Application of a Cold-Chain Logistics Distribution System Based on Cloud Computing and Web Delivery Date Management

Fei Tang, Henan Polytechnic Institute, China*

ABSTRACT

The cold chain maintains and transports fresh food in the correct temperature range for slow biological decay processes and delivers safe, high-quality food to customers. Ensuring that quality and efficiency are not affected by the supply chain of cold chain products is a goal. Therefore, this paper proposes the intelligent time scheduling management model (ITSMM) based on cloud computing and a web-based platform for cold-chain logistics and distribution systems. This paper establishes a time scheduling model to reduce the overall order operation cost, diminish the variance among the expected and actual time of finalizing the service orders, and improve useful logistics service providers’ satisfaction. Data, including all cold chain phases (distributors, industry, consumers, and retailers), have been gathered. This paper examines the distribution cost and time refrigerated vehicles, thus instituting a cold chain distribution vehicle path optimization.

KEYWORDS

Cold-Chain, Deliver Schedule Management, Distribution System, Logistics

INTRODUCTION

The size of the cold chain logistics has recently been shown to grow at a rapid rate of approximately 15 percent each year. The main issue faced by these systems is carbon emission during transportation. The carbon emission due to transportation amounts to around 14% of total carbon emissions. Hence, systems that minimise carbon emission are a major task in cold chain logistics (Liu et al., 2020). Fresh food cannot be transported at room temperature. During transportation, they must be maintained at a suitable low temperature so that the food remains in its original state. Thus, the cold chain logistics system maintains an appropriate temperature for food materials like ice cream, fresh fruits, pharmaceutical medicines, etc. (Chen, 2020).

These cold chain logistic systems employ various sectors like warehouses, transportation units, repacking units, transportation units etc (Poornima, 2020). Food safety is a crucial task, especially
in the case of medicines. The required low temperature is not maintained; the medicines may lose their quality, leading to serious disasters (Chen et al., 2020). Besides, dairy products such as milk may easily lose their original form when the temperature gets high. To enable the customers to get complete satisfaction, the warehouses and the transportation units must be equipped with suitable freezing units. With the rapid increase in internet technologies usage, all these units are equipped with IoT units (Wang et al., 2020).

These units are used for the collection of real-time data. It helps in the identification of a suitable path to reach the customers (Poornima & Arulselvi, 2020). The identification of the path is done based on the monitoring of traffic. It helps the transportation units to reach the customers on time (Qi and Hu, 2020). Big data analytics and cloud computing technologies are popularly integrated with the cold chain logistics systems to enable the products’ fast delivery. The dynamic information such as the travel route, the current storage status, vehicle details is constantly updated in the cloud (Song et al., 2020).

It enables customers to monitor their status through smart devices. The establishment of the path with minimum cost is done through various optimization algorithms (Arulselvi & Poornima, 2020). Genetic algorithms are widely employed for solving the optimization problem. Minimization of usage of network bandwidth is another important criterion in cold chain logistics (Wang & Wen, 2020). Besides, improvement of quality of service is another major objective. The customer satisfaction index, reduction in carbon emissions, the establishment of the shortest path, minimization of storage levels, decreasing the latency of computation are other factors that determine the efficiency of the cold chain logistic systems (Peng et al., 2020).

It has been found through a survey that, among various food products being transported, around 40% of the products required refrigeration facilities during transportation (Joshua Jeyasekar et al., 2019). Furthermore, these refrigeration units consume approximately 53% of the power supply. Thus minimization of power supply requirements is a major task (Dai et al., 2020). Vehicle route problem (VRP) is the technique employed in optimising the route used for the transportation of these products. It has two main objectives. The first objective is the minimization of transportation cost. Here the second objective is the minimization of transportation distance (Hu et al., 2020).

Based on the introduction on cold chain logistics, a new delivery schedule management scheme is proposed in this research.

The contributions of the paper are followed as

- A novel model called Intelligent Time Scheduling Management Model (ITSMM) based on cloud computing is proposed.
- The components of cold chain logistics are discussed.
- The delivery schedule management for cold chain logistics is analyzed.
- The proposed ITSMM model is compared with standard algorithms like Dijkstra’s algorithm (DKST), the shortest remaining time first algorithm (SRTF), and the shortest seek time first algorithm (SKTF).

The remainder of the study is followed as section 1, and section 2 discussed the introduction and existing chain logistics models. In section 3, Intelligent Time Scheduling Management Model (ITSMM) has been suggested. The numerical results were carried out in section 4. The research article ends in section 5.

RELATED WORK

Qin et al., (2020) have presented a technique for solving the vehicle routing optimization problem. This scheme is proposed based on the carbon trading mechanism. The carbon trading mechanism was opted to reduce the carbon emission cost. Further, the other objective was to improve the satisfaction rate of the customers. Zhang et al., (2019) have utilized the ant colony optimization algorithm for the cold
14 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: www.igi-global.com/article/application-of-a-cold-chain-logistics-distribution-system-based-on-cloud-computing-and-web-delivery-date-management/318644

Related Content

An Exploratory Study to Identify Complementary Resources to the Implementation of Web-Based Applications in a Paint Supply Chain
www.irma-international.org/article/exploratory-study-identify-complementary-resources/2502

Capacity Planning: A Process to Prepare Companies to Fulfill Volatile Demand in the Digital World
www.irma-international.org/chapter/capacity-planning/323731

Managing Enterprise Service Level Agreement
www.irma-international.org/article/managing-enterprise-service-level-agreement/45903

Offshoring Process: A Comparative Investigation of Danish and Japanese Manufacturing Companies
www.irma-international.org/chapter/offshoring-process-comparative-investigation-danish/48472

Fashioning a Socially Responsible Garment Supply Chain: A Qualitative Exploration of Corporate Social Responsibility in Sri Lankan Export Garment Manufacturers
www.irma-international.org/chapter/fashioning-socially-responsible-garment-supply/55219