

Travel Stress Index

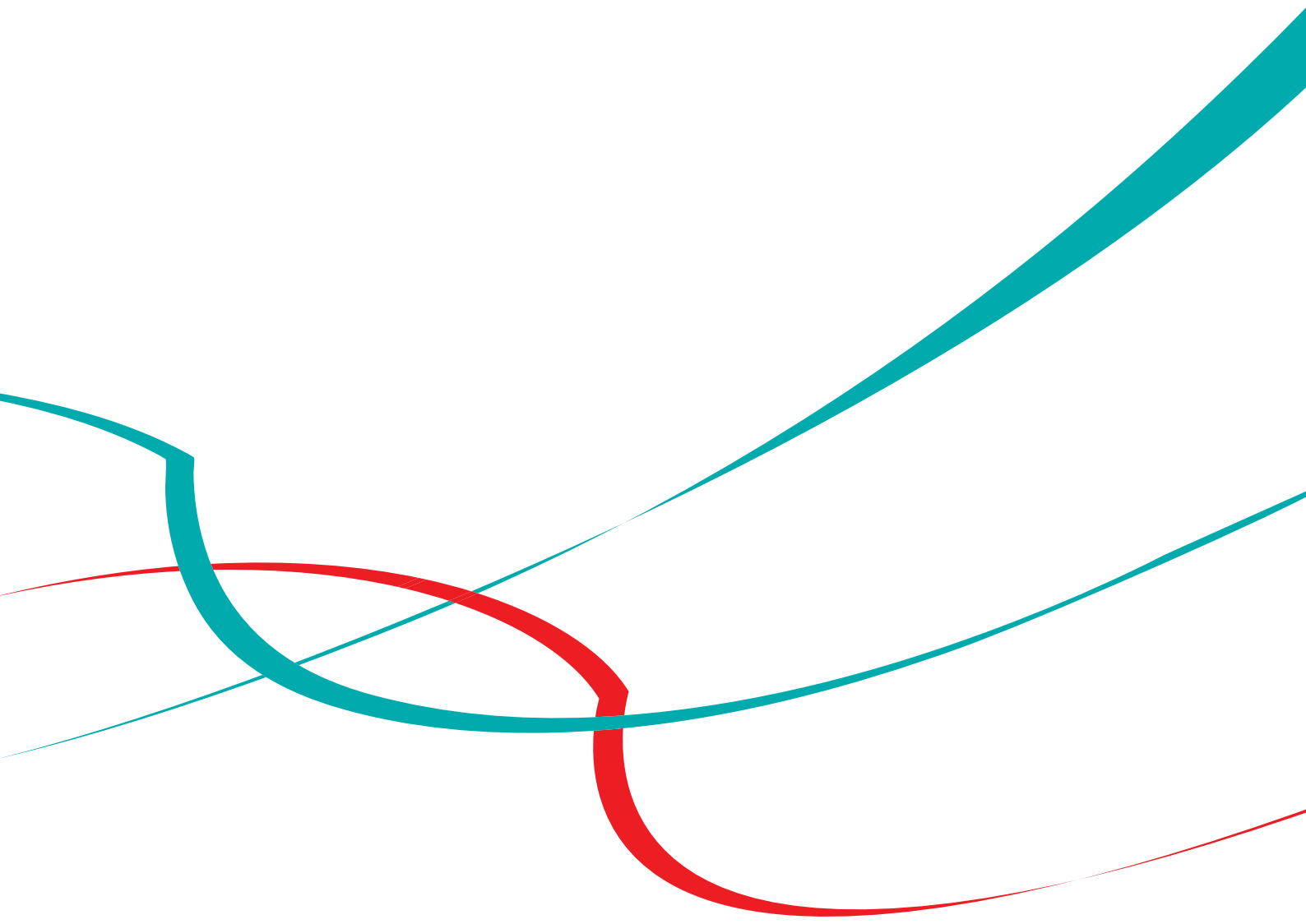
The Hidden Costs of Business Travel

**A New Industry Direction to
Improve Traveler Wellbeing and Corporate Productivity**



CWT Solutions Group







Foreword

Our journey started in June 2012, when we first introduced the concept of a Travel Stress Index – a concept based on the inherent correlation between stress and productivity, where increasing the former reduces the latter.

Following a wave of enthusiastic feedback after sharing this idea with our clients and other stakeholders, we confirmed what we had suspected: the need to deliver an overall measure of stress caused by business travel, and the ability to assess the corresponding monetary and non-monetary impacts on an organization. We have developed an industry-first algorithm to measure this, which we believe will become a standard within the travel industry.

This publication seeks to explain this concept in detail. We hope it will trigger your interest and convey some of the passion that drove us along the way. We look forward to engaging in productive discussions with you and will continue to evolve our model as we take into account reactions and feedback from the industry.

The authors

“ We have developed an algorithm, which we believe will become a standard within the travel industry. ”



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Executive Summary

This study is the second part in a broader initiative by the *CWT Solutions Group* to shed light on the hidden costs of business travel caused by travel-related stress. Our aim was to understand and measure how and to what extent traveler stress accumulates during regular business trips. We then defined a methodology and a set of key performance indicators (KPIs) to estimate the impact that this travel-induced stress has on an organization.

“ ... stress was measured based on the duration and the perceived stress intensity for each activity. ”

The scope of the study includes data from 15 million business trips booked and recorded by Carlson Wagonlit Travel (CWT) over a one-year period. We followed a “*divide-and-conquer*” approach: each trip was conceptually broken down into 22 potentially stressful activities covering pre-trip, during trip (transportation and destination-related elements), and post-trip. Associated stress was measured based on the duration and the perceived stress intensity for each activity. In essence, each of the 22 steps of the trip was viewed as having two components: “*stress-free*” time and “*lost time*.”

To quantify the effects of stress, we introduced the following KPIs:

- The maximum possible lost time per trip
- The actual lost time per trip (and its financial equivalent)
- The Travel Stress Index, defined as the ratio of the above quantities

The Travel Stress Index (*TSI*) across all trips booked through CWT is 39%.

Our results show that the **actual lost time is 6.9 hours per trip, on average**. The largest contributions to this lost time arise from flying economy class on medium and long-haul flights (2.1 hours) and getting to the airport/train station (1.1 hours). The **financial equivalent** of this 6.9 hours is **US\$ 662**.

The lost time greatly depends on the type of trip taken: an increase in the transportation time typically generates an increase in the lost time. The average actual lost time values by trip type are:

- 5.2 hours for domestic trips
- 5.6 hours for continental trips
- 15.6 hours for intercontinental trips

“ the impact of stress can be reduced... on average by 32% ”

Finally, our study indicates that the impact of stress can be reduced, but not entirely eliminated. We analyzed the *TSI* on a client-by-client basis and found out that companies can expect to control, on average, 32% of the actual lost time.

To summarize, this research introduces a methodology for quantifying the impact of business travel stress on an organization. It allows us to assess a company's average stress level across travelers and to benchmark it against the industry norm. Our ultimate objective is to provide recommendations to help clients tackle the hidden costs of business travel and optimize traveler well-being and productivity.



Introduction

This publication continues our work on the *TSI*, which aims at identifying the impact of stress in business travel. In our prior study [Ref. 1], we gained an understanding of the specific triggers of travel-related stress. In the current paper, we present quantitative measures of travel stress and its corresponding impact on an organization.

Previous studies have reported on the harmful effects of increased stress on productivity [Refs. 2-3]. Stress prevention was found not only to reduce costs but also to improve productivity [Ref. 4]. Addressing stress is thus fundamental not only to a company's duty of care responsibilities but also as a strategic component to managing the workforce.

" *... a new frontier in business travel optimization*

"

The highlights of this study are the following:

- 1 - "Putting a metric behind a feeling":** to our knowledge, this study is the first to examine and to quantify to what extent stress occurs during the different stages of a given business trip.
- 2 - Taking a big data approach:** 15.3 million air transactions from CWT's global client base were used, in conjunction with other sources of information from within CWT as well as external data.
- 3 - Defining a new set of key performance indicators:** in order to quantify the hidden costs of business travel, we conceived a set of metrics to measure successful travel management.

Understanding the mechanism of stress and its impact on both a traveler and the wider organization sets a new frontier in business travel optimization.



Scope of the Study

The current study uses 15.3 million CWT air trips booked within a one-year period from October 2011 to October 2012. The geographical scope is global comprising all CWT points of sale.

Each and every one of these trips is subjected to trip-reconstruction [Ref. 5]. CWT's trip reconstruction process combines multiple sources of information to obtain a comprehensive view of any given trip that CWT has delivered to its travelers.

Figure 1 shows a graphical illustration of the different sources of data used in this analysis.

Figure 1. The different sources of information used to reconstruct each individual trip [15.3 million trips total]. Green indicates CWT internal sources, while orange indicates external data sources.



The internal sources center on the transactional elements which are recorded for the main components of the trip: air bookings, hotel stays and car rentals. An air booking may or may not have a hotel stay or car rental attached to it; this can happen for example for same-day return trips, one-way trips, etc.

- The *transactional data* consists of airport codes, dates (booking, departure and return), flight time, connection information, fare paid, booking channel, etc. Also included is certain supplier information, such as hotel category or internet availability.
- The *traveler demographic* category is determined using CWT's traveler profile database (CWT Portrait). This is then mapped to the corresponding segment of respondents in the *TSI Survey* to determine the appropriate set of parameters to be used for analyzing each trip.
- *Benchmark employee compensation* (including social charges and benefits, averaged across industries) data by country. is used to calculate the financial equivalent of the lost time.

TSI Survey data: in a previous publication [Ref. 1] we presented the perceived stress reported for 33 activities related to a typical business trip. The current study incorporates 22 of these factors (Table 1), including nine of the top 12 – those with scores above 60/100. The remaining 11 factors are either challenging to quantify (e.g. "eating healthily at destination") or require certain data that was not available at this time.

Several stress factors such as flight delays, mishandled baggage and travelling to a high-risk destination require the usage of *external data*. References [6], [7], and [8], respectively, are used for these purposes.

Table 1: Stress-trigger ranking by perceived strength adapted from [Ref. 1]



Source: CWT Solutions Group, Stress Triggers for Business Travelers, Traveler Survey Analysis (2012)



Methodology

In this section we present the methodology employed in developing the *TSI* algorithm. We also introduce several key measures of travel stress and explain what is behind the *TSI* model.

General Considerations

To illustrate how the stress index algorithm was built, let us consider the case of a given stress factor i which acts over a time duration T_i .

In [Ref. 1] we have defined the strength of stress factor SF_i as the average reported stress on a scale of 10-100. For the current discussion it is convenient to express this strength as a percentage¹ S_i covering the range 0-1. With this notation, for $S_i = 100\%$ the traveler experiences stress during the entire time T_i . Conversely, for $S_i = 0\%$ the traveler experiences no stress during T_i . More generally, we apply the following two rules:

1. If a stress factor i of strength S_i acts over a duration T_i then:
 - a. Stress is experienced over an effective duration $S_i \times T_i$
 - b. The "stress-free" interval is $T_i - S_i \times T_i$. This time is available to the traveler to either work or rest.
2. If two or more stress factors act simultaneously during time T_i , we take into account only the factor having the largest strength (and discard the rest).

The second rule is the most conservative way to account for multiple stress factors.

In the remainder of this document, the time over which stress is experienced ($S_i \times T_i$) will also be referred to as "lost time" for the traveler. Our ultimate goal will be to reduce this quantity and maximize the "stress-free" component. This can be achieved through a combination of steps geared toward reducing T_i (e.g. flying direct versus indirect) and/or reducing S_i (e.g. internet connectivity to stay fully informed while on-the-go).

Having introduced these notions, we may state that at its most basic level, the current study is an exercise in "counting lost time". Specifically, for a given set of trips we can calculate the following quantities:

"the current study is an exercise in "counting lost time"

- **Maximum Possible Lost Time (MPLT)** - defined as the sum of all durations T_i across all possible stress activities i and across all trips in the set.
- **Actual Lost Time (ALT)** - defined as the sum of all intervals $S_i \times T_i$ across all possible stress activities i and across all trips in the set.

¹ This mapping is achieved using a simple transformation: $S_i = (SF_i - 10)/90$

The *Travel Stress Index (TSI)* is then defined as the ratio of *ALT* and *MPLT*:

$$TSI = \frac{ALT}{MPLT} = \frac{\text{Actual Lost Time}}{\text{Maximum Possible Lost Time}}$$

By construction, the *TSI* values lie in the [0,1] interval. For the sake of simplicity, we will express the *MPLT* and *ALT* as per-trip averages *mplt* and *alt*².

Lost time and lost productivity. Financial equivalent.

As discussed previously, the “stress-free” time $T_i - S_i \times T_i$ may be used either to work or to rest. If work is carried out, it represents a direct productivity gain. Rest is also expected to increase productivity, though indirectly: resting “now” leads to productivity “later”. This indirect relationship cannot be readily quantified.

By the same token, lost time cannot be precisely converted into lost productivity. However, we can calculate a *maximum productivity loss* if we consider that the entire lost time, *ALT*, could have been converted into productive time. Putting an upper limit on productivity loss gives us a reference point for discussing the impact of travel on productivity.

Lastly, a **financial equivalent (FE)** can be calculated for the maximum productivity loss, using the employee compensation benchmark database. *FE* is in essence the dollar equivalent of *ALT*. A per-trip average *fe* can be obtained by dividing *FE* by the number of trips in the set.

TSI Models

Having presented a blueprint to assess several measures of travel stress, we will now focus on an important aspect of this calculation: the *TSI* model.

A *TSI* Model is defined as the group of parameters required to calculate the *TSI*. These parameters are divided into three categories:

- Factor strengths S_i
- T_i - related parameters
- Financial parameters

As previously mentioned, the **stress factor strengths S_i** are obtained from the Travel Stress Index survey analysis published in [Ref. 1]. For the current study we divided our traveler group into ten demographic categories and then sorted our survey responses accordingly. For example, if the person taking the trip is identified as a female within the 30-35 age range category, the set of stress strengths corresponding to this particular group will be used in calculating the trip’s contributions to the lost time totals.

Depending on the stress factor i , **deriving the interval T_i** may require certain parameters or assumptions. For those activities i requiring assumptions, we asked a further group of travelers from different demographic categories to provide estimations of the time lost in these situations; the average across the responses was used as the T_i parameter of the *TSI* model.

² These averages are obtained by dividing *MPLT* and *ALT* by the number of trips in the set.

A few examples are given below:

- *Flying economy on medium/long haul flights:* T_i = Flight Time. The flight time is fully determined from the transaction details; thus, no assumption is needed.
- *Getting through customs and security:* the maximum possible lost time contribution is $T_i = 30$ minutes and, given the strength of this factor, the actual lost time will be roughly 15 minutes. Transactional data is needed as well: for a return trip one needs to account for these lost time contributions both on the inbound and the outbound legs of the trip.
- *Flight delays:* Transactional data is used to extract the origin-destination airport pair for each flight. External data [Ref. 6] is then used to obtain the average delay corresponding to this airport pair; this delay represents the T_i interval.

In conclusion, depending on the given factor i , the T_i duration may either be fully determined from the transactional data, or it may require certain assumptions and/or external data.

Financial data is used solely to calculate the financial equivalent of lost time. These data contain a benchmark cost of employment across all industries (which includes compensation, benefits and social charges) by job level in 58 countries around the globe. The average cost of employment is calculated based on the mix of job seniority among our group of travelers.

Summary of the main measures of travel stress

To conclude this section, we recap below the main quantities we use to measure travel stress:

- The maximum possible lost time per trip: $mplt$
- The actual lost time per trip: alt
- The Travel Stress Index: $TSI = alt / mplt$
- The financial equivalent fe of actual lost time per trip. Its definition indirectly implies that all lost time could have been ultimately converted into productive time. As a result, the financial equivalent should not be interpreted as the actual lost productivity, but rather as an estimation of the upper limit on lost productivity.



Results

In this section we present the main results of our analysis. First, we give the overall results obtained by using all 15.3 million trips, and we identify factors which produce the highest levels of stress. Second, we break down the overall results by trip type: intercontinental, continental, or domestic. Third and last, we discuss the client-by-client variations of the Travel Stress Index.

General results obtained using the full set of trips

Table 2 lists the actual lost time per trip for the ensemble of the stress factors, as well as for the top five factors in terms of their contribution to lost time. A graphical representation of these results is shown in Figure 2.

Table 2. The actual lost time per trip *alt* for all 22 stress factors combined (second row), as well as for the top five stress factors ranked by their contribution to *alt*.

Stress Factor	Actual lost time [hours/trip]
All 22 stress factors combined	6.9
Flying economy class on med/long haul	2.1
Getting to the airport/station	1.1
Flying economy class on short haul	0.6
Travelling during week-ends	0.5
Flying indirect vs direct	0.4
Other factors	2.2

The main KPIs obtained from analyzing the full set of trips are given below:

- Actual lost time per trip *alt* is 6.9 hours. We remind the reader that this result includes all 22 stress factors from Table 1, from booking the trip to filing reimbursement forms
- The financial equivalent *fe* is \$662 per trip
- The maximum possible lost time per trip *mplt* is 17.9 hours
- The *TSI* is 38.5%

Interpretation of the results:

The maximum possible lost time for the average trip is 17.9 hours; of this, 11 hours are "stress-free" - available to the traveler to either work or rest. The traveler experiences stress over the remaining 6.9 hours (integrated time duration).

// Financial equivalent of \$662 represents an upper limit on the lost productivity per trip... //

Based on our benchmark employment cost data, the financial equivalent of the 6.9 hours is \$662, which, as explained in the previous section, constitutes an upper limit on the lost productivity per trip. To illustrate the magnitude of this financial equivalent, we note that it amounts to 79% of the average plane ticket price. For example, for a client with a travel volume of 5,000 air trips per year, the expected financial equivalent of actual lost time is \$3.3 million.

Result breakdown by trip type

It is worthwhile breaking down the results by trip type, as the trip type mix can be very different from client to client. Also interesting is to examine how the lost time values stack up against the average flight duration for the trip. These results are shown in Table 3. In this table, the flight time includes the combined durations of the inbound and outbound flights (for a return trip), along with the connection time for indirect flights.

Table 3. Breakdown of the actual lost time by trip type (column A). Column B shows the total flight time including inbound and outbound flights, and connection time where applicable. Column C shows the actual lost time relative to the flight time (the ratio of columns A and B).

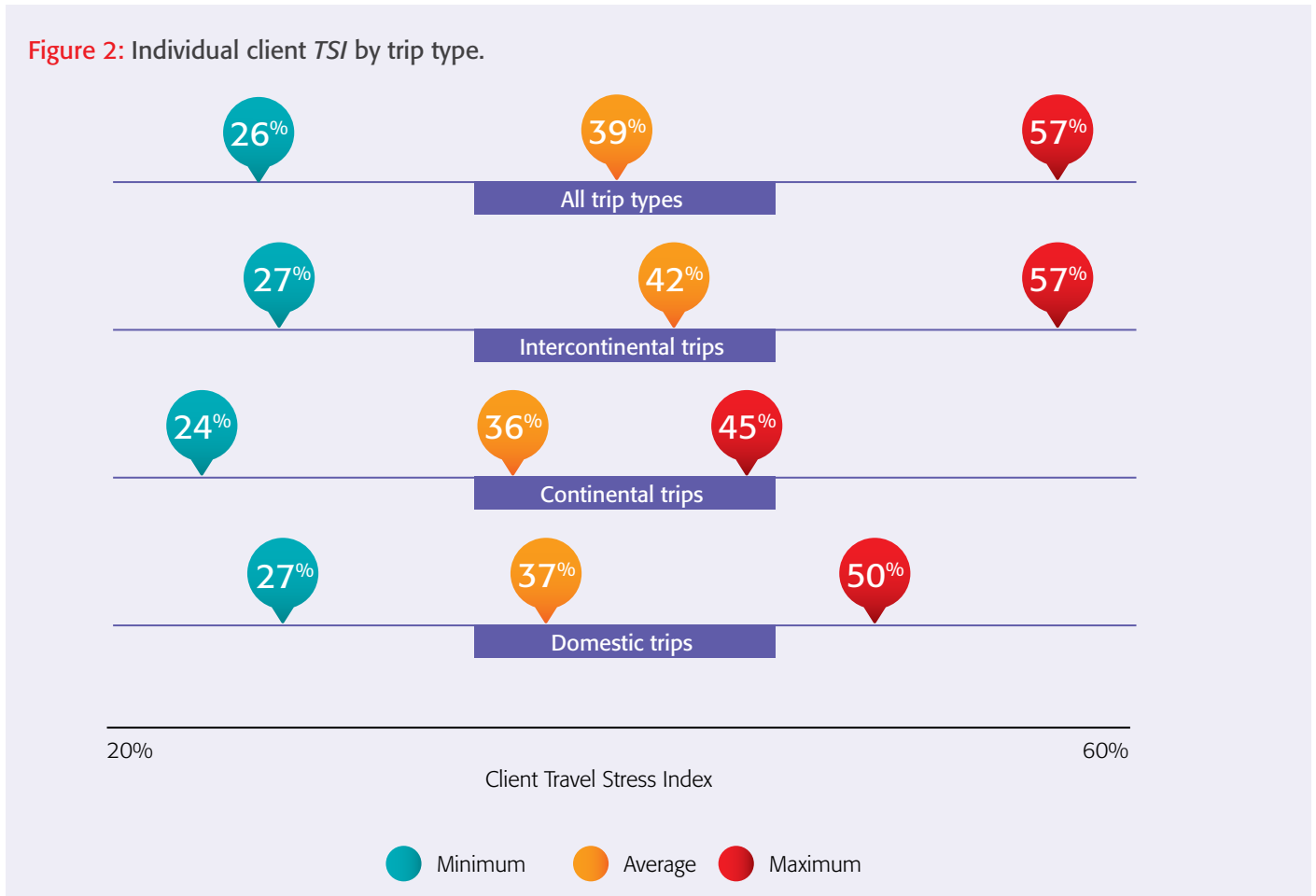
	A	B	C
Stress Factor	Actual lost time [hours/trip]	Flight time [hours/trip]	<i>alt</i> relative to flight time [%]
All trip types combined	6.9	6.8	101%
Intercontinental trips	15.6	19.7	80%
Continental trips	5.6	4.9	113%
Domestic trips	5.2	4.3	120%

Interpretation of the results:

According to the last column of Table 3, the actual lost time and flight time are comparable: their ratio varies from 0.8 (intercontinental) to 1.2 (domestic). This was partly expected, as three of the top five stress factors (by contribution to actual lost time) are tied to the flight and connection times.

Travel Stress Index variation across CWT clients

As presented in the first part of this section, the Travel Stress Index obtained by analyzing the combined set of CWT trips is **TSI** = 38.5%. In principle, a **TSI** can be calculated for any subset of trips, and in particular for subsets corresponding to individual companies. Within a sample of companies recording a minimum of 500 transactions per month, the **TSI** variations are shown in Figure 3 for the different trip types.



Interpretation of the results:

The results presented in Figure 3 reflect the fact that stress cannot be reduced beyond a certain limit. For our client companies, the best-in-class **TSI** value is 26%, or about 4.7 hours per trip. This represents an improvement of 32% over the average lost time of 6.9 hours.

Our objective is now to understand what travel policies and traveler behavior are in play for clients at both ends of the **TSI** spectrum.

“ stress cannot be reduced beyond a certain limit ”



Conclusions

With this research, we present a new way of looking at business travel within the scope of traveler wellbeing.

The methodology presented in this document has enabled us to “put a metric behind a feeling.” It sheds light into the hidden economics of business travel and we believe it will contribute to expanding industry norms.

We recap below the most important findings of this study:

- On average, stress is experienced over **6.9 hours per trip**. This is referred to as “lost time,” or time unavailable to travelers to work or rest. The financial equivalent of this lost time is \$662 per trip; this value should not be interpreted as the actual lost productivity, but rather as an upper limit on this quantity.
- While lost time cannot be completely eliminated, there appears to be significant room for improvement. Indeed, companies can expect to control up to 32% of the lost time, on average.

Looking at business travel from this angle requires a different approach:

- Beyond the purely transactional aspect of the trip, companies should recognize business travel as a strategic means to grow and compete effectively in the marketplace.
- Business travel has an impact on a company's most important asset: its employees. For these reasons, a broader stakeholder umbrella may be required in making travel policy decisions. This includes Human Resources and Responsible Business communities, as well as Procurement and Travel Management departments already involved in managing business travel today.

We see the Travel Stress Index as a decision-making tool to help our clients assess and adjust their travel policies, and move from “travel policy” to “traveler policy.”

“ Travel Stress Index will provide an alternative approach to help companies make savings and address their duty of care responsibilities. ”

Traveling smarter rather than less will be the way to find the optimal point combining the actual costs of travel and the hidden ones. Ultimately, this will help companies to address their duty of care responsibilities while ensuring their travelers focus on what they are paid for: being productive.



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- [8] *iJET* (www.ijet.com) is an intelligence-driven provider of operational risk management solutions, working with more than 500 multinational corporations and government organizations.



Glossary

ALT – Actual Lost Time

alt – Actual Lost Time per trip

CWT – Carlson Wagonlit Travel

CWT Portrait – Carlson Wagonlit Travel's internal database storing traveler information

FE – Financial Equivalent of the Actual Lost Time **ALT**

fe – Financial Equivalent of the Actual Lost Time **alt**

KPI – Key Performance Indicator

MPLT – Maximum Possible Lost Time

mplt – Maximum Possible Lost Time per trip

Trip types considered in this analysis:

- Domestic: origin and destination airports are located within the same country
- Continental: origin and destination airports are located in different countries of the same geographical region
- Intercontinental: origin and destination airports are located in countries from different geographical regions

TSI – Travel Stress Index



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CWT Solutions Group



CWT Solutions Group

CWT Solutions Group is a global consulting company specialized in travel program optimization, helping corporate travel and procurement professionals to make savings and deliver more value through their travel programs.

A team of more than 100 experts provides advice and operational support for air, hotel and ground transportation, policy and compliance, and other related areas such as corporate travel governance, telepresence, connectivity and expense management.

Whatever the engagement, CWT Solutions Group looks beyond rates and fares, analyzing the total cost of travel and different scenarios to target ambitious but achievable improvements. Services are tailored to each client's specific needs, ranging from a single deliverable to A-Z support comprising strategy, sourcing, distribution and ongoing optimization. For more information, please visit www.cwt-solutions-group.com.

CWT Product Innovation

The CWT Product Innovation team explores new corporate travel concepts to develop industry-leading products and services.

One major focus is reducing client spend by better understanding patterns in air and hotel booking behavior and identifying best practices. For example, the team is currently investigating how the travelers' booking experience influences the average trip fare, or how it reflects in behavioral aspects such as advanced booking or online booking tool usage. For this purpose, CWT Product Innovation has developed an advanced data platform to analyze CWT yearly transactions in conjunction with the traveler demographic profile and external data sources (flight delays, destination information etc).

CWT Product Innovation works in close collaboration with other in-house experts and in particular, the CWT Travel Management Institute, CWT Solutions Group, and CWT's Product Delivery and Global Marketing teams.

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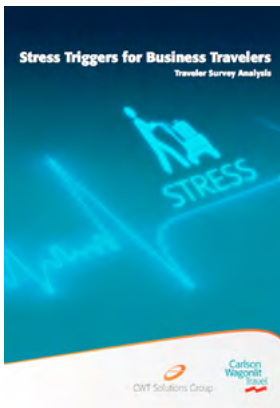
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