Service Informatics: A Quantitative Index for Airport Satisfaction Risk using Risk-O-Meter (RoM) Software

M. Sahinoglu*, Scott Morton, Preethi Vasudev

*Informatics Institute, Auburn University at Montgomery, Montgomery, AL 36124
mesa@aum.edu, smorton1@aum.edu, pvasudev@aum.edu

Abstract: The topic of airport satisfaction is one that anyone who has flown recently is certainly familiar with. The new millennium's environment has altered air travel as we knew it with additional security, crowding, and costs for the traveler. Airport satisfaction risk is concerned primarily with how travelers rate their experience with the various aspects of airport-related travel including issues such as security, food, baggage claim and on-time performance to name a few. In this research paper, we will adopt a model of airport satisfaction risk that quantifies the traveler's experience with eight crucial facets of airport-related travel. However we will add an original concept of quantification to the existing model through a designed algorithm by the author to calculate the airport satisfaction risk index. To accomplish this task, numerical and/or cognitive data was collected to supply the input parameters to calculate the quantitative risk index for airport satisfaction. This paper will not only present a quantitative model but also generate a prototype numerical index study that breaks new ground in this field.

I. INTRODUCTION

Airport satisfaction is a familiar topic to air travelers and the source of many conversations and complaints. In addition to the changes brought about by the new millennium (increased traveler scrutiny, crowding, costs and restrictions), the prolonged airline financial crisis has added to the diminution of services and their increased costs. Airport satisfaction becomes an issue when the travel experience is negatively impacted as in the case of lost luggage or surprise fees. In large part, travelers are satisfied when they can travel without hindrance or frustration. Assessing the nature of airport satisfaction is the goal of this paper. To do so, an Airport Satisfaction Risk-O-Meter based on a series of questions designed to assess the traveler's perceptions of airport satisfaction will be utilized. Based on the traveler's responses, an airport satisfaction risk index will be calculated. Where this approach differs from others such as *J.D. Power and Associates 2010 North America Airport Satisfaction Study* [2] or Skytrax's airport quality website [3] is that those approaches merely measure airport satisfaction and do not provide tools (based on game theory) for risk management and mitigation. The Airport Satisfaction Risk-O-Meter will provide objective, automated, dollar-based risk mitigation advice for interested parties such as airport managers, ground personnel, customs/immigration officials, and airlines to enhance the air travel experience. See Figure 2's advice column employing Game-Theory for sample mitigation advice generated from the respondent's submitted inputs.

II. VULNERABILITIES AND THREATS

Inspired by the authors' travel experiences, eight vulnerabilities are assessed: Security Checks, Food Service & Amenities, Immigration & Customs, Service Personnel, Waiting

Areas & Baggage Claim, Appearance & Cleanliness, Airport Transport Services, and On-Time Performance. Within each vulnerability category, questions pertain to specific threats and countermeasures. For example, within Security Checks vulnerability, travelers are asked questions regarding Curbside, Baggage Screening, Security Checkpoints, Gate Security, and General Airport Security threats and countermeasures. Within Waiting Areas &Baggage Claim vulnerability, travelers are asked questions regarding Comfort, Waiting Time, Loss & Delay, Cart Availability, Delivery Options, and Multi-faith area threats and countermeasures. Within Airport Transport Services vulnerability, travelers are asked questions regarding Accessibility, Gate & Parking Distance, Timeliness, Cost, and Availability threats and countermeasures. See Figure 1 below for the Airport Satisfaction Risk diagram detailing vulnerabilities and threats. The user's responses are then used to generate a practical, easy-to- interpret quantitatively workable and manageable airport satisfaction risk metric or index.

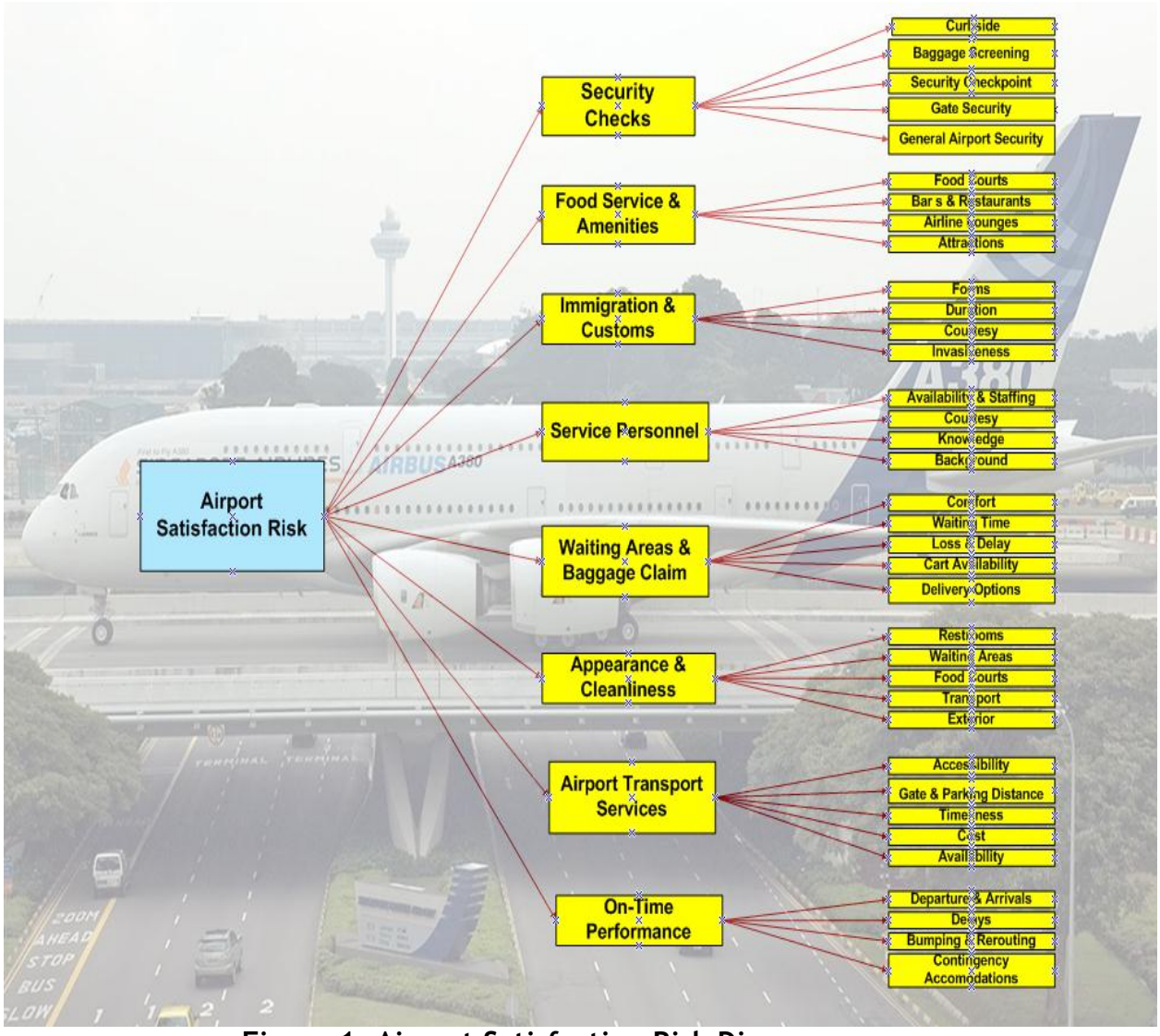

Figure 1: Airport Satisfaction Risk Diagram

III. ASSESSMENT QUESTIONS

Questions are designed to elicit the traveler's response regarding the perceived risk to airport satisfaction from particular threats, and the countermeasures the travelers may employ to counteract those threats. For example, in the Security Checks vulnerability, questions regarding Security Checkpoint include both threat and countermeasure questions. Threat questions would include:

- Does it take more than 15 minutes on average to go through security checkpoint lines?
- Are you required to remove articles of clothing other than belts and shoes when going through security checkpoints?
- Do you feel demeaned or violated such as being touched inappropriately after going through a security checkpoint?
- Are items confiscated from your carryon luggage other than indicated items such as liquids?
- When you are going through a security checkpoint with small children, the elderly, or the infirm, do the officials treat you with respect and dignity?

While countermeasure questions would include:

- Are there multiple security checkpoint lines besides the ones for the pre-screened?
- Do you wear easy to remove items such as slip-on shoes when going through security checkpoints weather allowing?
- Are security checkpoint agents trained to behave professionally and courteously?
- Are you familiar with what items cannot be brought aboard a commercial airliner?
- Are appropriate security checkpoint inspections at a separate location made for small children, the elderly, and the infirm?

Sample vulnerability (On-Time Performance) assessment questions employed in the Airport Satisfaction Risk-O-Meter (RoM) are presented in Appendix A at the end of this paper.

IV. RISK ASSESSMENT AND MITIGATION

Essentially, the travelers are responding yes or no to these questions. These responses are used to calculate residual risk. Using a game-theoretical mathematical approach, the calculated risk metric or index is used to generate an optimization or lowering of risk to desired levels [1]. Further, mitigation advice will be generated to show travelers, airport managers, customs /immigration officials, and airlines in what areas the risk can be reduced to optimized or desired levels such as from 56% to 40% in the screenshot representing the median response from the study participants. See Figure 2 below for a screenshot of the Median Airport Satisfaction RoM Results Table displaying the vulnerability, threat, countermeasure, and residual risk indices, and resource optimization options; as well as risk mitigation advice. The airport facility is advised to increase the CM for "Bars and Restaurants" by 53%. Also slightly (1%) to countermeasure the "Invasiveness" issue for the Food Service & Amenities at the Immigration and Customs is a necessity. For this study, a random sample of 25 respondents was taken and their residual risk results are tabulated and presented in Appendix B at the end of this paper. Respondents air travel experience, though primarily domestic (USA), also included travelers with international air travel experience.

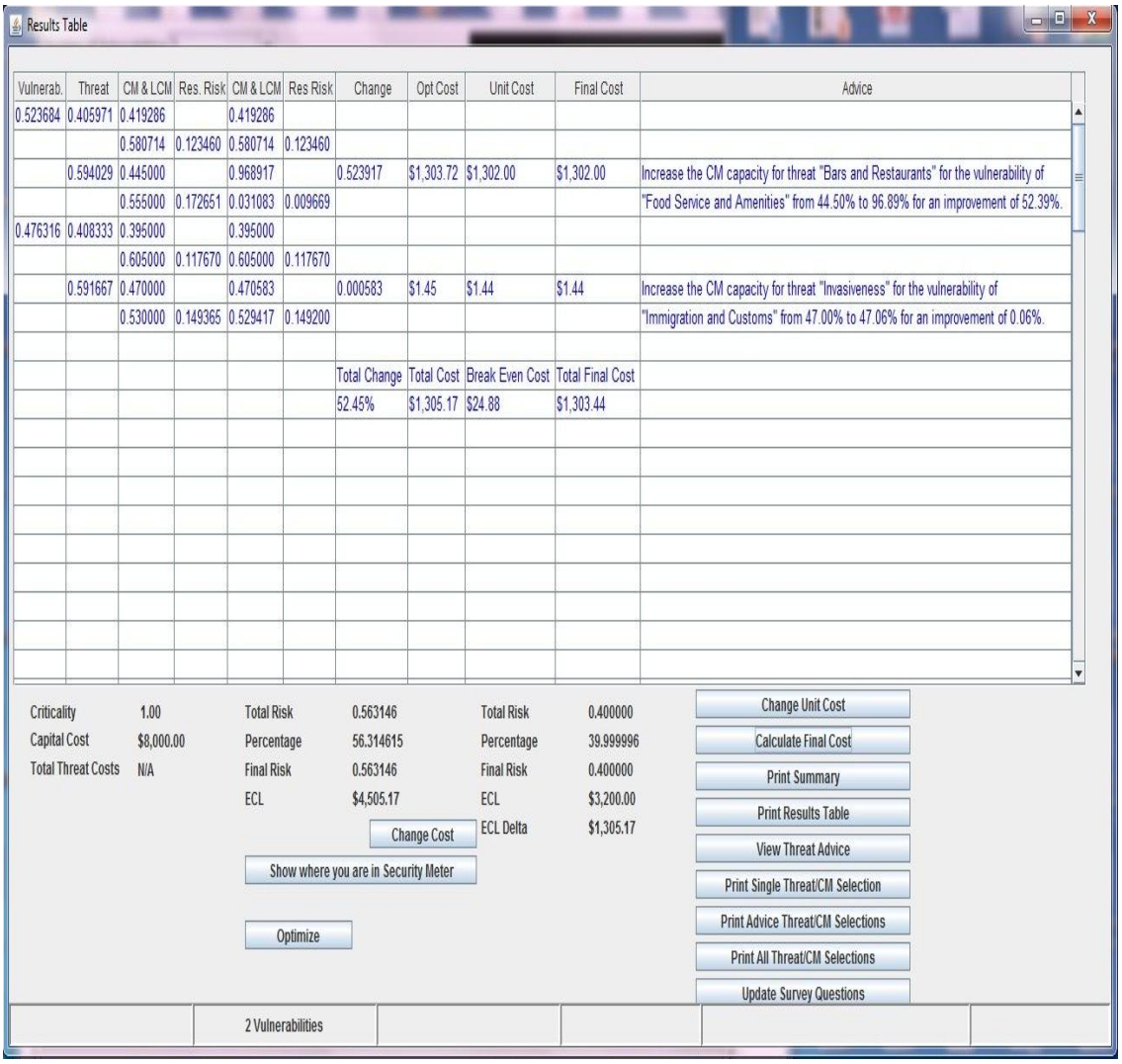

Figure 2: Median Airport Satisfaction Risk Meter Management Results

V. CONCLUSION

The Airport Satisfaction Risk-O-Meter breaks new ground in that it provides a quantitative assessment of risk to the user as well as recommendations for mitigating that risk. As such, it will be a highly useful tool to travelers as well as airport managers, customs/immigration officials, and airlines seeking to enhance the air travel experience. Future work will involve the addition of Information Technology concerns such as the airport website and Wi-Fi availability as well as the incorporation of new questions so as to better refine user responses and subsequent calculation of risk and mitigation recommendations. Enhancement of airport satisfaction specifically and air travel satisfaction generally, will greatly benefit not only the comfort and pleasure of travelers, but the airports and airlines that serve those travelers profitability as well. The Airport Satisfaction RoM tool and its future refinement provide the means to greatly enhance the air travel experience. As further, authors plan to incorporate more items such as language options, flight and shopping information, or leisure, and disabled or children's needs to add to the XML file.

REFERENCES

[1] M. Sahinoglu, Trustworthy Computing, John Wiley, 2007
[2] J.D. Power and Associates, 2010 North America Airport Satisfaction Study, http://www.jdpower.com/content/detail.htm?jdpaArticleId=1320
[3] Skytrax, Airport Customer Reviews, http://www.airlinequality.com/Airports/apt_forum.htm

Appendix A: Sample Vulnerability (On-Time Performance) Assessment Questions (in XML)

```
<survey>
  <vulnerability title="On-Time Performance" level="0">
<vQuestion>Is your airline frequently late? </vQuestion>
<vQuestion>Were you stuck at  the gate or runway for more than 15 minutes? </vQuestion>
<vQuestion>Were you bumped from your flight? </vQuestion>
<vQuestion>In case of missed flight, does the airline not provide you with a hotel voucher?
</vQuestion>
<threat title = "Departure and Arrivals" >
<tQuestion> Is price your only consideration when choosing an airline? </tQuestion>
<tQuestion> Are you unaware of your airlines on time performance? </tQuestion>
<tQuestion>Is your airport well known for congestion? </tQuestion>
<tQuestion>Have you arrived at the airport only to find that the flight has been canceled?
</tQuestion>
<tQuestion>Do you arrive as late as your flights departure was? </tQuestion>
<cQuestion>Do you take on time performance into consideration when choosing an airline?
</cQuestion>
<cQuestion> Have you reviewed the FAAs on time performance list for airlines? </cQuestion>
<cQuestion>Can you choose other nearby, less congested airports? </cQuestion>
<cQuestion>Did you sign up for text or email flight alerts? </cQuestion>
<cQuestion>Does the airline pilot make up lost time in flight? </cQuestion>
</threat>
<threat title = "Delays" >
<tQuestion>Is weather a frequent issue at your departing airport? </tQuestion>
<tQuestion>Is the airport or airline subject to labor disputes? </tQuestion>
<tQuestion>Has your aircraft had mechanical delays? </tQuestion>
<tQuestion>Is the aircraft over 15 years of age? </tQuestion>
<tQuestion>Were you delayed due to security issues? </tQuestion>
<cQuestion>Do you try to avoid early morning or late afternoon flights when fog or storms may be
more frequent? </cQuestion>
<cQuestion>Are you able to select a different airport or airline for travel? </cQuestion>
<cQuestion>Did you select an airline with a superior maintenance and safety record? </cQuestion>
<cQuestion>Did you select an airline that has a new aircraft fleet? </cQuestion>
<cQuestion>Did the airline and security officials properly and thoroughly screen passengers and
baggage? </cQuestion>
</threat>
<threat title = "Bumping and Rerouting" >
<tQuestion>Did the airline bump you off your flight? </tQuestion>
<tQuestion>Did the airline reroute you due to weather or other adverse events     ? </tQuestion>
<tQuestion>Did the airline or travel agency ask you to buy an entirely new ticket due to an itinerary
change or missed flight ? </tQuestion>
<tQuestion>Were your itinerary changes a result of the airline making changes? </tQuestion>
<tQuestion>Did weather or an airlines changes cause you to miss a connecting flight on a different
airline? </tQuestion>
<cQuestion>Did the airline immediately rebook you and provide you with a coupon for future flights?
</cQuestion>
<cQuestion>Did you arrive at your destination within four hours of your original arrival time?
</cQuestion>
<cQuestion>Were you only charged for an itinerary change as opposed to buying a new ticket?
</cQuestion>
<cQuestion>Were all charges waived? </cQuestion>
<cQuestion>Did the original airline provide a voucher usable with the other airline? </cQuestion>
</threat>
<threat title = "Contingency Accommodations" >
```

<tQuestion>Did you have to wait overnight because of a delayed or canceled flight? </tQuestion>
<tQuestion>Did you have to go to the center of town to find a hotel? </tQuestion>
<tQuestion>Were you and other passengers forced to spend overnight in the airport due to weather? </tQuestion>
<tQuestion>Was your flight delayed or canceled through no fault of your own? </tQuestion>
<tQuestion>Were you left on your own in terms of finding lodging? </tQuestion>
<cQuestion>Did the airport have a hotel? </cQuestion>
<cQuestion>Were there hotels within five to ten minutes of the airport? </cQuestion>
<cQuestion>Did the airline or airport provide cots or air mattresses? </cQuestion>
<cQuestion>Did the airline provide meal and hotel vouchers? </cQuestion>
<cQuestion>Did the airline provide accommodations or assistance in finding lodging? </cQuestion>
</threat>
</vulnerability>
</survey>

Appendix B: Respondent Residual Risk Results Tabulation conducted in 2013

Respondent/DATE	Total Residual Risk (TRR)	
Respondent1 Feb20	0.482224	
Respondent2 June7	0.593035	
Respondent3 April3	0.202892	
Respondent4 April8	0.412031	
Respondent5 April19	0.515245	
Respondent6 April30	0.361296	
Respondent7 May 1	0.195347	
Respondent8 June7	0.506403	
Respondent9 Mar13	0.745874	
Respondent10 Mar13	0.739829	
Respondent11 Mar13	0.703571	
Respondent12 Mar13	0.753439	
Respondent13 Mar13	0.671285	
Respondent14 Apr13	0.520104	
Respondent15 Apr13	0.334549	
Respondent16 Apr13	0.602795	
Respondent17 Apr13	0.563146	MEDIAN (The middlemost to personify the survey)
Respondent18 Apr13	0.53427	
Respondent19 Apr13	0.593769	
Respondent20 Apr13	0.569956	
Respondent21 Apr02	0.709571	
Respondent22 Apr05	0.562413	
Respondent23 Apr03	0.638719	
Respondent24 Apr07	0.627699	
Respondent25 Apr01	0.555374	

Acknowledgements

The authors acknowledge the meticulous work the following graduate students toiled to administer and receive the survey results from 25 volunteering survey-takers whose identities are not disclosed for privacy reasons. They are C. Kelsoe, J. Pelkey, S. Stockton, and W. Kramer who are currently graduating candidates in the CSIS M.S. program of AUM' Informatics Institute. However the anonymous 25 respondents are also acknowledged with appreciation for taking the responsibility to voice their concerns through this dynamic information gathering activity.