CONTENTS	V
LIST OF FIGURES	vii
LIST OF TABLES	Х
SUMMARY	хi
1 Introduction	1
2 Approaches for Location Planning	3
2.1 Location Planning and Factors	3
2.1.1 Descriptive Approach	3
2.1.2 Normative Approach	6
2.2 Classification within Hub-and-Spoke System	11
2.2.1 Definition and Characteristics of Hub-and-Spoke System	12
2.2.2 Types of Hub Location Problems	18
2.3 Approaches for Solution Model	22
2.3.1 Exact Methods	22
2.3.2 Heuristic Methods	24
2.4 State of the Art	29
2.4.1 Mathematical Approaches	29
2.4.2 Solution Approaches	32
3 Hub Location Models and the Solution Method	35
3.1 P- Hub Median Problems	36
3.1.1 Single-Allocation	36
3.1.2 Multiple-Allocation	40
3.2 Hub Location Problems	43
3.2.1 Hub Location Problems with Fixed Cost	43
3.2.2 Hub Location Problems with Fixed Cost and Direct Transportation	. 47
3.3 Genetic Algorithms	51

3.3.1 The Standard Genetic Algorithm	51
3.3.2 The Distributed Genetic Algorithm	59
4 The Thai Shrimp Industry and its Hub-and-Spoke Model	62
4.1 The Thai Shrimp Production	62
4.2 The Structure of the Market Channels of the Thai Shrimp Industry	68
4.3 Application of the Hub-and-Spoke Model for the Thai Shrimp Industry	74
5 Computational Results and Analysis	79
5.1 Computational Results	80
5.1.1 Uncapcitated Hub Location Problems	80
5.1.2 Hub Location Problems with Minimal Capacity	98
5.2 Analysis	114
6 Discussion and Conclusions	118
7 References	123