instances reaches the maximum of Lagrangian iterations, and in all of them the condition about the Number of iterations in which the objective function of CLMRPCR not improved, satisfied. These two tables were set for (β,θ)= (0.0004, 0.01) but for more investigation on the network design and its costs, we can vary these values and then compare the results to previous. Another important issue in this section is related to capacity. In both tables, when we limited the capacity of a DC, in most of the time, it remained open in optimal solution. It means that restricting capacity could not be a main factor for opening or closing a DC.

4. Conclusion and Future Research

CLMRPCR is a more practical model than CLMRP, because besides all of the properties of CLMRP, it considers coverage radius which is a real factor in the business world. There are some reasons for that we mentioned before. In addition, the CLMRPCR has the properties of CLMRP. For example, ordering more in smaller quantities, developing the CFLP and providing a more reasonable measure of capacity for warehouses are some of them.

We want to talk about some extensions for CLMRPCR. A natural extension to the CLMRPCR would be to consider multi products. Another extension would be to incorporate the CLMRPCR with stock-out costs. Also considering multi-sourcing instead of one-sourcing would be a logical extension that would lead to lower logistics costs. Also, in our model we assumed direct shipments from DCs to the assigned retailers. But in reality, the shipments are a traveling-salesman-like tour. Hence considering routing costs instead of direct shipment costs would be more realistic.

As one part of future research, one can focus on developing algorithms to solve the problem we study in this paper for large scale supply chains with thousands of nodes. Examples of such algorithms in supply chain settings are a two-level GA algorithm by Aliabadi *et al*., 2013, Neural network algorithm by Avsar and Aliabadi, 2015, or agent-based algorithms by Aliabadi *et al*., 2017.

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Biography

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