MATHEMATICAL MODEL
FOR SUPPLY CHAIN NETWORK DESIGN

Major:	BUSINESS ADMINISTRATION
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PhD. candidate:	**ĐƯỜNG VÕ HÙNG**
Advisor:	**Associate Professor BÙI NGUYÊN HÙNG**

In this dissertation, the author had developed 3 theoretical mixed integer linear programming – MILP models to fulfill all gaps and research questions for supply chain network design problems. For the first model, the multi-item, multi-period, two-echelon capacitated facilities location problem was proposed. The differences of this model are that the facilities are opened at relevant period (*distribution network*); the transportation volumes are determined in the system (*transportation network*); and the opened facilities' inventory levels are considered at each period in time horizon. Therefore, the operational parameters are confirmed at each period. This essential information is very useful for the investors and managers to make their decisions.

For more application in realistic and reducing research gaps (*with the same research direction – research branch*), the author had developed the *second* MILP model (*model 2*). In this model, the opened facilities' operational volumes are considered to evaluate their efficiencies. This is the new contribution factor to the capacitated facilities location models. All opened facilities are controlled their operational volumes. At any period in time horizon, if these volumes are under requirement levels then these opened facilities have to pay the penalty costs respectively. This information helps the investors to adjust their decision making.

The other extension is applied for direct-shipment and out-sourcing strategies in SCND problems (*research branch*). In the *third* MILP model (*model 3*), the author employed a dummy distribution center set to connect directly from manufacturing

plants to retailers. The capacities of the respective vehicles are considered as dummy distribution center capacities. This model helps to reduce the investment capital, and then reduce the investment risks. For both model 2 and model 3 are applied for single item cases.

In addition, the Lagrange relaxation algorithm was proposed to find all solutions for all developed models. This algorithm provided the reliability solutions for application in realistic. The difference of this algorithm is that some additional constraint sets are added to two sub-problems for getting solutions quickly.

Advisor	PhD. candidate
Associate Professor Bùi Nguyên Hùng	Đường Võ Hùng