

# TABLE OF CONTENTS

<u>RESUMEN</u> .....	<u>I</u>
<u>ABSTRACT</u> .....	<u>II</u>
<u>ACKNOWLEDGMENTS</u> .....	<u>III</u>
<u>TABLE OF CONTENTS</u> .....	<u>IV</u>
<u>LIST OF TABLES</u> .....	<u>VIII</u>
<u>LIST OF FIGURES</u> .....	<u>IX</u>
<b><u>1 INTRODUCTION</u></b> .....	<b><u>1</u></b>
<b><u>1.1 ORDER AND CONTRACTOR MATCHING</u></b> .....	<b><u>1</u></b>
<b><u>1.2 CASE STUDY</u></b> .....	<b><u>2</u></b>
1.2.1 OBJECTIVE .....	2
1.2.2 SCOPE .....	2
<b><u>1.3 STRUCTURE</u></b> .....	<b><u>3</u></b>
<b><u>2 LITERATURE AND BACKGROUND</u></b> .....	<b><u>4</u></b>
2.1.1 CORNERSHOP BACKGROUND.....	4
2.1.2 DELIVERY SERVICE DESCRIPTION .....	4
2.1.3 RIDE HAILING SIMILARITIES AND THE SOCIAL BENEFIT OF A DELIVERY SERVICE.....	5
2.1.4 ENVIRONMENTAL IMPACT ON EFFICIENT SHARED VEHICLE DELIVERY SERVICES .....	9
<b><u>2.2 PROBLEM DESCRIPTION</u></b> .....	<b><u>9</u></b>
<b><u>2.3 INDUSTRY REFERENCES</u></b> .....	<b><u>10</u></b>
2.3.1 GENERALIZED ASSIGNMENT PROBLEM .....	10
2.3.2 DEFERRED ACCEPTANCE.....	12
<b><u>3 PROBLEM</u></b> .....	<b><u>14</u></b>

<b>3.1 COMPANY PIPELINE MODEL FORMULATION .....</b>	<b>14</b>
<b>3.2 MATHEMATICAL OPTIMIZATION .....</b>	<b>17</b>
3.2.1 SETS.....	17
3.2.2 DECISION VARIABLES .....	19
3.2.3 CONSTRAINTS.....	19
3.2.4 OBJECTIVE .....	21
<b>4 PROPOSAL EVALUATION .....</b>	<b>23</b>
<b>4.1 SCENARIO SOURCES.....</b>	<b>23</b>
<b>4.2 MODEL RUN SETUP.....</b>	<b>24</b>
<b>4.3 MODEL VERSIONS .....</b>	<b>25</b>
4.3.1 OPTIMAL ALLOCATION MODEL .....	26
4.3.2 THRESHOLD MODEL .....	26
4.3.3 FAIRNESS MODEL .....	26
4.3.4 FAIRNESS AND THRESHOLD MODEL .....	27
4.3.5 PIPELINE MODEL.....	27
<b>5 RESULTS .....</b>	<b>28</b>
<b>5.1 RUN SCOPE.....</b>	<b>28</b>
5.1.1 RESOURCES SCOPE.....	28
5.1.2 RESULTS EVALUATION ENVIRONMENT .....	28
5.1.3 LENGTH SCOPE .....	29
5.1.4 SIZE OF INSTANCES.....	29
5.1.5 RESULTS FORMAT.....	30
<b>5.2 MEASUREMENT METRICS .....</b>	<b>32</b>
<b>5.3 SINGLE INSTANCE RUN.....</b>	<b>32</b>
5.3.1 RESULTS .....	32
<b>5.4 RUN RESULTS .....</b>	<b>38</b>

5.4.1 SEQUENCE DATA.....	38
5.4.2 RESULTS .....	38
<b>5.5 CITY MODEL .....</b>	<b>54</b>
<b>5.6 RESULTS ANALYSIS .....</b>	<b>57</b>
5.6.1 INSTANCE RUNS.....	57
5.6.2 SEQUENCE RUNS .....	57
5.6.3 CITY MODEL .....	59
<b>6 CONCLUSION.....</b>	<b>61</b>
<b>6.1 FURTHER DISCUSSIONS.....</b>	<b>61</b>
6.1.1 NON-ALLOCATION COSTS IMPROVEMENTS .....	61
6.1.2 DELAYED ORDER ALLOCATION .....	62
6.1.3 FAIR SHOPPER SELECTION .....	64
6.1.4 CITY MODEL .....	65
6.1.5 RUNTIME AND ENGINEERING ASPECTS .....	67
<b>6.2 PROPOSALS FOR FUTURE WORK .....</b>	<b>69</b>
6.2.1 EXPLICIT ON-TIME ARRIVAL COSTS .....	69
6.2.2 STOCHASTIC OPTIMIZATION FOR FUTURE SHOPPER AVAILABILITY .....	69
6.2.3 REDUCED RUN FREQUENCY .....	69
6.2.4 ONLINE OPTIMIZATION HEURISTICS.....	70
6.2.5 FUTURE SCENARIO SETUP COSTS ON CURRENT MATCHES COST.....	70
<b>7 BIBLIOGRAPHY.....</b>	<b>72</b>
<b>ANNEX.....</b>	<b>74</b>
<b>ANNEX A - PROPOSED OPTIMAL ALLOCATION MODEL 1.....</b>	<b>74</b>
ANNEX A.1 - SETS .....	74
ANNEX A.2 - DECISION VARIABLES .....	74
ANNEX A.3 - OBJECTIVE FUNCTION.....	74

ANNEX A.4 - CONSTRAINTS .....	74
<b>ANNEX B - EVALUATION RUNS SETUP .....</b>	<b>75</b>
<b>ANNEX C - RESULTS .....</b>	<b>76</b>
ANNEX C.1 - SINGLE RUNS .....	76
ANNEX C.2 -SEQUENCE RUNS .....	81
ANNEX C.3 - CITY MODEL RUNS .....	94