Using cost behavior to make optimal business decisions: The case of Air Land Transport, Inc.

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ABSTRACT

Air Land Transport, Inc. (ALTI) is a freight forwarding company that specializes in the shipping of unique cargo. ALTI has recently experienced a large turnover in employees following a lengthy period of unprofitability. As a new operations manager takes over, he must assess how to make optimal shipping decisions given the mandate from ALTI ownership to restore profitability, time-sensitive delivery demands made by customers, and the set of carrier options available to his regional office, some of which are variable in nature and some of which are fixed in nature. The purpose of this case study is to familiarize introductory level managerial accounting students with how variable and fixed costs behave and to demonstrate one way in which knowledge of cost behaviors can impact typical business decisions. This case can be used to provide real world context to the traditional academic study of cost behavior.

Keywords: Cost Behavior, Cost Minimization, Optimal Decision Rules

INTRODUCTION

This case is designed to help students understand the nature of variable and fixed costs at an introductory level. According to Weygandt et al. (2013), "A knowledge of cost behavior helps management plan operations and decide between alternative courses of action. Cost behavior applies to all types of entities." In this case, management is charged with the task of planning operations and deciding between alternatives based on cost behaviors in a logistics setting. Studying cost behavior in a real-world context enhances student understanding of the topic and allows students to understand that topics such as cost behavior apply in a broad array of business settings.

BACKGROUND

Scott Powers, Assistant Operations Manager for the Denver headquarters of Air Land Transport Inc. (ALTI), was returning to ALTI's Denver operations office after spending the evening supervising outbound shipments for one of ALTI's major clients in the area when he noticed a car in the parking lot that wasn't usually there so late in the evening. It belonged to Preston Smith, ALTI's founder and CEO. Preston had moved ALTI's headquarters from Memphis to Denver five years prior so that he could spend more time at his vacation home in the area. Scott had gotten to know Preston well over those previous five years and knew that he wouldn't be at the headquarters so late unless there was an urgent reason. As soon as Scott reached his office, he found Preston and Maddy Barza, Denver Operations Manager, waiting there for him. Preston explained that there was trouble in the Memphis office and that he needed Scott's help to keep the office open and keep ALTI's long-time Memphis clients from moving their business to other freight forwarding companies.

ALTI, a major freight forwarding company, was founded in 1987 by Preston Smith. Over the course of three decades, Preston grew ALTI from a single office in Memphis with just one employee and no clients, to a national company with more than 50 offices, 500 employees and $200,000,000 in revenues. ALTI grew by specializing in the shipment of unusual, time-sensitive freight with special shipping requirements that major freight carriers couldn't handle well in their large, monolithic shipping systems such as sensitive electronic equipment and high-value medical products. Freight forwarders, such as ALTI, don't own the trucks and planes being used to transport shipments. Instead, they rely on specialized trucking and air transport companies that cater to large shippers like ALTI who can bundle together numerous small shipments into larger single shipments headed from one destination to another.

Preston explained to Scott that despite ALTI's national success, the Memphis office had lost clients and been unprofitable for the past several years. "If this were any other office besides Memphis, the office where I founded ALTI, I would have closed it by now," Preston said. Preston went on to tell Scott that he wanted to offer him a promotion to Memphis Region Operations Manager. Scott knew that Preston had left his youngest son, Nick, in charge of the Memphis office as the Operations Manager when Preston moved ALTI's headquarters to Denver. "Doesn't Memphis already have an Operations Manager?" Scott asked. Preston told Scott that he had informed Nick earlier that day that he was being reassigned to the Dallas office as the Assistant Operations Manager. He went on to say that Nick had accepted the change well, but that the Memphis Operations team which Nick had filled with his friends all quit upon hearing that Nick would no longer be running the Memphis office. "So who's running the office there?" Scott asked. Preston said that Tad Phillips was the only member of the Memphis Operations team that stayed. "Tad is a good young employee," Preston said, "but he doesn't have the experience to run that office and he can't keep it open by himself." Preston could tell that Scott was hesitant to commit his future to an office with such dire problems. "I tell you what," Preston said, "you fly down to Memphis in the morning and spend a few weeks there working with Tad and evaluating the situation. If you think it's a lost cause after those two weeks, I'll close the office and you can come back here. If you think we can salvage the office, the job as Operations Manager there is yours. I won't sugarcoat things. That office has lost all its employees except one, it's lost all its clients except one, and it lost nearly $150,000 last year. It might not look like a great opportunity right now, but I will be personally grateful if you can keep my founding office open." Despite his reservations, Scott accepted and flew to Memphis the next morning.

MEMPHIS OPERATIONS

Scott had talked to Tad Phillips and learned that the lone client left in the Memphis office typically starting tendering outbound shipments at 5 P.M. and had a cut off time of 11:00 P.M. since most truck and air carriers stopped taking shipments just before midnight. Scott arrived in Memphis early on Tuesday afternoon and drove straight to ALTI's office to meet with Tad. Scott asked Tad a range of questions about how the Memphis operations had been conducted under Nick. He found out that their single client shipped to four destinations – Atlanta (ATL), Tampa (TPA), Chicago (ORD), and Minneapolis (MSP). Tad told Scott that all shipments required 1-Day or 2-Day delivery, the average shipment was approximately 150 lbs., and each of the four destinations typically had 5 to 15 shipments per night. Scott was very concerned when he asked Tad to see a copy of the operations manual for Memphis and was told that there was no manual because Nick's operations team had decided they didn't need one. The operations manual for each office is a compilation of price lists for various trucking and air carriers, detailed information about shipping requirements for each client of that office, along with contact numbers for all other ALTI offices and ALTI headquarters where a national shipping coordinator is available 24/7 to assist with coordinating difficult shipments. Tad explained that they didn't need a list of carrier prices because there were only two truck carriers and one air carrier left in Memphis that would accept freight from ALTI since Nick had rarely paid bills from the carriers in a timely manner and had often left invoices unpaid for 120 days or more. The two truck carriers that still accepted ALTI freight were Quick Trucking who serviced the Southeast, including Atlanta and Tampa, and Boomerang trucking who serviced the Midwest, including Chicago and Minneapolis. "So what happened when a customer wanted to ship something to the West coast?" Scott asked. "We just told them that we didn't ship there, and then they would give the shipments to another freight forwarder. Eventually they just started giving all the shipments to other freight forwarders," Tad said. Scott immediately realized that it would take a long time to rebuild the ALTI brand in Memphis and how important it was to hold onto their one remaining client. All ALTI air shipments were being handled by Sky Freight. Scott has stopped using Sky Freight in Denver because they weren't price competitive with other less costly air freight carriers, but he had no choice for the time being but to use them.

Scott ended the meeting with Tad and told him to begin preparations for the night's shipping activities while Scott made some calls to gather more vital information. Scott talked to managers at Boomerang Trucking, Quick Trucking, and Sky Freight to let them know that the

Memphis office was being run under new management and to assure them that they would no longer have to worry about when their invoices would be paid. He also gathered information from each carrier about which destinations they served, their price per pound to each destination, when freight would arrive in each destination, and what time freight had to be tendered to them to make the outbound trucks and planes. Scott also knew that they desperately needed to expand their shipping options, so he got a list of Memphis carriers from ALTI's national office and began calling each of them. One by one, they refused to accept any freight from ALTI until all prior invoices were paid, which Scott knew would take several days at a minimum given Nick's lack of recordkeeping or filing. One carrier, Straight Arrow Trucking, agreed to take shipments after Scott paid ALTI's outstanding invoices using his personal credit card. Straight Arrow was a custom hotshot carrier, meaning that they charged per mile rather than per pound like other typical freight companies. They also didn't carry freight from any other carrier on a truck once it had been hired for a trip, and they would pick up and depart as late as Scott needed. This meant that if Scott arranged for Straight Arrow to carry a shipment from Memphis to another city, he had sole use of the truck which could carry up to 11,000 lbs., and the driver would make the pick up and take it directly to the ALTI office in the destination city. Although custom carriers like Straight Arrow tended to be expensive, Scott was relieved to have another carrier option if he needed it. He spent another hour compiling all the carrier information he had gathered into a single document that he could refer to during the night (Exhibit 1), then he and Tad departed to head to their client's warehouse to get the night's shipments processed and shipped out.

FIRST NIGHT

When Scott and Tad arrived at the client's warehouse, Tad began getting the necessary shipping supplies ready for the evening and Scott immediately met with Harvey Williams, the Warehouse Manager. Scott asked Harvey if he knew ahead of time about shipments that would be tendered after 10 P.M., and if he could let Scott or Tad know about those type of shipments earlier in the night so they could be sure all freight makes it to the carriers on time. Harvey agreed to let Scott know early about any shipments that would be ready for shipping near the end of the night. As of 9:30 PM, ALTI has received the following shipments for each destination:

- ATL: Three 1-Day shipments totaling 450 lbs.; Five 2-Day shipments totaling 725 lbs.
- TPA: Two 1-Day shipments totaling 450 lbs.; One 2-Day shipment totaling 525 lbs.
- ORD: Eight 1-Day shipments totaling 900 lbs.; Four 2-Day shipments totaling 475 lbs.
- MSP: Five 1-Day shipments totaling 785 lbs.; Three 2-Day shipments totaling 460 lbs.

Tad noticed throughout the night that Scott would refer to several sheets on his clipboard and start punching numbers into his calculator every time a new shipment was tendered. He was also pretty sure he saw several mathematical equations that Scott had written on one of the sheets. It seemed odd to him that Scott would be using equations of any kind on a shipping dock, but he didn't say anything because Scott seemed to know a lot about shipping. Scott told Tad to continue preparing the shipments on the dock while he went to speak with Harvey Williams in the shipping office. Harvey told Scott that there would be two additional 1-Day shipments for Atlanta totaling 875 pounds, and that they would be ready just before cutoff time. Scott thanked Harvey and went back to finish all the shipping paperwork and get carrier pickups scheduled. When Scott returned to ALTI's area of the shipping dock, Tad proudly showed him that he had completed the carrier shipping documents for all the various destinations and carriers. "How did you decide which carriers to use?" Scott asked Tad. "Well," Tad explained, "I've seen Nick do it a hundred times, so I just followed what we've done in the past." Scott patiently told Tad that he had crafted a new set of decision rules that should save ALTI a lot in shipping costs, and he also told Tad that he would sit down with him after all the freight was shipped out for the night and teach him how to use the new cost equations and decision rules. The two Atlanta shipments arrived as Harvey said, and Scott used his new set of decision rules to determine which carriers should be used to minimize ALTI's shipping costs. Scott and Tad had a meeting after finishing for the night where Scott showed Tad the carrier cost sheet he had formulated before operations that night, the cost estimation equations he had written, and the new set of decisions rules that he had formulated. He and Tad then worked together to calculate how much ALTI had saved that night in shipping costs using the new decision rules versus Nick's old decision rules.

STUDENT ASSIGNMENT

1. Prepare a chart showing Nick's old decision rules for each destination. Be sure to consider 1-Day versus 2-Day freight and the day of the week when making out decision rules.
2. Using the ALTI Carrier Cost Sheet (Exhibit 1), prepare cost equations for each destination keeping in mind the day of week that shipments are being made.
3. Use your cost equations and your knowledge of hotshot carrier costs to replicate Scott's new decision rules. (HINT: Should ALTI ever pay more than the hotshot carrier rate to transport?)
4. How do you think Scott explained his new decision rules to Tad? Be sure to consider which costs are variable and fixed when formulating an answer.
5. Compute the cost savings for Scott's first night using Scott's new decision rules versus Nick's old decision rules. Do you think these new decision rules will be able to make the Memphis office profitable again?

EXHIBIT 1

ALTI CARRIER COST SHEET			
(MEM to ATL) Memphis to Atlanta - .59 per pound – Quick Trucking – 1 Day			
Departure Day	Arrival Day	Pickup Cutoff Time	Arrival Time
MON	TUE	23:00	09:00
TUE	WED	23:00	09:00
WED	THU	23:00	09:00
THU	FRI	23:00	09:00
FRI	SAT	23:00	09:00
(MEM to TPA) Memphis to Tampa – .98 per pound – Quick Trucking – 2 Day			
Departure Day	Arrival Day	Pickup Cutoff Time	Arrival Time
MON	WED	23:00	08:00
TUE	THU	23:00	08:00
WED	FRI	23:00	08:00
THU	MON	23:00	08:00
FRI	MON	23:00	08:00
(MEM to ORD) Memphis to Chicago - .78 per pound – Boomerang Tucking – 1 Day			
Departure Day	Arrival Day	Pickup Cutoff Time	Arrival Time
MON	TUE	23:00	10:00
TUE	WED	23:00	10:00
WED	THU	23:00	10:00
THU	FRI	23:00	10:00
FRI	MON	23:00	08:00
(MEM to MSP) Memphis to Minneapolis – .96 per pound – Boomerang Trucking – 2 Day			
Departure Day	Arrival Day	Pickup Cutoff Time	Arrival Time
MON	WED	23:00	08:00
TUE	THU	23:00	08:00
WED	FRI	23:00	08:00
THU	MON	23:00	08:00
FRI	MON	23:00	08:00
Memphis Air Departures – Sky Freight – 1 Day – All Arrivals Next Morning			
Destination	Cost per pound	Pickup Cutoff Time	Arrival Time
ATL	1.76	23:59	09:00
TPA	2.02	23:59	09:00
ORD	1.87	23:59	09:00
MSP	1.99	23:59	09:00
Memphis Hotshot Departures – Straight Arrow Freight			
Destination	Cost per mile/Total – 24FT MAX 11,000 lbs.	Pickup Cutoff Time	Transit Time
ATL (378 Miles)	$2.00/$756	None	7 Hours
TPA (836 Miles)	$2.00/$1672	None	14 Hours
ORD (556 Miles)	$2.00/$1112	None	9 Hours
MSP (808 Miles)	$2.00/$1616	None	13 Hours

TEACHING NOTE

TN 1 – Instructors can discuss with students that all of the previous shipping options used by Nick are completely variable in nature based on pounds shipped.

Previous Decision Rules		
Destination	**1-Day**	**2-Day**
ATL (Atlanta)	• Quick Trucking	• Quick Trucking
TPA (Tampa)	• Sky Freight (M-Th) • Quick Trucking on Fridays	• Quick Trucking
ORD (Chicago)	• Boomerang Trucking	• Boomerang Trucking
MSP (Minneapolis)	• Sky Freight (M-Th) • Quick Trucking on Fridays	• Boomerang Trucking

TN2 – While there are only 4 destinations, there are 10 cost equations based on destination, day of the week, and shipping choice. This is a good time to discuss with students that Quick, Boomerang, and Sky Freight represent variable costs based on pounds shipped. Straight Arrow, on the other hand, is a fixed cost. Many students may think that Straight Arrow is variable based on number of miles, but the instructor should point out that the number of miles between Memphis and each destination does not vary. Therefore, the cost of a hotshot truck remains the same regardless of pounds shipped. In a deeper discussion of the subject, instructors can point out that Straight Arrow is variable from the point of view of making of shipment with the carrier or not making a shipment with the carrier. The instructor could also have a discussion centering around the fact that Straight Arrow costs are variable based on destination, but not based on pounds shipped like the other carriers in the case.

Cost Estimation Equations	
Destination	**Equation**
ATL (Atlanta) – Quick Trucking all days	ATL Cost = .59(# lbs.)
ATL (Atlanta) – Straight Arrow all days	ATL Cost = $756
TPA (Tampa) – Both Land & Air, Mon to Thu	TPA Cost = 2.02(# 1-Day lbs.) + .98(# 2-Day lbs.)
TPA (Tampa) – Quick Trucking, Fri	TPA (Friday) Cost = .98(# lbs.)
TPA (Tampa) – Straight Arrow all days	TPA Cost = $1,672
ORD (Chicago) – Boomerang Trucking all days	ORD Cost = .78(#lbs.)
ORD (Chicago) – Straight Arrow all days	ORD Cost = $1,112
MSP (Minneapolis) – Both Land & Air, Mon to Thu	MSP Cost = 1.99(# 1-Day lbs.) + .96(# 2-Day lbs.)
MSP (Minneapolis) – Boomerang Trucking, Fri	MSP (Friday) Cost = .96(# lbs.)
MSP (Minneapolis) – Straight Arrow all days	MSP Cost = $1,616

TN 3 – Instructors should discuss with students that 1-Day and 2-Day freight represent different products in some circumstances (TPA, M-Th; MSP, M-Th), but that they are treated exactly the same from a cost perspective in other situations (ATL, all days; ORD, all days; TPA, Fri only; and MSP, Fri only). This gives instructors an opportunity to examine how costs can behave differently under different circumstances. This also gives instructors the chance to display how cost equations can be set equal to each other to find indifference points and devise decision rules. Many students will be confused that an indifference point can't be readily found for TPA (M-Th) and MSP (M-Th) in terms of pounds. This is due to 1-Day and 2-Day freight representing different costs for these destination/day combinations. Instead of defining decisions rules in terms of pounds, these two destinations must be defined in terms of total cost for M-Th shipments.

<table>
<tr><th colspan="3">New Decision Rules</th></tr>
<tr><th>Destination</th><th>1-Day</th><th>2-Day</th></tr>
<tr><td>ATL (Atlanta)</td><td colspan="2">• Quick Trucking up to 1,282 lbs.
Straight Arrow above 1,282 lbs.</td></tr>
<tr><td>TPA (Tampa) – Mon to Thurs</td><td>• Sky Freight if combined cost of 1-Day and 2-Day Shipments is less than $1,672
• Straight Arrow if combined cost of 1-Day and 2-Day Shipments is more than $1,672</td><td>• Quick Trucking if combined cost of 1-Day and 2-Day Shipments is less than $1,672
• Straight Arrow if combined cost of 1-Day and 2-Day Shipments is more than $1,672</td></tr>
<tr><td>TPA (Tampa) – Friday Shipments</td><td colspan="2">• Quick Trucking on Fridays up to 1707 lbs.
• Straight Arrow on Fridays above 1707 lbs.</td></tr>
<tr><td>ORD (Chicago)</td><td colspan="2">• Boomerang Trucking up to 1426 lbs.
Straight Arrow above 1426 lbs.</td></tr>
<tr><td>MSP (Minneapolis) – Mon to Thurs</td><td>• Sky Freight if combined cost of 1-Day and 2-Day Shipments is less than $1,616
• Straight Arrow if combined cost of 1-Day and 2-Day Shipments is more than $1,616</td><td>• Boomerang Trucking if combined cost of 1-Day and 2-Day Shipments is less than $1,616
• Straight Arrow if combined cost of 1-Day and 2-Day Shipments is more than $1,616</td></tr>
<tr><td>MSP (Minneapolis) – Friday Shipments</td><td colspan="2">• Boomerang Trucking on Fridays up to 1684 lbs.
• Straight Arrow on Fridays above 1684 lbs.</td></tr>
</table>

TN 4 -Most students will point out that Scott's new decision rules are more complex than Nick's old rules. Computing the cost savings from Scott's first night in Memphis will confirm that the benefits of the new rules outweigh the costs of the increased complexity. Using a fixed cost option to ATL and MSP saves ALTI a total of $826.50 for a single night of operations. Most students will assume that level of savings is available every night and conclude that ALTI could save $214,890 ($826.50 * 5 * 52) over the course of a year, thus restoring profitability to ALTI's Memphis office. Instructors should discuss with students that a single night of data is not enough to conclude whether the new decision rules can restore a positive profit. This can also lead to a discussion of what other actions Scott may be able to take over time to increase cost savings beyond adding a new fixed cost carrier.

Computation of Cost Savings

Shipment	Previous Decision Rules	New Decision Rules	Savings
ATL 1-Day (1300 lbs.)	$767.00		
ATL 2-Day (725 lbs.)	$427.75	$756.00	$438.75
TPA 1-Day (450 lbs.)	$909.00	$909.00	-
TPA 2-Day (525 lbs.)	$514.50	$514.50	-
ORD 1-Day (900 lbs.)	$702.00	$702.00	-
ORD 2-Day (475 lbs.)	$370.50	$370.50	-
MSP 1-Day (785 lbs.)	$1562.15	$1616.00	$387.75
MSP 2-Day (460 lbs.)	$441.60		
Total	$5694.50	$4868.00	$826.50

REFERENCES

Weygandt, J. J., Kimmel, P. D., & Kieso, D. E. (2013). Accounting principles (11th ed.). Hoboken, NJ: Wiley.