

ABSTRAK

Distribusi merupakan salah satu komponen penting dalam sistem rantai pasok, terutama bagi industri rumah tangga yang memiliki keterbatasan sumber daya operasional. *Home Industry* Tempe “Pak Mul” di Bantul, Yogyakarta, menghadapi permasalahan dalam penentuan rute distribusi harian yang dilakukan tanpa perencanaan rute yang optimal, sehingga menyebabkan tingginya jarak tempuh, pemborosan bahan bakar, dan peningkatan biaya operasional. Penelitian ini bertujuan untuk menyusun usulan rute distribusi optimum guna meminimalkan total jarak tempuh dan biaya operasional, melalui pendekatan algoritma eksak.

Metode yang digunakan adalah algoritma *Branch and Bound* dalam pemodelan *Travelling Salesman Problem* (TSP), dengan proses simulasi yang dilakukan menggunakan perangkat lunak WinQSB. Data lokasi pelanggan diperoleh dan dikonversi menjadi matriks jarak berdasarkan informasi dari *Google Maps API*, yang kemudian diolah menggunakan modul *Network Modeling*. Hasil simulasi menunjukkan bahwa rute distribusi yang dihasilkan memiliki efisiensi jarak sebesar 52,01% untuk sesi pagi dan 60,24% untuk sesi sore, dibandingkan dengan rute aktual. Total jarak tempuh harian berkurang dari 68,904 km menjadi 30,35 km, dengan penghematan biaya bahan bakar mencapai Rp504.000,00 per bulan.

Berdasarkan hasil tersebut, dapat disimpulkan bahwa metode *Branch and Bound* terbukti efektif dalam merancang sistem distribusi yang optimal bagi UMKM dengan skala operasional terbatas. Penelitian ini membuka peluang implementasi pendekatan eksak dalam peningkatan efisiensi operasional dan mendukung pengembangan rute berbasis *Vehicle Routing Problem* (VRP) di masa depan.

Kata Kunci: Distribusi, UMKM, *Branch and Bound*, *Travelling Salesman Problem*, WinQSB

**Proposed Optimization Routing For Tempe Murni Distribution
To Minimize Distance And Cost Using The Branch And Bound Method**

(Case study: Home Industry Tempe “Pak Mul”, Bantul, Yogyakarta)

ABSTRACT

Distribution is one of the essential components in the supply chain system, particularly for household-scale industries that operate with limited resources. Home Industry Tempe “Pak Mul” in Bantul, Yogyakarta, faces challenges in determining its daily distribution routes, which are carried out without optimal planning. This condition has led to excessive travel distances, fuel waste, and increased operational costs. This study aims to develop an optimum distribution route proposal to minimize total travel distance and operational expenses using an exact algorithmic approach.

The method employed is the Branch and Bound algorithm applied to the Travelling Salesman Problem (TSP), with simulation conducted using WinQSB software. Customer location data were collected and converted into a distance matrix using Google Maps API, which was then processed through the Network Modeling module. The simulation results show that the optimized routes achieve distance efficiencies of 52.01% in the morning session and 60.24% in the afternoon session, compared to the actual routes. The total daily travel distance was reduced from 68.904 km to 30.35 km, yielding fuel cost savings of IDR 504,000.00 per month.

Based on these results, it can be concluded that the Branch and Bound method has proven effective in designing an optimal distribution system for MSMEs with limited operational scale. This study opens up opportunities for the implementation of exact approaches in improving operational efficiency and supports the development of routes based on the Vehicle Routing Problem (VRP) in the future.

Keywords: *Distribution, MSMEs, Branch and Bound, Travelling Salesman Problem, WinQSB*