
Senior Design

Transportation Bid Selection Tool

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Management Summary

Transportation Bid Selection Tool

The main goal of this project was to create a tool that would assist midsize companies in their selection of transportation bids. The tool needed to be easy to use, scalable, reusable, and distributable. In order to accomplish these goals, Microsoft Access was selected as the platform to handle the back-end tasks. By developing a clean front-end for Access, we were able to meet the ease of use requirement while harnessing the power of Access to scale and be reusable.



The opening screen of the tool presents a very simple, clean interface with buttons numbered 1 through 4. By clicking these buttons in order, the user accomplishes the tasks necessary to create a finished report. The first button allows the user to import historical data. The import screen will provide information on how to format data for import, and will also allow the user to open an example file in Excel. After importing the historical data, the user selects number 2, which allows him to import the data for the shipping lanes, the bids themselves, and the bidder information.

After importing all of these items, the user clicks number 3 to exclude bids and set the selection options. Finally, the user selects 4 to run his reports. On the report selection screen, the user is offered selected bids by lane and by bidder, as well as historical lane statistics and a cost comparison of this year's linehaul costs to those of previous years.

The tool is distributable because it has a secure area access by clicking on the Alix icon and entering a password. In this area, the company name ("Float N' Joy" in the example) can be

entered, and the type of time-in-transit consideration can be selected. Alix can then redistribute the set-up version of the tool to a client.

Background & Problem Description

Transportation Bid Selection Tool

The Problem

Every year, midsize companies all over the globe request bids from transportation companies for thousands of shipping lanes. They often receive thousands of bids back with varying trade-offs between time-in-transit and linehaul costs. Without a system to sort through these bids and weigh the trade off between transit time and linehaul costs, the companies' shipping managers are left to spend the majority of their time lining up shippers on a one-off basis or selecting a bidder without formally calculating a true winner by taking into account both linehaul cost and the cost of time-in-transit. For many companies, these time-in-transit costs can be extremely significant because shipments may carry several hundred thousand dollars worth of goods. Having said that, not all companies have a concrete grip on their WACC (weighted average cost of capital) and shipment values, so in order for our tool to be widely usable, it was necessary to allow an option to use a time-in-transit calculation based on WACC and shipment values, a time-in-transit cost that is a fixed dollar amount per day, and to ignore the time-in-transit cost completely.

Analysis Of The Situation

Transportation Bid Selection Tool

Considerations

The things that make this project a difficult one are not necessarily in the modeling. The tool needed to be able to import data from many different sources to create useful selections and reports. It needed to allow shipping managers to make selections based on their knowledge of bidders and incorporate this information into the model. It also needed to allow for the flexibility in calculating time-in-transit costs discussed previously. Most importantly, it needed to automate as many of the tasks as possible and have a straightforward, easy-to-use user interface in order to be useful to the maximum number of companies. Finally, the tool also needed to be self-contained and not require any outside software.

Approaches

By using Access as a back-end and VBA to automate tasks and provide a front-end, we were able to deal with most of the issues presented above. Using a combination of VBA and import functionality built into Access, we were able to develop a process that insured that the tool would not import any data that would cause a problem with program execution. While this checking does not ensure that the data is valid or useful, it ensures that the program will continue to run without problems until the data can be analyzed and the program can decide whether or not it is valid and useful information. In order to allow shipping managers to influence the selections made, a framework was created to allow easy click-to-remove functionality to exclude bidding companies from being considered for a particular lane. Automation of tasks was important not only for the ease-of-use reason described above, but also to ensure that a report was not created with erroneous results due to a user not completing all required steps before generating the report. For this reason, the front-end uses VBA to actuate all of the selection processes as well as importation, database management, and output creation. Finally, in order to allow the tool to be re-distributable without requiring the purchase of any outside software licenses (save for Access), we utilized a several step sort-and-select method to find the optimal solution. By using

this approach we were able to avoid moving to an integer programming based model, which to be practical for development would require the use of an outside software package. This method also allows for increased reliability, because the work is all done inside of Access itself and there is no uncertainty about what will be returned when the program requests something.

Technical Description

Transportation Bid Selection Tool

Sort-And-Select Process

As previously discussed, the tool utilizes a multiple-step sort-and-select approach in order to find the optimal solution. The first step is to calculate the total cost of each bid received. Depending on the options selected for the database, this process can take one of several paths:

Time-In-Transit Cost Based On WACC & Shipment Value

$$\text{Total_Cost} = \text{LineHaul} + ((\text{Daily WACC}) * (\text{Transit time in days}) * (\text{Shipment value}))$$

Time-In-Transit Cost Based On A Set Cost Per Day

$$\text{Total_Cost} = \text{LineHaul} + ((\text{Transit time in days}) * (\text{Cost Per Day}))$$

Ignore Time-In-Transit Cost

$$\text{Total_Cost} = \text{Linehaul}$$

After these costs are calculated, the bids are filtered to remove any bids that are not valid because they contain an invalid value for either LineHaul or TransitTime. The bids are further filtered to remove bids that have been selected to be excluded by the user. The bids are then sorted by Lane, then by TotalCost. The top three bids are selected and assigned an index from 0 to 2 based on their relative values (0 being the lowest bidder). The indexes are used later in report generation to show the number of shipments that should be allocated to that shipper.

After we have our list of winning bids with bid indexes, we can create our reports. Depending on the report selected, the process varies slightly. For bid selection reports, the report is generated and the number of shipments allocated to each shipper is calculated based on the total number of shipments for that lane and the logistical availability rules input by the user. For historical lane statistics and the cost comparison reports, the historical data in the database goes

through a verification process that combines records that are entered on more than one line due to a peculiarity of the system that generates this input data. The data is farther cleaned up by using comparison among similar records to check origin & destination information. Finally, the data is matched to our current shipping lanes, first using origin & destination zip codes, then for the left over records, on origin & destination names. Not all records in the input have both fields, so it is necessary to match on each and then combine the records to have a complete list of historical shipments that are relevant to our current list of shipping lanes. This matched historical information is then used to calculate the historical average LineHaul cost, and the cost comparison reported is generated, showing for each lane whether the company is spending more or less on LineHaul than the historical average.

Conclusion & Critique

Transportation Bid Selection Tool

The completed tool is certainly a success. With a simple point-and-click numbered interface, it is certainly easy to use, and with the ability to import different file types, output example files to help with formatting input files, and ability to identify incorrect input files before they cause program execution problems, the program is certainly flexible and reliable. It presents appropriate solutions in minutes, instead of weeks and shows clearly the comparison of this years selections to the historical averages.

While the tool is certainly useful and ready to distribute, it could use additional development. Writing a loader program would allow the tool to be opened without clicking through the security warnings in Microsoft Access. The tool could be further developed to allow for more options in the selection of bids & generation of reports. Finally, with a little more development, it could also produce reports in easily distributable PDF format.

All in all, the project has been a success. We suspect it will see much use by clients of Alix who face sorting through thousands of bids for hundreds of shipping lanes. It will produce clear savings by strictly enforcing a policy for bid selection in place of haphazard selection that is often done when companies don't have a tool to help them.

Appendix A

Transportation Bid Selection Tool

SCREEN SHOTS



Shot 1 - Home Screen

Update Historical Data

This tool can accept historical data in Excel and Comma-Separated-Value format. If you need help with formatting data for this tool, please click the question mark.

 Formatting Data Help
 Data Format Example

What would you like to do?

Add new historical data to database (Append)
 Clear data and start over (Replace)

Select File To Import



Shot 2 - Update Historical Data

Update Lane Data

This tool can accept lane data in Excel and Comma-Separated-Value format. If you need help with formatting data for this tool, please click the question mark.

-  Formatting Data Help
 Data Format Example

What would you like to do?

Add new Lane data to database (Append)
 Clear Lane data and start over (Replace)


- Select File To Import Skip this step and move on to Bid data



Shot 3 - Update Lane Data

Update Bid Data

This tool can accept bid data in Excel and Comma-Separated-Value format. If you need help with formatting data for this tool, please click the question mark.

 Formatting Data Help

 Data Format Example

What would you like to do?

Add new bid data to database (Append)

Clear bid data and start over (Replace)

Select File To
Import

Skip this step and
move on to Vendor
data



Shot 4 - Update Bid Data

Update Vendor Data

This tool can accept vendor data in Excel and Comma-Separated-Value format. If you need help with formatting data for this tool, please click the question mark.

 Formatting Data Help

 Data Format Example

What would you like to do?

Add new vendor data to database (Append)

Clear vendor data and start over (Replace)

Select File To
Import

Skip this step



Shot 5 - Update Vendor Data

Set Exclusions & Options

- 1 Exclude Bids
- 2 Set Options



Shot 6 - Set Exclusions & Options

Exclusions

To exclude bids from each lane, click the lane ID number below, then de-select bidders in the right pane.

Lanes

ID	OriginCity	DestinationCity
10766	MEXICALI	RAWDON
10767	ANJOU	EDMONTON
10768	CRANSTON	ANJOU
10769	CRANSTON	EDMONTON
10770	DAVENPORT	ANJOU
10771	WHITINSVILLE	PHILADELPHIA
10772	WHITINSVILLE	CHICAGO
10773	WHITINSVILLE	LAS VEGAS
10774	CRANSTON	WOBURN
10775	CRANSTON	SMETHFIELD
10776	CRANSTON	THOMPSON
10777	CRANSTON	EAST RUTHERFORD
10778	CRANSTON	THOROFARE
10779	CRANSTON	LANSHURST
10780	CRANSTON	BROOKLYN
10781	CRANSTON	BRISTOL
10782	CRANSTON	RICHMOND

Bidders

ID	Bidder Name
553	TTS LOGISTICS, LLC
544	MGE-MENTUM TRANSPORTATION
566	CRST Logistics
564	M.A.D. Logistics
571	Tech Transport Inc
546	Crete Carrier Corporation
551	Heartland Express
556	US Xpress, Inc.
561	Landstar Inway, Inc.
560	Swift Transportation Corporation
575	NFI Industries
578	Covenant Transport
554	Knight Transportation Services, Inc.
569	J. B. Hunt Transport, Inc.
567	Werner Enterprises
583	westwood cartage inc.
547	CH Robinson

Finished

Shot 7 - Exclusions

Set Options

Cost Of Capital & Shipment Value Options

Weighted Average Cost Of Capital: %

Set Individual Lane
Shipment Values

Logistical Availability Rules

Set the amount that can be awarded to each bidder for each lane below:

Cheapest Shipper: % of shipments

2nd Cheapest Shipper: % of shipments

3rd Cheapest Shipper: % of shipments

Enforce these rules for lanes with a minimum of:

shipments per year



Shot 8 - Set Options

Run Reports

Bid Selections by Lane

Bid Selections by Bidder

Historical Lane Statistics

Cost Comparison



Exit

Shot 9 - Report Selection

Bid Selection Report

Prepared: 5/9/2008

By Lane

Float N' Joy

Vendor ID	Total Cost	Flat Rate	Transit Time	Shipments
10766	MEXICALMEX-RAWDON,QC			4 shipments annually
557	\$20,537	\$4,099	3	4
558	\$32,277	\$4,880	5	0
567	\$37,159	\$4,282	6	0
Lane Average	\$29,991	\$4,420	5	4
10767	ANJOU,QC-EDMONTON,AB			152 shipments annually
557	\$15,934	\$4,975	2	106
561	\$25,318	\$3,400	4	23
550	\$27,018	\$5,100	4	23
Lane Average	\$22,757	\$4,492	3	152
10768	CRANSTON,RI-ANJOU,QC			69 shipments annually
563	\$5,943	\$464	1	48
574	\$5,979	\$500	1	10
582	\$5,979	\$500	1	10
Lane Average	\$5,967	\$488	1	68
10769	CRANSTON,RI-EDMONTON,AB			8 shipments annually
563	\$28,212	\$6,294	4	8
558	\$30,337	\$2,940	5	0
560	\$31,387	\$3,990	5	0
Lane Average	\$29,979	\$4,408	5	8
10770	DAVENPORT,IA-ANJOU,QC			12 shipments annually
558	\$12,607	\$1,648	2	12

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Shot 10 - Bid Selections By Lane Report



Shot 11 - Password Box For Setup Area



Shot 12 - Protected Setup Area