Flight delays: towards measuring the cost to corporations

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Abstract

This study, conducted in South Africa, is a first step in measuring the cost of flight delays to corporations. Following a simple quantitative methodology the direct cost of flight delays to travellers from one corporation, based on man-hours lost, was determined. Significant relationships were found between substantial delays and month, day and time period flown. Viewed against the limitations of the study the value of time lost was found not to constitute a substantial amount to the corporation. Implications of the research rest in the identification of patterns of flight delays which could provide business travellers, especially frequent flyers, with information to better manage their travel arrangements optimising travel times and costs to corporations.

Keywords: Corporate travel management, corporate travellers, flight delays, cost to corporations

1. Introduction

One of the main concerns business travellers have is the potential loss of productivity while travelling. This could be exacerbated by the occurrence of flight delays which, according to a number of industry-based studies, seems to be showing an increasing trend (Müller & Santana, 2008; Skyguide, 2005; Mazzeo, 2003). Most studies on flight delays have focused on the reasons for and cost of delays to airlines and airports. The impact of delays on air travellers has been looked at from passenger complaints (Januszewski, 2004), consumer protection rights (Sherry, Wang & Donohue., 2007) and service quality (Forbes, 2006) perspectives but little attention has been given to the cost of flight delays on travellers or corporations. This may be because it is a difficult concept to measure. Business travellers are less price sensitive than leisure travellers, so cost appears less important. The question also arises as to whom the cost of the delay is attributed. In the business travel market a distinction is made between the passenger (the actual traveller) and the corporation paying for the trip on behalf of the traveller, thus the corporation and the traveller both experience some form of loss. Also, costs incurred as a result of flight delays can be both direct (for example the cost of alternative flights/modes of transport or accommodation and catering), and indirect (for example “opportunity” costs such as missed business opportunities which are almost impossible to measure). Although limited in scope, this

study represents a starting point in investigating the impact of flight delays on business travellers and corporations aiming to:

- determine if a substantial percentage of business travellers are affected by flight delays;
- assess man-hours lost due to the flight delays experienced by travellers of an organization over a specified period;
- measure the direct cost in terms of man-hours lost as a result of flight delays;
- identify patterns in the occurrence of flight delays as experienced by business travellers of a specific organization.

2. Methodology

A simple quantitative methodology was used to determine the direct cost of flight delays to travellers from one corporation, based on man-hours lost. Two sets of data were used (one provided by the corporation and one by the air traffic authorities) from which a comparison could be made to determine which flights undertaken by the corporate travellers were delayed and if any significant relationships could be determined between flight delays and types of traveller (frequent/infrequent) or time periods (time, day, week, month). The population for this study was drawn from a list of corporate travellers provided by a corporation with a substantial travel budget in South Africa. The corporation supplied company travel data for the period January 2008 until June 2008 as captured by their contracted Travel Management Company. The travel data contained a total of 749 travel entries. Once all the entries were split into their individual flight legs, a total of 1 313 flights were identified, each with its individual departure and arrival points. A total of 518 flights were discarded for various reasons including duplications, refunded flights and spelling mistakes. After further cleaning of the data 752 corporate flights were successfully matched to air traffic flight records.

For comparative purposes (to match scheduled and actual flight times) and to analyze the extent of flight delays experienced by the corporation over the six-month period, South African flight data for the same time period (January to June 2008) was provided by air traffic authorities in South Africa. Before statistical analysis could begin, editing of the data was done to detect any errors or omissions, which were then corrected wherever possible or removed, to ensure that minimum data quality standards had been achieved. To accurately identify the flight delays, the sets of data needed to be matched to each other. Prior to matching the flight data two main issues were identified:

- Firstly, the two sets of data were captured according to two different coding systems, namely IATA and ICAO. The decision was made to substitute all relevant ICAO codes with the corresponding IATA codes
- Secondly, the two sets of data were captured using two different time zones. This was rectified through a specially scripted program

The Actual Time of Arrival (ATA) was used to identify whether flights arrived later than scheduled, were on time or early. Flights arriving 15 minutes or more after the scheduled arrival time were recorded as delayed flights. The calculation of certain estimates from the available data was required to address the effect of flight delays experienced by business travellers from a time and cost perspective, and to quantitatively measure the effect of flight delays on business travellers. These estimates are reflected in table 1.

Table 1

Estimates required for assessing the number of flights affected by delays and the subsequent time lost.

The value of the time lost by business travellers were grouped according to industry standard valuation and levels of seniority. The aim was to match the extent of flight delays to generally accepted hourly rate valuations relative to the salary grades of the travellers. The corporation supplied an estimated value of time for each level of business traveller: senior, middle and lower level employee.

3. Results

3.1 *Total flight delays and time lost*

The number of individual travellers identified on the corporate database mounted to 144 of which 35 (24.3%) could be classified as frequent travellers (having flown a minimum of once per month thus six or more times during the six months period). These frequent travellers accounted for 63.2% of the total flight travel undertaken by the corporate travellers. A total of 752 flights were captured and of these 96 flights (12.8%) experienced substantial delays (more than 15 minutes). A total time of 67.6 hours (4,055 minutes) from 96 flights was lost due to flight delays. Frequent flyers experienced 63.5% of the delayed flights, thus the majority of the flight delays. The shortest delay experienced was 15 minutes and the longest was 4.5 hours with the average delay being calculated at 42.2 minutes. Compared to the average delay of 42.2

minutes, frequent travellers experienced an average substantial delay of 46.5 minutes. The total time loss experienced by frequent travellers due to the occurrence of substantial delays totaled 47.3 hours.

Chi-square tests of significance (at a *p-value* < *0.05*) were done to identify any significant association between the on-time performance of a flight and a number of variables including the route flown, airline, month of the year, day of the week and time of the day flown. No significant results on routes and delays were obtained. The results as shown in table 2 indicated a significant relationship between delays and month flown. As the flight data was captured over the six-month period from January to June 2008, only those months were tested, meaning that the results could differ across other months. The months were coded from 1 (January) to 6 (June).

Table 2

Delays per Month of the Year

At a *p value = 0.0043* the months of February (2), March (3) and April (4) showed greater than average frequencies of substantial flight delays. March experienced the greatest frequency (20.74%), while May (5.67%) experienced the least.

Table 3

Delays per Day of the Week

As shown in table 3, a significant relationship was found between flight delays and days of the week. At a *p value = 0.0407* Mondays and Saturdays experienced the greatest frequency of substantial flight delays, while Sundays and Wednesdays experienced greater than average delays, and Tuesdays and Thursdays showed lower than average frequencies of flight delays.

A relationship was also sought between delays and time of day and to better allow for the identification of any trends / patterns the standard 24-hour day was divided into 5 time zones:

- 00h00 – 04h59 (zone 1)
- 05h00 – 09h59 (zone 2)
- 10h00 – 14h59 (zone 3)
- 15h00 – 19h59 (zone 4)
- 20h00 – 23h59 (zone 5)

Table 4

Delays per Time Zone

Table 4 shows that at a *p value* = 0.0449 zone 4 (15h00 – 19h59) and zone 5 (20h00 – 23h59) proved to have experienced the greatest frequency of delays. Zone 2 (05h00 – 09h59) indicated a lower than average frequency of flight delays

3.2 *The cost of flight delays*

In calculating the value of the time lost by corporate travellers due to flight delays, it was decided to divide the travellers into levels of seniority as it is generally accepted that the higher the level of seniority of an employee, the greater the value of his or her time. From the information provided by the corporation, the travellers were divided into seniority levels as follows:

- 35% of travellers were senior level management
- 55% of travellers were middle level management
- 10% of travellers were lower level employees

The total flight delay time was thus proportionally allocated to provide a delay time for each level of seniority (calculating the percentage of each level against the total time lost) as follows:

- Travellers at Senior level management experienced a total of 23.7 hours of substantial flight delays,
- Travellers at Middle level management experienced a total of 37.2 hours of substantial flight delays, whilst
- Lower level employees experienced 6.8 hours of substantially delayed flights.

Following this, the actual cost resulting from the flight delays for each level of traveller, was determined. The estimated value of time provided by the corporation for each level of traveller was estimated as follows (in South African currency):

- Senior level management – R10 000 per day (R1 111 per hour)
- Middle level management – R7 500 per day (R833 per hour)
- Lower level employees – R5 000 per day (R555 per hour)

From the estimates provided, the relevant cost of time lost due to flight delays for each level of traveller was calculated as follows (value of time per minute rounded up to the next Rand):

- The substantial flight delays experienced by senior level travellers, whose time was valued at R1 111 p/hour or R19.00 p/min, resulted in a cost to the company of R26 330.70.
- The substantial flight delays experienced by middle level managers, whose time was valued at R833 p/hour or R14.00 p/min, resulted in a cost to the company of R30 987.60.
- Finally, the cost of substantial flight delays experienced by lower level employees, whose time was valued at R555 p/hour or R10.00 p/min, resulted in a total loss of R3 774.

The total cost of the 12.8% of substantial flight delays experienced by the corporate travellers over the six months period from January to June 2008, amounted to R61 092.30.

4. Discussion

The results show certain significant trends in flight delays. Delays occur more frequently over certain months, days of the week and time zones. The reasons for this were not investigated in this study but the patterns seem to suggest that recurring reasons may be evident. From the perspective of the corporate traveller the reasons may not be as important as the trends that are exhibited since travellers would probably wish to avoid undertaking travel in periods where the likelihood of flight delays is more evident. These trends could be considered as a factor in more effective planning of business trips.

It is evident from the simple calculation on the cost of flight delays, that the value of time lost does not constitute a substantial amount for the corporation and that it could easily be discounted as being unimportant. Two perspectives could be taken here:

First, that the actual impact of flight delays is much greater than depicted in these results.

- The monetary value of time lost, which is the objective set for this study, is only one component when looking at the impact of flight delays. Other components such as additional delays due to baggage arrival delays may be present. Also, other direct costs such as transport and accommodation, as well as indirect costs such as missed

appointments or business opportunities may also be a factor. This could increase the amount.

- The reader is reminded of the limitations of the research in terms of the geographic location for the originating flights, the period over which the flights were calculated and the small number of corporate travellers used against the total number of flights flown.
- The sample is small in terms of total number of travellers and represents one company only, and a different result is probable with a larger sample and different companies.

Second, the total time lost does in actual fact represent only a small number of delays and, even if the sample is relatively small, this has implications in terms of traveller perceptions. This means that the perception of travellers that flight delays are an increasing source of concern is perhaps exaggerated and airlines should pursue research in this area in order to harness whatever positive results are obtained from such research to promote positive traveller perceptions.

The study also aimed to analyze the influence of substantial flight delays experienced by frequent travellers. Whilst only 24.3% of the total corporate population could be regarded as frequent travellers, they accounted for 63.5% of the total substantial flight delays experienced. Frequent travellers not only undertook the majority of travel, but also experienced the majority of substantial flight delays. This statistic is similar to previous research which noted that frequent travellers tend to account for the majority of flight delay experiences (Suzuki, 2000).

The results showed that most of the frequent travellers were influenced by the occurrence of at least one substantial flight delay. Compared to infrequent travellers, the smaller percentage of frequent travellers, accounted for the greatest monetary loss. Following the value of time calculation, the frequent travellers (24.3%) accounted for a total monetary loss of R42 708.50. The results suggest that frequent travellers' arrangements need to be carefully managed, as they experience not only the greatest number of substantial flight delays, but also for greater monetary losses. Consequently, if frequent travellers experience less flight delays, the subsequent monetary losses resulting from frequent flyer delays, would be reduced.

The existence of any travel patterns or relationships around the occurrence of substantial flight delays was investigated to provide corporate travellers the opportunity to better plan their travel arrangements to reduce the potential to experience substantial flight delays, and thus the resulting costs. The avoidance of substantial delays could promote the more efficient use of travellers' time through less time wastage, as well as lower traveller frustration levels during travels, particularly in the case of frequent travellers.

Within the confines of this study statistically significant relationships were found between substantial delays and the month of the year, the day of the week, and the time of day

flown. This type of result could provide an opportunity for organizations to consider the avoidance of travel during certain time periods, days or months of the year.

5. Conclusion

The limitations of this study are clear. The results of the study are limited to travel undertaken by corporate travellers from a specific organization in South Africa over a period of six months from January to June 2008. These results would probably differ from those for other companies over different periods. Furthermore, as the study was restricted to South Africa only flights with a South African arrival or departure leg were analyzed. Finally, even though the monetary value of time provided by the corporation was in accordance with previous research, the cost of flight delays experienced is applicable only to the selected organization. So while a quantitative methodology was used to analyze the data, the corporation can be viewed as a corporate case study in determining the effect of flight delays on their travellers. Most importantly, the study looked only at the estimated monetary value of time lost by travellers. Only direct costs were measured as historical flight data, supplied by the selected corporation and the air traffic authorities, were used to identify the occurrence and extent of any flight delays. The study did not take into account other costs such as additional accommodation, alternative transport or lost business opportunities. Nevertheless it represents a start in collecting credible evidence of what flight delays may cost business travellers and their corporations.

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Table 1

Estimates required for assessing the number of flights affected by delays and the subsequent time lost.

TOTAL FLIGHTS
% delays to total flights
Number of delayed flights to total flights
Total time lost (in hours)
PER AIRLINE
% delays to total flights per airline
Number of delays to total flights per airline
Time lost per airline
PER ROUTE
% delays to total flights per airline per route
Number of delays to total flights per airline per route
Time lost per airline per route
PER MONTH
% delays to total flights per month
Number of delayed flights to total flights per month
Time lost per month
PER DAY OF WEEK
% delays to total flights per day of the week
Number of delays to total flights per day of the week
Time lost per day of the week
PER TIME OF DAY
% delays to total flights per time of the day
Number of delays to total flights per time of the day
Time lost per time of the day
FREQUENT TRAVELLERS
Identify no of individual travelers from total flights/travelers (e.g. out of 1000 flights, 200 indv travelers were identified)
% frequent travelers from total travelers (5 or more flights): e.g. 20 % of travelers accounted for 80 % of flights?
% delays affecting frequent travelers
SUBSTANTIAL DELAYS
% Substantial delays to total flights (flights late 15 min or more)
Total number of substantial delays (flights late 15 min or more)
Total time lost due to substantial delays (flights late 15 min or more)

Table 2

Delays per Month of the Year

Month	Substantial delays		
	No	**Yes**	**Total**
1	79	7	86
	10.51	0.93	11.44
	91.86	8.14	
2	85	16	101
	11.3	2.13	13.43
	84.16	15.84	
3	107	28	135
	14.23	3.72	17.95
	79.26	20.74	
4	148	24	172
	19.68	3.19	22.87
	86.05	13.95	
5	133	8	141
	17.69	1.06	18.75
	94.33	5.67	
6	104	13	117
	13.83	1.73	15.56
	88.89	11.11	
Total	656	96	752
	87.23	12.77	100

p = 0.0043

Table 3

Delays per Day of the Week

Day of Week	Substantial		
	No	**Yes**	**Total**
1 Sunday	58	10	68
	7.71	1.33	9.04
	85.29	14.71	
2 Monday	63	16	79
	8.38	2.13	10.51
	79.75	20.25	
3 Tuesday	118	13	131
	15.69	1.73	17.42
	90.08	9.92	
4 Wednesday	108	19	127
	14.36	2.53	16.89
	85.04	14.96	
5 Thursday	141	11	152
	18.75	1.46	20.21
	92.76	7.24	
6 Friday	131	17	148
	17.42	2.26	19.68
	88.51	11.49	
7 Saturday	37	10	47
	4.92	1.33	6.25
	78.72	21.28	
Total	656	96	752
	87.23	12.77	100

P = 0.0407

Table 4

Delays per Time Zone

Time Zone	Substantial		
	No	**Yes**	**Total**
00h00-04h59	13	2	15
	1.73	0.27	1.99
	86.67	13.33	
05h00-09h59	207	19	226
	27.53	2.53	30.05
	91.59	8.41	
10h00-14h59	198	26	224
	26.33	3.46	29.79
	88.39	11.61	
15h00-19h59	205	40	245
	27.26	5.32	32.58
	83.67	16.33	
20h00-23h59	33	9	42
	4.39	1.2	5.59
	78.57	21.43	
Total	656	96	752
	87.23	12.77	100

P = 0.0449