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A Joint Model for Usability and Security of the Passenger Process in Airports

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***Abstract* – As new security technologies are introduced in public transportation systems, their accessibility for the disabled needs to be evaluated. We analyze the usability of the passenger process in airports alongside the security risk, both from the point of view of the disabled and elderly passengers. A process-centered analytical framework has been developed. The methodology is to identify different user profiles as well as the various tasks involved in the passenger process. Cognitive walkthrough method is used to assess aspects of passenger inconvenience and security risks for selected user profiles. A normalized scale has been used to compare the two aspects quantitatively. Results are presented for the passengers with cochlear implant. The framework can be used at the design stage for usability and risk evaluation of new security technologies, thus avoiding new technological barriers.**

***Keywords* – disability, usability, security, airport, transportation systems**

I. INTRODUCTION

With increased levels of threats to public transportation system in recent years, there is now heightened emphasis on risk mitigation by deploying new security technologies for identification, detection and surveillance. Airports are a good example where the goal of security enhancement is being pursued aggressively by the deployment of mass spectrometry and biometric technologies.

It is often the case that when security is the main focus, ethical and social concerns are often forgotten in the false belief that the latter are an impediment to the security objectives. Our thesis is that the system designers need to evaluate different dimensions of their systems in a common framework to be able to make optimal choices of new technologies thus ensuring greater acceptability by the end users while satisfying the functional and security objectives. A common evaluation framework is however lacking, and this research goes some way towards analyzing usability and security concurrently.

We also propose that the usability and security of new technologies needs to be assessed at the process level rather than specific actions. This is in accordance with the basic idea of business process redesign where new technologies offer the opportunity of smarter process design rather than just automating existing tasks. For this reason, we have chosen to develop our analytical framework at the process level.

We illustrate our methodology on a case study of passenger departure process at airports for which we have chosen IATA/SPT ideal process as the formal process definition [1].

In Section II, we present a brief overview of the scale of disability and related public policy guidelines. Section III reviews main approaches to usability evaluation and recent work on the usability of biometrics. The latter aspect is motivated by the central role of biometrics based identification technologies in airport passenger processes through the introduction of electronic passports and registered traveler schemes [2]. Section IV presents a new joint evaluation framework for usability and security risk, which is illustrated with an example of our case study. Finally, we present our conclusions in Section V.

II. THE CHALLEGE OF DISABILITY

"… a society, in which disabled people are fully included, is a better society for all." – European Disability Forum [3].

A. Current Trends

Recent studies have highlighted a number of demographics trends in Europe, which must be borne in mind when considering the introduction of new technologies in large scale public applications [4]

Taking into account the needs of the elderly and of people with disability, not only is an obligation, but adds different ways of perceiving problems and finding solutions for all users. The problems do not concern only people with permanent disability, but also a large number of people with temporary disability. The so called *silver economy* concept recognizes the importance of designing systems usable by the elderly [5].

The specific needs of the elderly and of people with disability have to be considered in order to allow a *design for all* approach in the aspects related to the data's privacy and to the travel documents' identity controls, checked by manual or automatic readers.

B. The Scale of Disability

According to European Disability Forum, disabled people represent 50 million persons in the European Union (10% of the population). One in four Europeans has a family member with a disability [6]. Figures of the same order are available also for the USA: 54.4 million people, about one in five residents of the USA (19%) report some level of disability [7].

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In the UK alone an estimated 14% of the population has some form of disability [8]. Fig. 1 shows the distribution of different forms of disability in the UK.

When considering share of the disabled in public transport, it is fair to assume that a larger majority of the disabled are unable to travel due to the existing barriers.

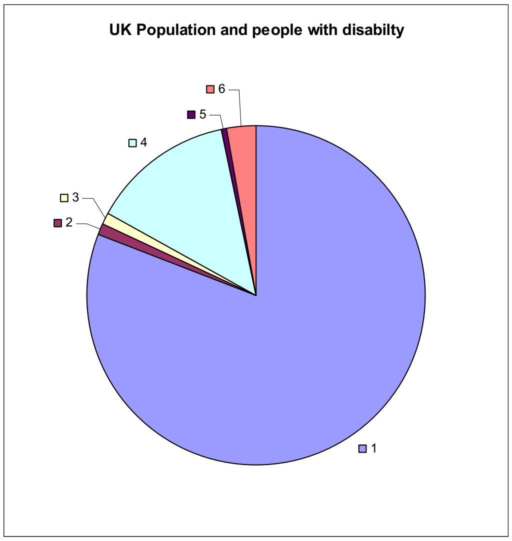

Figure 1. UK Population and people with disabilities (numbers are in millions).

1: Population without disability (50)
2: Wheelchairs users (0.7)
3: Deaf people (0.7)
4: Hearing impaired people (8.3)
5: Blind or partially sighted people (0.3)
6: Hidden disabilities: diabetics (1.8)

C. *Public Policy on Disability*

European Union has extensive laws for mobility rights and equal treatment of the disabled passengers [9], [10]. This includes right to boarding, assistance, mobility equipment and accessible information.

A UN convention aims "to ensure the equal enjoyment of all human rights and fundamental freedoms by all persons with disabilities, and to promote respect for their dignity". The Convention will cover 650 million people in the world, including 50 million in the EU alone. [11].

III. Related Work on Usability

A. *Definition*

"Usability is the effectiveness, efficiency and satisfaction with which a *specified set of users* can achieve a *specified set of tasks* in a particular environment." [12]

B. *Usability Study*

Research on usability goes back to the early 1970s with the introduction of platform style guides and usability labs. There are three basic approaches to usability evaluation: (a) user-centered evaluation; (b) Expert-based evaluations; and (c) Model-based evaluations [13].

User-centered evaluations include the use purpose built *usability labs*, *focus groups*, *formative evaluation* at conceptual design stage and *summative evaluation* carried out formally using well-designed experiments and real users. User-centered evaluations are time consuming and expensive.

Expert-based evaluations involve *expert reviews* adherence of design guidelines and standards, *cognitive walkthroughs* to evaluate sequence of user interactions with the system, and *heuristic evaluations* with respect to accepted usability design principles. Expert-based evaluations can be carried out in fairly short amount of time.

Among the above techniques, cognitive walkthrough can be carried out using only the system description at an early stage of design.

C. *Usability of Biometrics*

Usability of biometrics has received attention in recent years with their increasing use in commercial and government applications. Early lead was taken by NIST in the area of biometric usability standards, user interaction models and sample quality / usability relationship [14].

User acceptance requires that the users perceive the real need and the system's utility e.g. convenience for them. Reliability of recognition and data security can establish trust in a biometric system. Conversely, problems with usability will diminish the confidence. The system's acceptance also depends on personal attitudes and minorities may be particularly sensitive in this field [15]. Context also matters in the acceptance of biometrics: using biometrics in passports is considered to be more useful than using them for monitoring work hours [16].

Nadel has highlighted procedural considerations in biometric usability [17]. These include factors such as information, guidance and ergonomics. Fondeur stresses features like autonomy, fault tolerance, minimum habituation adaptability and performance [18]. Lack of commonly accepted methods and metrics or for biometric usability was also recognized. Proceedings of a recent usability workshop provide an excellent overview of this topic [19].

D. *Usability Challenges in Biometric Access Control*

Accessibility. Physical accessibility for people with reduced mobility is now becoming a norm however access to information systems by the disabled is not fully explored. Biometrics in access control combines the physical and information domains, e.g. when biometric identification is used in the end-to-end air travel process [2].

Communication. Information systems are not perfect nor are the people using them. Therefore information provision to users in a process needs to be designed on the basis of cognitive limitations as well as expectations of the end users. Design factors to consider are:

- *what* would the different users *wish* to know (content),
- what they *need* to *know* (relevance)

- *when* people need such *information* (timeliness)
- *how they* will best *understand* it (communication channel)
- how *they* will *remember* it (retention for later use)
- What information needs to be *repeated* (re-enforce).

With respect to the disabled, the above factors need to be considered for the specific modes of disability therefore the communication channels in a public service context need to be adapted to diverse disability profiles.

Safety. A person with sensory or cognitive impairment or under linguistic barriers may react in an unexpected way or just not react at all. This may give rise to a security or safety issue or exacerbate an emergency situation, such as during evacuation. A practical challenge is therefore how to communicate effectively to all user in an emergency as well as in normal situations?

IV. A Framework For Usability and Security Assessment

A. *The Analytical Framework*

Referring back to the definition of usability given in Section III, the key aspects are

a. a specified set of users,

b. a specified set of tasks,

c. a particular environment.

In the present research, the specified *set of users* consisted of the different types of disable passengers as well as the elderly while the *specified set of tasks* were the main passenger tasks involved in the airport passengers' process.

The specific usability context was set by the Simplified Passenger Travel process for seamless airport journey [1]. Fig. 2 shows a high level abstraction of the SPT process model.

On the other hand, security is defined in terms of the risk posed to the assets by the threats that may be natural or man-made. When developing a framework for common security and usability analysis, we need to take into account the primary stakeholders: the citizen on one hand and authorities on the other. This is shown in Table 1.

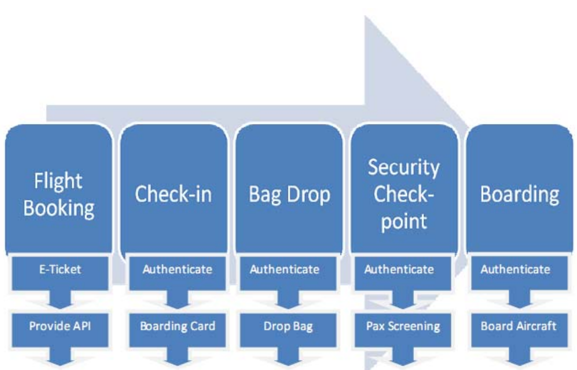

Figure 2. High-level abstraction of the Ideal Process Flow Departures Process (Passenger's view)

TABLE 1. A FRAMEWORK FOR CONCURRENTLY ANALYZING USABILITY AND SECURITY FOR PERSONS WITH DISABILITY

<table>
<tr><td rowspan="2">Citizen with disability</td><td>Usability</td><td>The citizen may face specific inconvenience due to the choice of technologies or the design of the process in which they are deployed.</td><td>What is the relationship between risks and inconvenience in a system?</td></tr>
<tr><td>Assistive Needs</td><td>Authorities are responsible for offering assistance as per the needs of a person with disability</td><td>Authorities may perceive specific security risks from a person with specific profile</td></tr>
<tr><td rowspan="2" colspan="2"></td><td>Obligations</td><td>Security</td></tr>
<tr><td colspan="2">Authorities responsible for a Service</td></tr>
</table>

An analytical framework was developed for a joint usability-security assessment along the process dimension A table, in the form of a spreadsheet, considered the inconvenience encountered by users with different abilities all along the typical situations encountered by them in the airport passenger process. Table 2 shows the task/user profile matrix used in the analysis.

The rows in Table 2 represent the **tasks** in the normal progression order encountered by the passengers, from the initial stage of scheduling and booking a flight online, by telephone or at a travel agency, to the practical problems eventually encountered in reaching the airport, parking and starting the check in procedures and baggage drop. Particular attention was then paid to the next steps of identity controls, by human personnel or by automatic e-gates as well as hand luggage controls. Then the next steps of reaching the security gate, passing the final boarding controls, getting onto the plane, flight, disembarkation, arrivals controls, baggage collection and exit from the airport.

The columns in Table 2 represent different types of disability: from visual or hearing or mental disability, to motor disability, as well as the problems related to the elderly or passengers with temporary impairment, such as being pregnant or using crutches or traveling with several children.

TABLE 2. SCOPE OF USABILITY STUDY IN THE SPT PROCESS WITH RESPECT TO A RANGE OF USER PROFILES

	Sensorial disability: blind	Sensorial disability: deaf	Mental disability: psychological	Physical disability: motor	Elderly	Temporary disability
Scheduling a flight						
Booking a flight						
Approaching the airport						
Check in						
Communications						
Passport control						
Emergency escape						
Reaching the plain						
Flight						
Luggage control						
Leaving the airport						

B. Analysis of the SPT Process – Results

This section details the analysis of Table 2, where each cell represents a particular context of user/task pair in the SPT process. For a selected set of cells, usability problems were identified from the passengers' point of view as well as potential security problems from the operators' point of view. After a first iteration, the matrix was then refined.

The spreadsheet was first populated with analytical information in a qualitative form. A quantitative evaluation of this information was then carried out to identify various factors contributing to passenger inconvenience as well as the security risk to the departure process. This method was repeated for selected user profiles. A partial snapshot of the resulting analysis is shown in Table 3; more details are provided in Table A2 in the Annex. The inconvenience and risk factors were quantified on a scale of 1-5 and aggregated on a 'per profile' and 'per process' stage basis (1=minimum; 5=maximum).

TABLE 3. INITIAL QUANTIFICATION OF SECURITY RISK AND PASSENGER INCONVENIENCE FOR A PASSENGER PROFILE (PARTIAL SET; FOR EXTENDED SET, SEE TABLE A2 IN ANNEXE)

Sensorial Disability: Hearing (permanent)				
	deaf with **internal equipment** (cochlear implant		deaf or hard of hearing **with external equipment (**prosthesis)	
	inconv.	*sec. risk*	*inconv.*	*sec. risk*
body control: frontal clear communication or unpredictable reactions; electromagnetic interference	5	3	3	2
bags control: frontal clear communication or unpredictable reactions; electromagnetic interference	3	3	3	3
identity control: no voice recognition systems; no voice-guided semi-automatic systems	1	1	1	1

Results for a set of the most significant cases were plotted in a graphical form, thus helping in redefining with more precision the previous data and any correlations between different sets. Fig. 3 shows the evaluation of inconvenience and security risk for a specific user profile in the departure process.

For instance, the data presented in Fig. 3 underlined a significant difference between the passengers' feelings of inconvenience and the security risks. Users with assistive aids, as pace makers or cochlear implants, of course attach the greatest importance to their equipment, both the implanted part and the external one. From the point of view of security, the risk is rather limited, mainly related to possible magnetic interference or hidden explosives.

This situation is unbalanced, since it may bring to a superficial control, sufficient to reduce the security risk, but dangerous for the user: for instance only a passenger with pace maker may avoid the electromagnetic controls, while a passenger with cochlear implant has to insist in order to avoid such control that might deregulate the implant; sometimes the external part of the assistive devise may be passed through X-rays control with a similar risk. For this reason, the figures previously indicated were normalized, increasing the level of the security risk in order to indicate not a real greater risk but a need for greater attention.

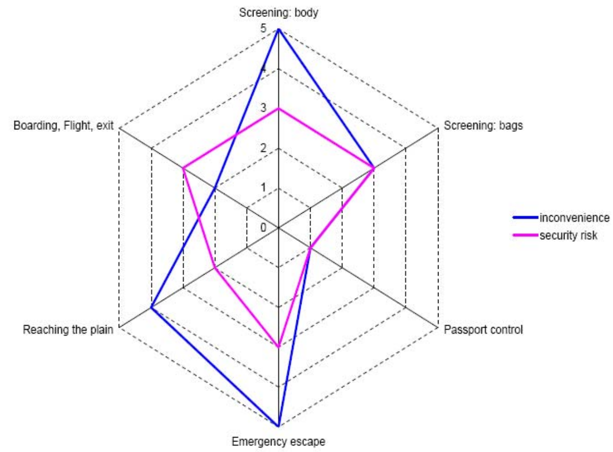

Figure 3. Security risk and inconvenience profile of the SPT process for passengers with cochlear implant

For the above reasons, Table 3 was augmented by further information, separating the responsibility of the security checks and that of the airport's handlers, showing them in different colors. This allowed a more precise interpretation of different situations form the point of view of passenger and his feelings of inconveniences, in such a clearer way so as to better define the same situations from the point of view of what the airport's authorities should do.

Separating the security risks from the airports' handlers doubled the number of columns, while examining more steps in the passenger process added a considerable number of rows. Altogether this approach more than doubles the matrix dimension, and the dispersion on too many situations created difficulties in comparing the numeric values attributed to different but similar cases.

In order to limit the proliferation of the number of columns, further distinction within the data registered into the latter two columns - i.e. security risk or need of special care for accessibility - was presented only by using a set of colors, as described below.

Some simplification had to be made: concentrating on situations in the departure process and making the hypothesis that for a similar situation in the arrival or transfer passenger control could be defined by the same numeric value (e.g. hand luggage security checks for the first or the second flight; same difficulties in reaching the airport as well as leaving from it, etc.).

Even more important, all the numeric values have been re-attributed in a more standardized way, easier to be presented to the airport's authorities: for instance, level 5 for each passenger with an implanted assistive device or with a physical or visual impairment. This is shown in Table 4.

TABLE 4. MODIFIED QUANTIFICATION METHOD FOR SECURITY RISK AND PASSENGER INCONVENIENCE FOR A PASSENGER PROFILE

-: not applicable	marks from 5 (max) to 1 (min); no strict correspondence between passenger's inconvenience and security risks					0: no additional problem
	passenger's equipment, with risk of damage, and requiring additional security control					
	passenger's inconvenience (worried about personal risks)					
	5: passenger has an internal equipment	4: external equipm linked to the internal	3: external equipm	2:	1:	
	security risk (metal, explosives, electromagnetic interference)					
	5: passenger's equipm: explosives / interference	4:	3:	2:	1: risk reduction in control's level	
	passenger requiring help to overcome physical barriers					
	passenger's inconvenience (difficulties in overcoming physical barriers)					
	5: physical or visual impairment	4: hearing impairment	3:	2: access web site or telephone call center	1: limited additional difficulties	
	security risk (limited risk, but special help needed)					
	5: equipment or staff to help overcoming	4: written info and staff to help	3:	2: accessible web site and call center	1: risk reduction in control's level	

The indications are made more visible by the use of a set of colors:

- the passengers' feelings of inconvenience (blue for values 3-5 / azure for values 1-2) with respect to the security risks (pink for values 3-5 / rose for values 1-2),
- the passengers' need for help in order to overcome barriers (dark green for values 3-5 / light green for values 1-2) with respect to the obligation of providing some additional help (brown for values 3-5 / beige for values 1-2).

A section of the final table is presented in Annexe (Table A3).

V. DISCUSSION & CONCLUSIONS

A. Discussion

This research has brought up new questions re the challenges of usability and security in the context of the passengers with disability. We highlight a few of them here.

Electromagnetic interference: Risk to assistive medical implants such as pacemakers and cochlear implants due to EM interference of the detection devices at security checkpoints.

Explosives: Risk of hiding explosives or other items of security threat in wheel chairs and other belongings; Risk of explosion due to personal oxygen container prescribed on medical grounds.

Certification: Who should certify/prescribe the use of medical devices on-board for a passenger and what is an acceptable form of certification/prescription in all EU countries? Who should certify the quality of medical equipment - what are the requirements for such certification?

Automated control: What are the design criteria for the accessibility of eGates for a range of disabled, reduced mobility passengers as well as the elderly? What are the procedures for emergency evacuation and how they are built into the design of eGates?

Data protection and privacy: May the users with disability be known *a priori* (in the booking procedure or in airports?). Should this information be included in the electronic passport, in order to speed up the controls?

B. Conclusions

With increasing flux of security technology in transportation systems, and air transport processes in particular, the challenge of usability is recognized. This paper has analyzed these issues in the context of users with disability in an idealized process of Simplifying Passenger Travel (SPT). We presented a common framework for analyzing security risks and inconvenience for the disabled for the SPT process; and showed that it allows to examine the two aspects in a balanced way. The framework can be used to devise risk-managed inspection policies for the disabled passengers with assistive devices.

Acknowledgement

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References

[1] SPT: Ideal Process Flow V 2.0, 1 December 2006, http://www.iata.org/NR/rdonlyres/31BD66A2-4446-4514-A911-3EA9DDAC7CAA/0/IPF_V20_FINAL.pdf

[2] BAA, *miSense – the Connected Journey*, http://www.baa.com/portal/site/baa/menuitem.6a4740fe62e293a4b03f78109328c1a0/

[3] European Disability Forum (EDF), http://www.edf-feph.org/

[4] Institute for Prospective Technological Studies (IPTS), Joint Research Centre (JRC): http://ipts.jrc.ec.europa.eu/

[5] Silver Economy Network of European Regions:: http://www.silverlife-institute.com/uploaded_files/docs/bulletin_en_070924_1190989084.pdf

[6] European Disability Forum (EDF): http://www.edf-feph.org/Page_Generale.asp?DocID=12534

[7] Report on 2005, issued by the United States Census Bureau, December 2008: http://www.cjwalsh.ie/2009/02/us-disability-statistics-practical-application-in-europe/

[8] The Social Firms UK Website - Disability Facts and Stats: http://www.socialfirms.co.uk/document/format_uploaded/download.php/doc690.html

[9] Official Journal of the European Communities: http://eur-lex.europa.eu/LexUriServ/site/en/oj/2006/l_204/l_20420060726en00010009.pdf

[10] Civil Aviation Authority - Consumer Protection Group: http://www.caa.co.uk/docs/33/CAA_CPG_PRM_Update.pdf

[11] Final report of the Ad Hoc Committee on a Comprehensive and Integral International Convention on the Protection and Promotion of the Rights and Dignity of Persons with Disabilities: http://www.un.org/esa/socdev/enable/rights/ahcfinalrepe.htm

[12] Usability, http://en.wikipedia.org/wiki/Usability

[13] Jean Scholtz, "Usability evaluations", http://www.itl.nist.gov/iad/IADpapers/2004/Usability%20Evaluation_rev1.pdf

[14] Biometric Usability, NIST, http://zing.ncsl.nist.gov/biousa/

[15] Anglea Sasse, *User Perception of the Technology and Acceptance*, http://zing.ncsl.nist.gov/biousa/docs/workshop08/day1/6Sasse/sassebiomdc_june08.pps

[16] Andrew Patrick, *Acceptance of Biometrics, http://zing.ncsl.nist.gov/biousa/docs/workshop08/day1/7Patrick/Andrew-Patrick-Acceptance-of-Biometrics.pdf*

[17] Lawrence D. Nadel, *Usability Considerations for Face Image Capture at US-VISIT Ports of Entry*, http://zing.ncsl.nist.gov/biousa/docs/workshop08/day2/2Nadel/Usability_Face_Image_Capture_at_US_VISIT_POE.pps

[18] Jean-Christophe Fondeur , *Usability of Biometrics for Border Crossing* , http://zing.ncsl.nist.gov/biousa/docs/workshop08/day2/5Fondeur/Usability%20of%20Biometrics%20for%20Border%20Crossing%201.1.pdf

[19] The International Workshop on Usability and Biometrics, June 23-24, 2008 http://zing.ncsl.nist.gov/biousa/html/workshop08.html

ANNEXE

Table A1. Detailed structure of the Task/User matrix

The **rows** were the following:

PREPARATION
- Scheduling a flight
- Booking a flight
- Approaching the airport

DEPARTURE
- Check-in
- Web check-in
- Kiosk check-in
- Mobile phone boarding card
- Baggage drop

SECURE AREA
- Screening: body
- Screening: bags
- Identity control
- Identity control: fingerprints
- Identity control: eyes iris
- Identity control: voice recognition

BORDING
- Emergency escape
- Reaching the plain
- Boarding, Flight, exit

EXIT
- Reaching the airport
- Transfer
- Passport control
- Luggage (all=drop)
- Exit airport (all=approaching)

The **columns** were presented on several pages, grouped by the following sets and sub-sets of user profiles:

Sets:
- Physical disability: Motor
- Medical, Other Physical
- Psycho, Miscellaneous
- Sensorial Disability: Visual
- Sensorial Disability: Hearing
- Biometrics: eGate

For each set, 2 or 3 sub-sets were considered:
- with internal assistive device
- with external control of the internal assistive device
- with external assistive device, without any assistive device.

Finally, for each sub-set two columns were proposed:
- passengers' inconvenience
- security risk.

TABLE A2. INITIAL QUANTIFICATION OF SECURITY RISK AND PASSENGER INCONVENIENCE FOR A PASSENGER PROFILE

Needs of elderly people and people with disabilities in a Secure Airport *versus when and where the problem arises: possible consequences and solutions*										
1min - 5max	**Sensorial Disability: Hearing**									
	permanent						**temporary**			
	with int. equipm. (deaf with cochlear implant)		**with ext. equipm.** (deaf or hard hearing with prosthesis)		**no equipm.**		**with ext. equipm.** (broken or lost hearing aids)		**no equipm.** (hears inflammation)	
	inconv	*sec. risk*	*inconv*	*sec. risk*	*inconv*	*sec. risk*	*inconv*	*sec. risk*	*inconv*	*sec. risk*
PREPARING A FLIGHT										
Scheduling a flight: accessible call center; relay service	*1*	*0*	*1*	0	*1*	0	*1*	0	*1*	0
Booking a flight: web site: ok; tel: accessible call center; travel agent: ok	*1*	*0*	*1*	0	*1*	0	*1*	0	*1*	0
Approaching the airport	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
DEPARTURE PROCESS										
Check-in: only written messages	*2*	*1*	*2*	*1*	*2*	*1*	*2*	*1*	*2*	*1*
SECURE AREA ACCESS										
Screening body: frontal clear communication or unpredictable reactions; electromagnetic interference	5	3	3	2	1	2	1	2	1	2
Screening bags: frontal clear communication or unpredictable reactions; electromagnetic interference	3	3	3	3	1	2	1	2	1	2
Identity control: no voice recognition systems; no voice-guided semi-automatic systems	1	1	1	1	1	1	1	1	1	1
MOVING IN THE AIRPORT, BOARDING										
Emergency escape: light indicators	5	3	5	3	5	3	5	3	5	3
Reaching the plain: clear info on delays and changes of gates	4	2	4	2	4	2	4	2	4	2
Boarding, Flight, exit	2	3	2	3	2	3	2	3	2	3
LANDING, EXIT										
Reaching the airport: only written messages	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Luggage and passport control: frontal clear communication or unpredictable reactions	1	2	1	2	1	2	1	2	1	2
Transfer: clear info on delays and changes of gates	*4*	*2*	*4*	*2*	*4*	*2*	*4*	*2*	*4*	*2*
Exit airport	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*

TABLE A3. MODIFIED QUANTIFICATION METHOD FOR SECURITY RISK AND PASSENGER INCONVENIENCE FOR A PASSENGER PROFILE

Needs of elderly people and people with disabilities in a Secure Airport *versus when and where the problem arises: possible consequences and solutions*																
		Physical disability: Motor														
		permanent									**temporary**					
		with int eq (metal prosthesys)	inconv	sec risk	**with ext eq** (wheel chair, crutches)	inconv	sec risk	**no equipm** (no hands, finger, fingerprints)	inconv	sec risk	**with ext eq** (wheel chair, crutches, plastering)	inconv	sec risk	**no equipm** (difficulties or slow moving)	inconv	sec risk
PREPARATION	Scheduling a flight		*1*	*1*	accessible web	*2*	*2*	accessible web	*2*	*2*	accessible web	*2*	*2*	accessible web	*1*	*1*
PREPARATION	Booking a flight	provide info; accessible web site	*1*	*1*	provide info; book local eq; access. web	*2*	*2*	accessible web	*2*	*2*	provide info; book local eq; accessible web	*2*	*2*	accessible web	*1*	*1*
PREPARATION	Approaching the airport	parking, ramps, elevators *(=temp no eq)*	*2*	*0*	parking, ramps, elevators	*5*	*5*	parking, ramps, elevators	*2*	*0*	parking, ramps, elevators	*5*	*5*	parking, ramps, elevators	*2*	*0*
DEPARTURE	Check-in		*2*	*1*		*4*	*1*		*2*	*1*		*4*	*1*		*2*	*1*
DEPARTURE	Web check-in		*2*	*1*		*2*	*1*		*2*	*1*		*2*	*1*		*2*	*1*
DEPARTURE	Kiosk check-in		*2*	*1*		*2*	*1*		*2*	*1*		*2*	*1*		*2*	*1*
DEPARTURE	Mobile phone boarding card		*2*	*1*		*2*	*1*		*2*	*1*		*2*	*1*		*2*	*1*
DEPARTURE	Baggage drop		*3*	*1*		*5*	*1*		*3*	*1*		*5*	*1*		*3*	*1*
SECURE AREA	Screening: body	metal, explosives	*5*	*5*		*3*	*5*		*2*	*2*		*3*	*5*		*2*	*2*
SECURE AREA	Screening: bags	metal, explosives (accessories)	*2*	*2*		*3*	*5*		*2*	*1*		*3*	*5*		*2*	*1*
SECURE AREA	Identity control		*2*	*1*		*2*	*1*	no fingerprints recognition	*2*	*1*		*2*	*1*		*2*	*1*
SECURE AREA	Identity control: fingerprints		*2*	*1*		*3*	*2*	not applicable	-	-		*3*	*2*		*2*	*1*
SECURE AREA	Identity control: eyes iris		*2*	*1*		*3*	*2*		*3*	*2*		*3*	*2*		*2*	*1*
SECURE AREA	Identity control: voice recogn		*2*	*1*		*3*	*2*		*3*	*2*		*3*	*2*		*2*	*1*
BOARDING	Emergency escape	ramps, elevators no ectricity	*2*	*1*	cars, elevators, ramps	*5*	*5*	cars, elevators, ramps	*2*	*2*	cars, elevators, ramps	*5*	*5*	cars, elevators, ramps	*3*	*1*
BOARDING	Reaching the plain	cars, elevators, ramps	*2*	*1*	cars, elevators, ramps	*5*	*5*	cars, elevators, ramps	*2*	*2*	cars, elevators, ramps	*5*	*5*	cars, elevators, ramps	*3*	*1*
BOARDING	Boarding, Flight, exit	cars, elevators, ramps	*2*	*1*	cars, elevators, ramps	*5*	*5*	cars, elevators, ramps	*2*	*2*	cars, elevators, ramps	*5*	*5*	cars, elevators, ramps	*3*	*1*
EXIT	Reaching the airport	cars, elevators, ramps	*2*	*1*	cars, elevators, ramps	*5*	*5*	cars, elevators, ramps	*2*	*1*	cars, elevators, ramps	*5*	*5*	cars, elevators, ramps	*3*	*1*
EXIT	Transfer		*2*	*1*		*5*	*5*		*2*	*1*		*5*	*5*		*3*	*1*
EXIT	Passport control		*2*	*1*		*2*	*1*	no fingerprints recognition	*2*	*1*		*2*	*1*		*2*	*1*
EXIT	Luggage *(all=drop)*		*3*	*1*		*5*	*1*		*3*	*1*		*5*	*1*		*3*	*1*
EXIT	Exit airport *(all=approach.)*	elevators, ramps, parking	*2*	*0*		*5*	*5*		*2*	*0*		*5*	*5*		*2*	*0*