SECONOMICS

A RELATIVE COST-BENEFIT APPROACH FOR EVALUATING ALTERNATIVE AIRPORT SECURITY POLICIES

Woohyun Shim and Fabio Massacci Department of Information Engineering and Computer Science University of Trento Trento, Italy Email: surname@disi.unitn.it

Alessandra Tedeschi and Alessandro Pollini Deepblue S.r.I Rome, Italy Email: name.surname@dblue.it

I PROBLEM STATEMENT

Previous studies on airport security have investigated alternative policies based on costbenefit analysis, but they have faced significant problems in the lack of considering social aspects of security policies as well as the concrete measurability of model parameters. Moreover most of the policies and strategies in aviation security have been implemented as a reactive result of terrorist activities rather than motivated by a proper assessment.

OBJECTIVES

We aim at providing policy makers with a framework to compare alternative security policy proposals and to determine which one to employ by answering the following questions:

1) How does changing the current security policy alter the cost and benefit of the airport security? Is employing a new security policy cost-effective?

2) Can a new security policy be aligned with

RELATIVE CBA FOR ALTERNATIVE SECURITY POLICIES

When various alternative security policies are proposed, decision makers need to compare these policies with each other and with a current security policy regarding three dimensions as shown in Figure 1: the expected benefits of a new security policy measured by reduced security risks; the total cost of the implementation; and the public acceptability of the new policy.

For the comparison, we first define parameters for the calculation as shown in Table 1.

TABLE 1
DESCRIPTION OF PARAMETERS

Parameter	Description
с _в	The total annual costs of a current (base) security policy
PB	The effectiveness of a current (base) security policy (i.e., the probability that this security policy can detect an attempted attack)
UB	Welfare state of the public/passengers due to a current (base) security policy
C _{Pi}	The total annual costs of a proposed (alternative) security policy <i>i</i>
P _{Pi}	The effectiveness of a proposed (alternative) security policy i (i.e., the probability that this security policy can prevent an attempted attack)
U _{Pi}	Welfare state of the public/passengers due to a proposed (alternative) security policy <i>i</i>

From these parameters, we calculate the ratio of the cost and welfare difference to the outcome (i.e., effectiveness) difference between the base and proposed policies as shown below: The interpretation of (3.1) can be gained from Figure 2 (Note that the interpretation and application of (3.2) coincides with (2.1)). It shows that (a) is always beneficial to switch to the proposed policy i, (b) is never advantageous to switch to the proposed policy i. For the cases of (c) and (d), it is unclear whether switching to the proposed policy i is beneficial. To avoid this limitation, we we consider the situation where decision makers face a choice between two alternative security policies, P1 and P2. From (2.1) and (2.2), for P2 to be preferable to P1, we must have:

$$\frac{C_{P2} - C_B}{(P_{P2} - P_B)} \le \frac{C_{P1} - C_B}{(P_{P1} - P_B)}$$
(2.3)
$$\frac{U_{P2} - U_B}{(P_{P2} - P_B)} \le \frac{U_{P1} - U_B}{(P_{P1} - P_B)}$$
(2.4)

For example, if we consider that P1 and P2 change the cost and the detection rate as shown in Figure 3, we can identify that while P1 and P2 do not strictly dominate the current policy as in (C) in Figure 2, P2 strictly dominates P1. As a result, it is beneficial for policy makers to select P2.

societal needs and values?

3) What are the tradeoffs between alternative security policies?

To find the answers to these questions, we use a relative cost-benefit approach (CBA) which can assess the impact and the cost of the decision to use a specific security policy.







CONCLUSIONS

This study develops a model for determining the best alternative policy for airport security. The model proposed here is simple but flexible and it is based only in quantifiable & measurable parameters, so it can compare and evaluate effectively alternative security policies. In the model development, we incorporate the perspectives of cost, benefit and social acceptability.







s project is partially funded by the European Commission der the 7th Framework Programme.



www.seconomicsproject.eu