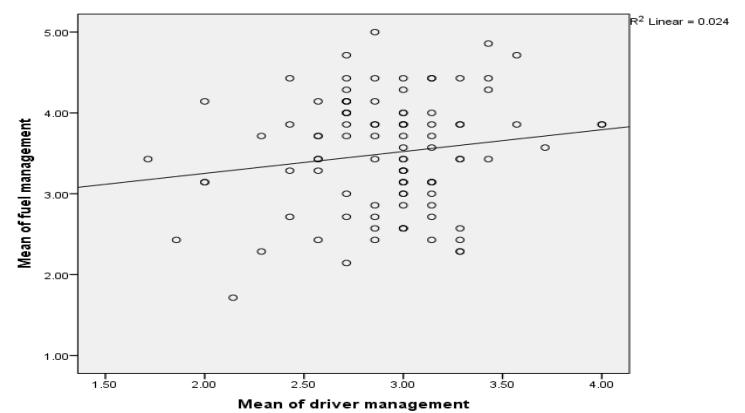
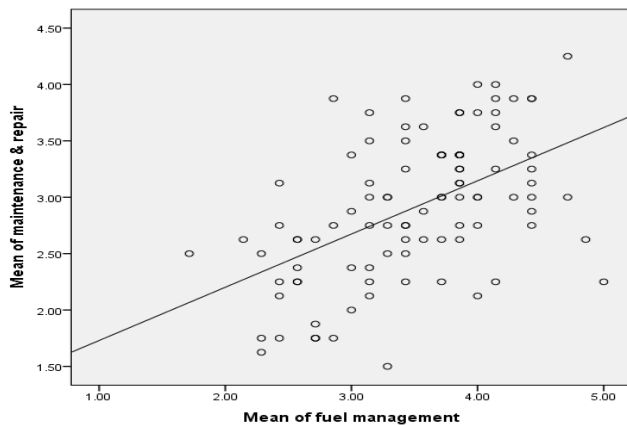
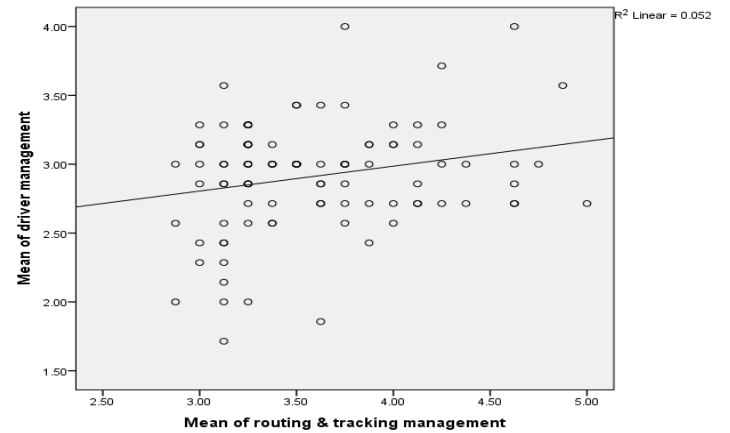
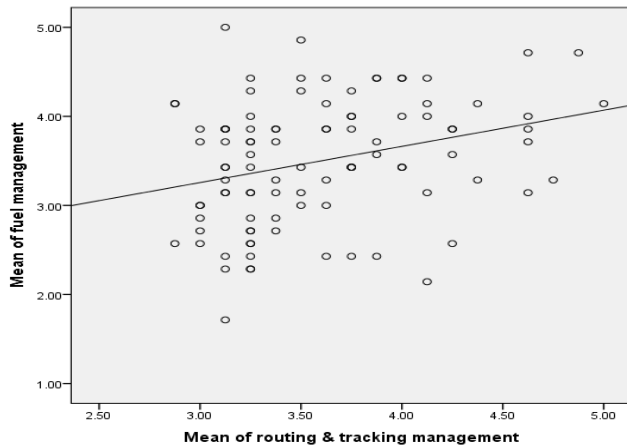
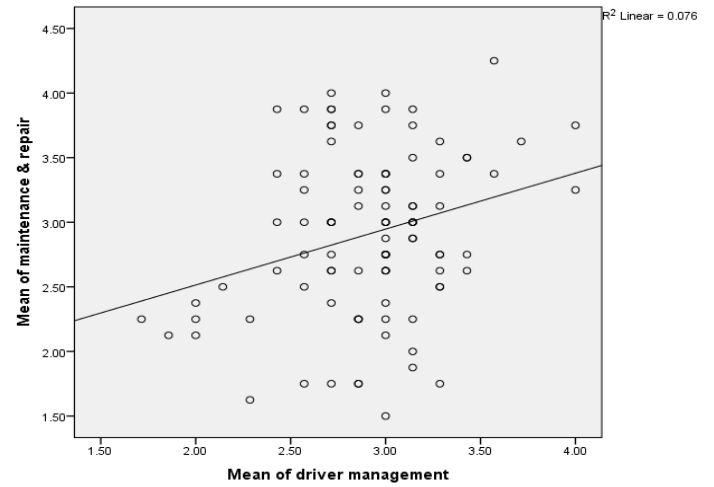
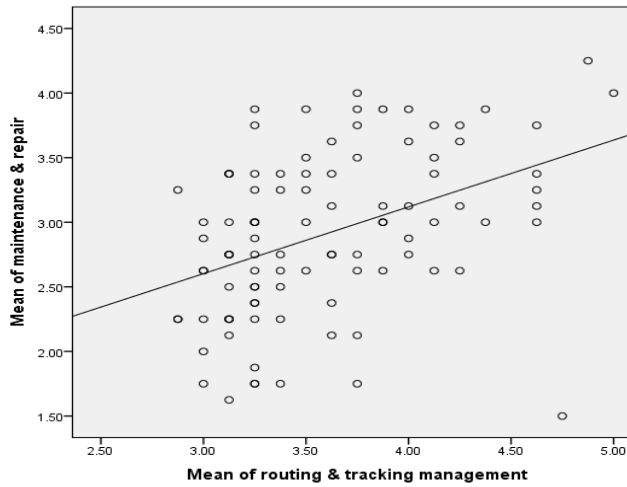
Annex IV: Profiles of EPSA Branches

No.	Names of Branches	Number of Health Facilities Served	Population Coverage	Distance from Head Office	Cluster
1	Adama	342	7.8 million	100 km	Adama
2	Addis Ababa 2	220	-	14.5 km	Central
3	Addis Ababa 1	919	11 million	18.4 km	
4	Kebridahar	60	1.1 million	990 km	Eastern
5	Jigjiga	78	0.2 million	619 km	
6	Diredawa	262	7 million	515 km	
7	Asossa	77	2.3 million	668 km	North Western
8	Gondar	227	4.3 million	738 km	
9	Dessie	348	-	401 km	
10	Bahirdar	399	9 million	565 km	Northern
11	Semera	63	1.9 million	587 km	
12	Shire	99	1.7 million	1380 km	
13	Mekele	203	4.8 million	788 km	Southern
14	Arbaminch	225	4.9 million	505 km	
15	Negele Borena	229	5.6 million	610 km	
16	Hawassa	501	15 million	275 km	Western
17	Gambella	40	0.9 million	714 km	
18	Nekemte	256	6 million	328 km	
19	Jimma	337	9.2 million	358 km	

Annex V: Preliminary Assumption Tests for Spearman Correlation

Assumption one: The variables must be ordinal. This assumption holds true for this study.

Assumption two: Two variables must be monotonically related. There is no linear relationship between two variables, however, there is a monotonic increment of one variable along with another. as shown in the scatter plot diagrams below.



Annex VI: Preliminary Assumption Tests for Ordinal Logistic Regression

A. Assumption one: There is no multi-collinearity.

Multi-collinearity is a high correlation between two or more independent (predictor) variables in regression analysis. Correlations of more than $\rho=0.8$ may be problematic during this condition. According to collinearity diagnosis in SPSS, variance inflation factor (VIF) and tolerance are widely used to detect if multi-collinearity problem exists or not. For this assumption to be acceptable, tolerance scores need to be above 0.1, and VIF scores need to be well below 10 (Olivoto *et al.*, 2017).

Independent variables	Collinearity Statistics	
	Tolerance	VIF
Maintenance & repair Management	.631	1.585
Fuel Management	.721	1.387
Routing & tracking Management	.802	1.246
Driver Management	.908	1.101

Source: Own Study Findings (2021)

The table above shows that all the tolerance scores are above 0.1 and all VIF values are well below 10 meaning that multi-collinearity problem does not exist in the model.

B. Assumption two: Proportional odds (parallel lines) exist.

Proportional odds assume that the effects of any explanatory variables are consistent or proportional across the different thresholds. In SPSS, the null hypothesis states that the location parameters (independent variables) are uniform ($p>.05$) across response categories (dependent variable) to say the criteria is met (Pallant, 2011). In this case, the location parameters are maintenance & repair, fuel, routing & tracking, and driver management. Response categories are level of agreements for fleet performance.

Model	Chi-Square	df	Sig.
General	45.514	44	0.263

Source: Own Study Findings (2021)

The above table shows that the significance value is 0.263. Therefore, the location parameters are uniform (proportional) across response categories which means that the parallel lines or proportional odds assumption is met.