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Artificial Intelligence as a Catalyst for Digital Transformation in Public Health Supply Chains: An Analysis of the Ethiopian Pharmaceutical Supply Service (EPSS)

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Abstract: **This study examines the role of Artificial Intelligence (AI) as a catalyst for digital transformation in public health supply chains, with specific reference to the Ethiopian Pharmaceutical Supply Service (EPSS). The research investigates the level of AI awareness, digital readiness, governance support, and the perceived impact of AI adoption on supply chain performance within EPSS. A quantitative research approach was employed using structured questionnaires distributed to EPSS staff working in different functional areas, including warehouse operations, supply chain management, branch administration, and information technology. A total of 333 responses were collected and analyzed using descriptive statistical methods.**

The findings reveal that AI technologies have significant potential to improve inventory management, demand forecasting, medicine tracking, distribution efficiency, and responsiveness to supply chain disruptions. However, the study also identified challenges related to digital infrastructure, staff technical capacity, organizational readiness, and data governance. The results further indicate that leadership support, staff training, and ethical compliance are critical factors influencing successful AI implementation in EPSS.

The study concludes that AI adoption can substantially enhance the efficiency and effectiveness of Ethiopia's public health supply chain system and recommends strengthening digital infrastructure, policy frameworks, and capacity-building initiatives to support sustainable digital transformation.

Keywords: **Artificial Intelligence, Digital Transformation, Public Health Supply Chain, EPSS, Supply Chain Management, Ethiopia, Digital Readiness, Demand Forecasting.**

I. INTRODUCTION

Artificial Intelligence (AI) has emerged as a transformative technology capable of improving efficiency, accuracy, and decision-making across various sectors, including healthcare and supply chain management. In public health supply chains, AI technologies such as predictive analytics, machine learning, and intelligent automation can support inventory optimization, demand forecasting, medicine distribution, and real-time visibility of pharmaceutical products.

The Ethiopian Pharmaceutical Supply Service (EPSS) plays a central role in ensuring the availability and distribution of medicines and medical supplies across health facilities in Ethiopia. However, challenges such as stockouts, supply-demand mismatch, wastage, delayed deliveries, and limited digital integration continue to affect operational efficiency. As digital transformation becomes increasingly important, integrating AI into EPSS operations may provide opportunities to improve supply chain performance and healthcare service delivery.

This study therefore investigates the role of AI in supporting digital transformation within EPSS public health supply chains. The research specifically assesses AI awareness, organizational readiness, governance factors, and the perceived impact of AI adoption on supply chain performance.

II. OBJECTIVES OF THE STUDY

General Objective

To assess Artificial Intelligence as a catalyst for digital transformation in public health supply chains: an analysis of the Ethiopian Pharmaceutical Supply Service (EPSS).

Specific Objectives

1. To examine the level of awareness and perception of AI technologies among EPSS staff.
2. To assess the digital readiness of EPSS for AI implementation.
3. To evaluate the perceived impact of AI adoption on supply chain performance.
4. To identify governance, ethical, and organizational factors affecting AI implementation in EPSS.

III. RESEARCH METHODOLOGY

The study employed a quantitative descriptive research design to investigate the role of Artificial Intelligence in public health supply chain transformation. Primary data were collected using structured questionnaires distributed to EPSS employees working in different operational areas.

The target population included warehouse staff, branch managers, supply chain officers, IT personnel, and other professionals working within EPSS branches. A total of 333 valid responses were collected and analyzed.

Data analysis was conducted using descriptive statistical methods, including frequencies, percentages, tables, and charts. The findings were presented and interpreted in relation to the study objectives.

IV. RESULTS AND DISCUSSION

A. Respondent Background

The demographic findings indicate that the respondents were relatively experienced professionals working within EPSS. A considerable proportion of participants were aged 45 years and above, suggesting substantial professional exposure in public health supply chain operations.

Most respondents had between one and ten years of experience in supply chain management, while supply chain officers and warehouse staff represented the majority of participants. The findings also revealed varying levels of familiarity with AI technologies, indicating both opportunities and challenges for AI adoption within EPSS.

B. Artificial Intelligence Awareness and Perception

The study findings showed that many respondents believed AI technologies could improve real-time medicine tracking, demand forecasting, and data-driven decision-making within EPSS supply chain operations. However, some respondents demonstrated limited familiarity with AI applications, highlighting the need for awareness creation and technical training.

C. Digital Readiness

The results indicated moderate levels of organizational readiness for AI adoption. While respondents acknowledged the importance of digital infrastructure, data quality, staff expertise, and organizational support, challenges related to infrastructure limitations and technical capacity were also identified.

D. Supply Chain Performance

Respondents generally agreed that AI adoption could improve inventory accuracy, reduce stockouts, optimize distribution routes, minimize wastage, and enhance responsiveness to changing healthcare demands.

E. Governance and Ethical Considerations

The findings further revealed that leadership commitment, government support, ethical compliance, and clear data governance policies are essential for successful AI implementation in EPSS.

F. Overall perception and strategic impact of AI adoption

The results confirm the conceptual framework's proposition that effective AI adoption, supported by digital readiness and governance, leads to digital transformation, improved decision-making, and enhanced supply chain performance.

Correlation

Pearson correlation analysis was conducted to examine relationships among the study variables. Results indicated *significant positive correlations* between all variables ($p < .001$). AI familiarity showed a strong relationship with AI application knowledge in supply chain management ($r = .777$) and decision-making influence ($r = .662$), AI knowledge influencing decision-making was strongly correlated with ethical compliance considerations ($r = .682$). Ethical compliance also demonstrated a moderate positive association with AI familiarity ($r = .548$). These findings indicate that increased familiarity and knowledge of AI are associated with more positive perceptions of AI adoption and operational decision-making.

Regression

A multiple regression analysis revealed that AI familiarity and AI knowledge influencing decision-making significantly predicted familiarity with AI technologies in supply chain management, $F(3, 329) = 253.58$, $p < .001$, explaining 69.8% of the variance.

The study was conducted to examine the extent to which ethical compliance, general AI familiarity, and AI knowledge influencing decision-making predict familiarity with Artificial Intelligence technologies in supply chain management (dependent variable).

V. CONCLUSION

This study assessed the role of Artificial Intelligence as a catalyst for digital transformation in the Ethiopian Pharmaceutical Supply Service (EPSS). The findings demonstrate that AI technologies have strong potential to improve supply chain visibility, forecasting accuracy, inventory management, medicine distribution, and overall operational efficiency.

Despite these opportunities, the study identified several challenges affecting AI adoption, including limited digital infrastructure, inadequate technical expertise, inconsistent data quality, and organizational readiness constraints. The results also highlighted the importance of leadership support, governance frameworks, staff trust, and ethical compliance in facilitating successful AI implementation.

The study concludes that integrating AI technologies into EPSS operations can significantly strengthen public health supply chain performance and support healthcare service delivery in Ethiopia. To achieve sustainable digital transformation, EPSS should invest in digital infrastructure development, staff capacity building, data management systems, and supportive AI governance policies.

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