Designing an Intelligent System for Vaccine Supply Chain Management Based on Blockchain Using Machine Learning Algorithms

Morteza. Ahmadi[1], Shaghayegh. Sahraei[2]*, Sepehr. Ghazinoory[3]

[1] Graduate Student, Department of Information Technology Management, Tarbiat Modares University, Tehran, Iran
[2] Assistant Professor, Department of Information Technology Management, Tarbiat Modares University, Tehran, Iran
[3] Professor, Department of Information Technology Management, Tarbiat Modares University, Tehran, Iran

* **Corresponding author email address**: s.sahraei@modares.ac.ir

Editor	Reviewers
Rezvan Hosseingholizadeh Associate Professor, Department of Educational Management and Human Resource Development, Ferdowsi University of Mashhad, Mashhad, Iran rhgholizadeh@um.ac.ir	**Reviewer 1:** Hamid Rezaiefar Assistant Professor, Department of Management, Birjand Branch, Islamic Azad University, Birjand, Iran. Email: h.rezaiefar@iaubir.ac.ir **Reviewer 2:** Mohammad Esmaeil Fadaeinejad Associate Prof., Department of Financial Management and Insurance, Shahid Beheshti University, Tehran, Iran. Email: m-fadaei@sbu.ac.ir

1. Round 1

1.1. Reviewer 1

Reviewer:

The sentence, "the lack of transparency and accountability within the supply chain can lead to counterfeit products," would benefit from supporting data or examples to reinforce the prevalence and impact of counterfeiting in vaccine supply chains.

Clarify the process of "identifying and engaging key stakeholders" in the Methods section. Providing a detailed outline of the stakeholder identification process would enhance reproducibility.

The sentence, "Blocks in the vaccine blockchain system are used to store all relevant vaccine information," could be enhanced by describing the block size limitations and potential impacts on data storage efficiency.

Provide more technical detail on the development environment for the smart contracts, such as programming languages and testing frameworks used. This could be useful for replication.

Expand on the detect() function's integration within the web middleware. Clarifying its computational requirements could help evaluate its efficiency across larger databases.

The statement, "the model is designed with five input nodes and one output node," lacks clarity. Specify if these nodes are representative of a specific input-output configuration in demand forecasting.

Consider expanding on the hybrid LSTM-CNN model's training process. For instance, detailing the dataset's size and characteristics would help assess model accuracy.

Authors revised the manuscript and uploaded the new document.

1.2. *Reviewer 2*

Reviewer:

The sentence, "smart vaccine containers equipped with RFID technology," would benefit from further technical detail on the type and specifications of RFID technology employed. This detail could help readers assess system scalability.

In the section discussing the GMP, Distribution, and Immunization chains, the function of each chain could be clarified further by specifying unique data types recorded on each, as this could impact system architecture.

"The aggregate release process is a critical and comprehensive protocol," is vague. Please provide specific criteria or stages involved in the release process to aid clarity for readers less familiar with this area.

Provide additional details about sharding's role in the architecture, particularly how it impacts node interconnectivity and potential security risks.

The statement, "the technological infrastructure required for such integration is significant," could be expanded by discussing specific infrastructure needs, such as bandwidth or storage, that would be necessary at scale.

The economic implications of the VaccCoin mechanism could be further analyzed, including any potential exchange rate volatility or system dependencies on the ERC20 token standard.

Authors revised the manuscript and uploaded the new document.

2. Revised

Editor's decision after revisions: Accepted.
Editor in Chief's decision: Accepted.