

UPS Helper Dispatch Analysis

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1. INTRODUCTION

1.1 Project Motivation/Problem Statement

At the end of each calendar year, UPS sees an increase in the volume of packages. This increase is due primarily to the shipping of Christmas packages. This increased volume is far greater than the normally employed drivers are accustomed to. UPS hires helpers for each peak season so that this large volume can be handled. These employees are paid less than the drivers are, and work only half of the hours each day. There are two types of helpers: driver helpers and independent helpers. A driver helper will ride in the passenger seat of a delivery truck and at times separate from the driver to deliver packages. For example, the helper will walk down one street and deliver packages while the driver delivers packages to another street. An independent, standalone helper will work out of a garage, trailer, or apartment that is centrally located in his delivery area. Each day, large amounts of packages are delivered to the central location, and the helper will deliver all of the packages in their storage unit. This concept is ideal for apartment complexes, malls, downtown areas, and other situations where a large amount of packages will need to be delivered in a small area. A good example of this type of helper would be a trailer full of packages that needs to be delivered to an apartment complex. The helper will arrive and deliver all of the packages in that trailer to the residents of the nearby apartments. This type of helper usually uses a bike, hand truck, or other method to carry multiple packages at once.

Though UPS uses these helpers heavily throughout the holiday season each year, no recent study has been done on the helper's effectiveness or how their utilization can be maximized. No true criterion exists on when a helper should be used or what type of helper should be used. Therefore, the helpers are not being used in the most economically effective way, which could be potentially costing UPS thousands of dollars each year.

Many applications and techniques should be evaluated for the package driver helpers. The density that helpers should be used at needs to be studied. First, the criterion for what density is needs to be developed. The various data types include population, average number of deliveries, and the number of businesses that reside in a given area. Similarly, the type of area should be studied to see how the density is dependent on whether it is an apartment complex, shopping mall, residential neighborhood, or other area. In addition, the centroid type and location should be considered. Many different types should be examined, from trailers, to garages, to renting an apartment. The centroid location should be placed in a strategic area where it can reach the entire delivery area most effectively. This delivery area needs to be manageable such that a helper can deliver all of the packages in a reasonable amount of time. All of this information will be turned into some definite criteria to help UPS make educated decisions on where they should use helpers.

The type of delivery method also needs to be evaluated and benchmarked. The focus of this evaluation will be delivery methods that do not require a motorized vehicle. Therefore, alternative methods will be researched and evaluated. Some of these methods include bicycles, walking on foot, and any other method that can be found. Along with the type of transportation, is the method of transporting the packages, whether it is a pull-behind trailer, a backpack, carrying packages by hand, or another method.

Each method that is found should be evaluated and benchmarked. This information will then be used to help recommend what type of transportation should be used for various delivery characteristics. Some of these include malls, downtown areas, apartment complexes, and residential neighborhoods. Definite criteria should be developed to know which type of helper should be used for which type of area as well as how large that helper's area should be. The criteria will not only be developed based on efficiency and utilization, but also based on cost. Since helpers are cheaper than drivers are, there is a cost savings involved. A cost benefit analysis should be performed for each type of area.

This type of study will greatly improve the UPS organization. Since the Holiday rush is the busiest time of the year, it is also the most profitable time of the year. By giving UPS the information that is needed to better use their workforce based on both cost and efficiency, UPS will be able to make better, more informed decisions on where to use helpers and what type of helper to use. This information will not only reduce costs, but it will also help UPS continue to keep improving and stay ahead of the competition. This project is a great opportunity for UPS to improve an integral part of their distribution process.

1.2 Project Objectives

The objective of the project is to evaluate, benchmark, and develop criteria for UPS driver helpers. By evaluating applications and techniques for utilizing package driver helpers, the helper usage can be optimized. Benchmarking alternative delivery methods that do not require UPS delivery vehicles is also within the scope of the project. Developing criteria for the efficient usage of helpers during peak season is a key part of the project objectives. Additionally, not in the project objectives, the team has decided to create a Helper Decision Tool which is a computer program that will allocate helpers given different constraints for UPS given simple inputs. Lastly, a cost benefit analysis of the alternative will be done to justify the use of the Helper Decision Tool to UPS.

2.0 METHODS

2.1 Data

The design team collected data in numerous ways for the project with UPS and their driver helper analysis. The client, in the form of spreadsheets and tables, provided a large amount of the data and information to the group. Appendix B has an example of an Excel spreadsheet that UPS provided for the group detailing the average stops per on-road hour of full-time drivers and helpers. There is another example of data in Appendix A given to the group by UPS with a table that displays the costs per day of cars and for TP-60's, which are storage trailers that UPS uses. UPS was very accessible in sharing information with the design team for the project. With UPS having such a vast measurements system, any type of data that was needed was easily provided to the team. A lot of the quantitative data was collected from these tables and charts and then consolidated by the team for use in the algorithm for the Helper Selection Tool. This tool is a program that was developed by the design team and is the main deliverable to UPS that will assist them in more efficiently assigning driver helpers during the peak season. The data from the tables also drove the Cost/Benefit analysis that is used in the tool to find the most cost effective alternative for UPS while using helpers. The standard practice manual for the helpers was also provided by UPS. The manual was used to gain a better understanding of what the helper process was like, and to see what the company expects from their driver helpers.

The team also used some other methods for data collection. Information on UPS competitors needed to be collected in order to conduct a Benchmarking analysis. To learn more about the competitors processes during the peak delivery season, the group approached them in an informal conversation to try to gain as much information as possible. In Appendix E, there is a summary of data that was collected during the

conversation with the competitors, and this information was then used to compare to the UPS process, and to see if any useful tools could be gained from learning about the competition.

Qualitative data was collected by the group by actually working with UPS and participating as ride-along helpers during the peak season of 2006. Even though our project goal was to help with the efficiency of driver helpers for future peak seasons, the group thought it would be beneficial to participate during the current peak season, and get a first hand experience with the process and to learn as much about the methods of the helpers as possible. A summary of our time working as a helper driver is included below in Appendix C. This was a valuable experience by being able to get a better understanding of how the helpers worked on an average day. This understanding helped the group design the Helper Analysis Tool by knowing what conditions the helpers might be affected by, and what type of equipment they will be using. We were able to translate this first-hand experience into our program's algorithm, and better compare alternatives for the helper utilization.

2.2 ISE Methods and Tools

As described above, the group utilized several ISE methods in developing the best solution for UPS and their peak season driver helper utilization. The ISE tool of Benchmarking was used to compare the competition's process with UPS methods and see if any new knowledge could be gained. Even though they are the competitors, in today's business world it is important to keep a firm grasp on the market and see how everyone in the industry is performing. The ISE tool of Cost/Benefit analysis was critical to delivering the best possible alternatives to UPS for their problem. Comparing the costs and benefits for every type of combination of helper and driver possibilities was the center of the algorithm for our Helper Analysis Tool. By comparing the costs of each alternative, the tool can give UPS the most beneficial process to use their helpers efficiently. An extensive Cost/Benefit analysis drives the tool and takes many financial factors into account to deliver the best solution to UPS. Finally, the group's innovative use of programming with Microsoft Visual Basic allowed the group to surpass the client's expectations, and create an easy to use tool that UPS can use for years to come in their driver helper analysis. To assist in using and learning the tool, the design team created a UPS Helper Selection Tool User Manual. A copy of the Manual is included below in Appendix D. This manual will provide a reference to the user if they have any questions about the program.

3.0 SYSTEM DESIGN

3.1 Deliverables

Three design alternatives were considered for this project. The first design alternative which is being analyzed is using a user interface in determining the number of both independent and dependent helpers. In addition, the places in which they should be deployed will be included in the output. The deliverable for UPS includes the Helper Selection Tool application along with a user manual. This will help assist the user during operation. The Helper Selection Tool is the user interface application developed from the preferred alternative. The next alternative for this design is to keep the current state of helper dispatch method as it is. This is using only dependent helpers in some areas. The third alternative is using no helpers at all. This will cause the drivers to deliver all the packages with no help. The final alternative is for the helpers to accompany all drivers in all areas. This will maximize the help for the drivers.

3.2 Evaluation of Alternatives

The alternatives for this project are mutually exclusive. One of these alternatives must be chosen in order to have a successful helper dispatch system. There is one alternative that stands out among the others. This is to use a user interface application which will output the number of helpers needed for a given

route. It will show if the helper should work independently or dependently with a driver. The user interface application encompasses all other alternatives. It is able to decide whether a helper will be needed in a given route or not. This is the chief reason for choosing this alternative. It will entail the other alternatives and yield the optimal solution for dispatching helpers. In addition, a benefit cost analysis was completed on this alternative. This will weight the benefits of the investment against the costs incurred. The benefit cost ratio came to be 1.08 which suggests that more will come out of this investment than what is put in.

When performing the benefit cost analysis for the preferred alternative, many factors were included. First, the wages of both the drivers and helpers were taken into consideration along with the standard working hours for both. The drivers incurred overtime wages after eight hours and the helpers after four hours. The average working time for each week for both we factored in as well. According to the 2006 peak season data, approximately 39 percent of single drivers worked in teams with helpers. This shows UPS's reliance on helpers during the peak season. After wages are measured, the cost of additional equipment is calculated for the peak season. This equipment includes Trikes, RNC, hand trucks, and TP60s. These will help helpers work more efficiently. A Trike is special tricycle which includes a basket in the rear. There are approximately 23 helpers working each day during the peak season. While not all of the helpers work independently, the majority do. Due to this, not all helpers will receive a Trike so 16 should be used. RNCs are bags which UPS uses for small packages. This makes it easier for the driver or helper to carry many small packages at once. This can be used by both independent and dependent helpers so 23 RNCs should be purchased. The TP60s are UPS trailers used for on-site storage in high density areas. In the Roanoke South region, there are few areas with this type of density. For this reason, only 5 TP60s should be used during the peak season. To make delivers easier out of the TP60s, hand trucks should be used here and in other areas with independent helpers therefore 7 should be purchased. The costs for the equipment are broken down to a cost per day value in order to estimate the actual cost incurred during the peak season. The break down is shown in Appendix F. The final operating and maintenance cost per year for this alternative is \$3,110.05.

The key quantitative benefit in this project is the savings in the wages for the drivers. Currently, the drivers work on average 9.31 hours per day during the peak season. The goal is to reduce this to approximately 8 hours per day and reallocate the hours to the helpers. UPS does not want their drivers to work more than 8 hours since overtime wages are incurred when they work more hours. The overtime wage is one and a half times the regular rate for both the drivers and helpers. The Helper Selection Tool shows the need for more helpers to make the delivery system for UPS more cost efficient. The number of helpers will double to reduce the overall driver hours to 8 hours per day. The increase in helpers will also simultaneously reduce helper hours to approximately 4 hours per day. It is cheaper to pay the wages of more helpers than the overtime for drivers. If the average number of hours can be reduced to 8 hours per day for the driver, the expected salary savings is \$85,213.08 for one peak season using this past season's data.

Using the benefits and operating and maintenance costs for the preferred alternative the benefit cost ratio is used to determine the validity. The initial investment for this project is the hypothetical costs for the consulting team. This initial investment is \$73,714.14 for the project. This is used in weighting the project against its benefits and costs. After calculating the present worth of the first year's benefits and comparing it to the initial investment, there is a benefit cost ratio of 1.08. This value shows that there will be more benefits than costs in this project.

In addition to the quantitative benefits of this alternative, there are qualitative benefits. When more independent helpers are used, the driver's load is reduced allowing him to deliver packages in other areas quicker. This also increases the overall load on a team, which includes a driver and helper. There will be

more stops per on road hour for each driver with the assistance of the helper. This is a key aspect in UPS's delivery system. More stops means quicker delivery time which is important for UPS.

The ideal amount of man power was used in this project. The project resource was successfully loaded to obtain the optimal performance from the consulting team. The benefit cost ratio is slightly above the preferred value of 1. This shows that the correct amount of consultants was resourced throughout the project.

3.3 Preferred Alternative Specification

In order for the Helper Selection Tool to successfully give optimal outputs, many factors were loaded and taken into consideration. Helper and driver wages were collected. Along with this, the cost factor of team usage of the two was inputted. All of the equipment and storage costs were calculated. Different delivery areas, such as apartments, downtowns, and malls, took a significant role. Each area helps define the type of environment the driver and helper will be working in. In addition, the stops per on road hour was taken. This allows the application to know the density of the area in respect to the given route. Weather and terrain options are added for additional time and resources required during deliveries. Once all these factors are inputted, the application compares all possible combinations to obtain the optimal combination for the given route. The optimal solution will include a situation where the driver is still able to work 8 hours a day.

Visualbasic.NET was used for compiling the application tool. It allows the user to input values such as costs, equipment, and weather and outputs the optimal combination. The application includes a series of check boxes and data input boxes to allow usability to be simple. A manual is included for the user for reference. The output obtained from the application tool produces the most productive combination as well as the most cost efficient. In addition to productivity and cost efficiency, safety is factored in. There are weather and terrain options in the input boxes. This will assist the drivers and helpers on how long it will take them for their deliveries and the precautions necessary to achieve quick delivery times.

The application tool has been tested thoroughly for bugs. No errors were found in the software. Error traps are implemented in the programming to insure there are no crashes in the system. The design proves to be efficient. The most unique condition of the Helper Dispatch Tool is the fact that it can run on all windows operating systems which are updated. This allows the application to be installed in numerous computers. It will output the most cost efficient pairings of drivers and helpers along with the most time efficient. Since time and costs are very important during the peak season, the application tool proves to be very efficient in determining the dispatch of helpers.

3.4 Verification

The Helper Selection Tool has been developed on an easy-to-use platform. The input tools have been developed using simple check boxes and input values. This way there will be no confusion in the types of data needed to be inputted. This application will output the most cost and time efficient strategy in delivering packages. With the ease of use and the production of the most efficient strategy, users will be comfortable in using the Helper Selection Tool.

4.0 IMPLEMENTATION

4.1 Project Life-cycle

UPS identified a need for helper dispatch analysis and the consulting team wrote a proposal demonstrating the capability to deliver a solution. After a proposed solution was developed, the project

performance began and was completed in adherence to the Gantt chart. All project objectives have been met and the project is now ready for closure. The project life-cycle is complete from the team's capabilities. The results of the data analysis, completion of the Helper Decision Tool, and recommendations from the analysis are all complete. The last phase of the life-cycle, implementation, is to be completed at the discretion of the client based on our recommendations. The Helper Decision Tool has the capability to be implemented in every UPS distribution center in every region of the country and used to aid them in decision making for allocating driver helpers. It is recommended that UPS implement the Helper Decision Tool and it is justified by the cost benefit analysis.

4.2 Results

Thus far, the Helper Decision Tool has gone through usability testing and demonstrations, but has not been implemented. The project life-cycle is complete and the recommendation based on a cost benefit analysis greater than one is that UPS implement the Helper Decision Tool throughout their facilities. By reallocating driver hours to helper hours, the Helper Decision Tool will save UPS money on wages and also utilize their delivery methods more efficiently. Implementation before the next peak delivery season will result in savings and the optimization of helper usage.

5.0 FUTURE CONSIDERATIONS

5.1 Additional Recommendations

The team designed the Helper Selection Tool with the intentions of it being useable for any region in the United States. Even though the team focused on the Roanoke South region during the project, the tool can be used in any location in order to make their helper utilization more effective. The tool should not be difficult to implement, it is an easy to use program that also has a user manual that helps the user learn the system. The tool was also designed to be adaptable, so there are adjustable settings inside the program that the user can change over time and make sure that it is providing the most effective solution possible.

Creating a program was not a deliverable that was in the scope of the UPS request for proposal. UPS needed help analyzing their helper dispatch during peak season, and the design team felt like an easy to use program would be the easiest and most effective way for UPS to do this. Even though the programming for the tool created a significant amount of extra work, the group felt like it was the most effective way satisfy the client's needs and surpass their expectations. The Helper Selection Tool was created to be easy to use and implement, so UPS can distribute the tool to any of their facilities around the country if they so desire.

5.2 Future Expansion

As stated above, the Helper Selection Tool was designed to be easy to implement and adaptable to many different circumstances that might arise in the future. With UPS's expansive work measurements system, the tool can be easily kept up to date, so when variables change in the future, they can be changed in the program without difficulty. Cost Savings will increase exponentially as the tool is used over time since all of the cost is incurred in the first year.