



AUN2014 : Airports in Urban Networks
15-16 Apr 2014 CNIT - Paris la Défense (France)



Integrating Human factors in airport security checkpoints: a decision aiding analysis of structural incoherencies

Maréchal Ludovic, DGAC STAC, France

Crévits Igor, University of Valenciennes, France

Labour Michel, University of Valenciennes, France

Vanderhaegen Frédéric, University of Valenciennes, France



What is airport security?



- Aim: Fighting against terrorism



- How? By preventing the introduction of prohibited items into aircrafts

- Security equipments
- Security staff
- Operationnal procedures...





Security division @STAC



- What is our role?
 - Assessment and certification of security equipments
 - Access control in restricted areas
 - Expertise for French CAA
 - Innovation for the future





Human factors ... what for?



- Better security
- Better passenger experience
- Value for money
- Better working conditions for security staff





Human Factors @STAC



- Better use of security equipments in airports
 - Better decisions by security agents on the field
 - Better implementation of security measures
- Evaluation of the global security performance
 - Toward the certification of the whole system, rather than each layer
- Providing guidelines for R&D



Where to start?



- Systemic and scientific approach
- Study based on a partnership: STAC - Valenciennes University (LAMIH)
 - Decision aiding process
 - Information and communication sciences
 - Human – machine cooperation
- Aim: modeling the security checkpoint, measuring its performance, and providing guidelines for its evolution





Security checkpoints: a decision problem



- **Input:** Passengers and bags
- **Problem:** Any prohibited items?
- **Decision:** YES or NO
 - Based on the security equipments
 - Agregation of information
- **Output:**
 - Passengers and bags secured
 - Passengers on time

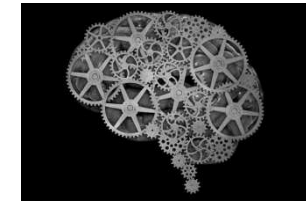




Method of the study



- Cooperation between
 - Scientific experts of decision aiding, social sciences and engineers
 - Experts of airport security
- Scientific theory: decision aiding process
- Review of the Human Factors Literature
- Interviews and observations during trials of new security equipments





Decision process

- Decision Process: procedural rationality [Simon, 1977], step by step:



- **Intelligence:** putting together the elements of a designated problem
- **Design:** building the solutions
- **Choice:** selecting the appropriate solution
- **Review:** checking the consistency with the real world



Decision aiding process

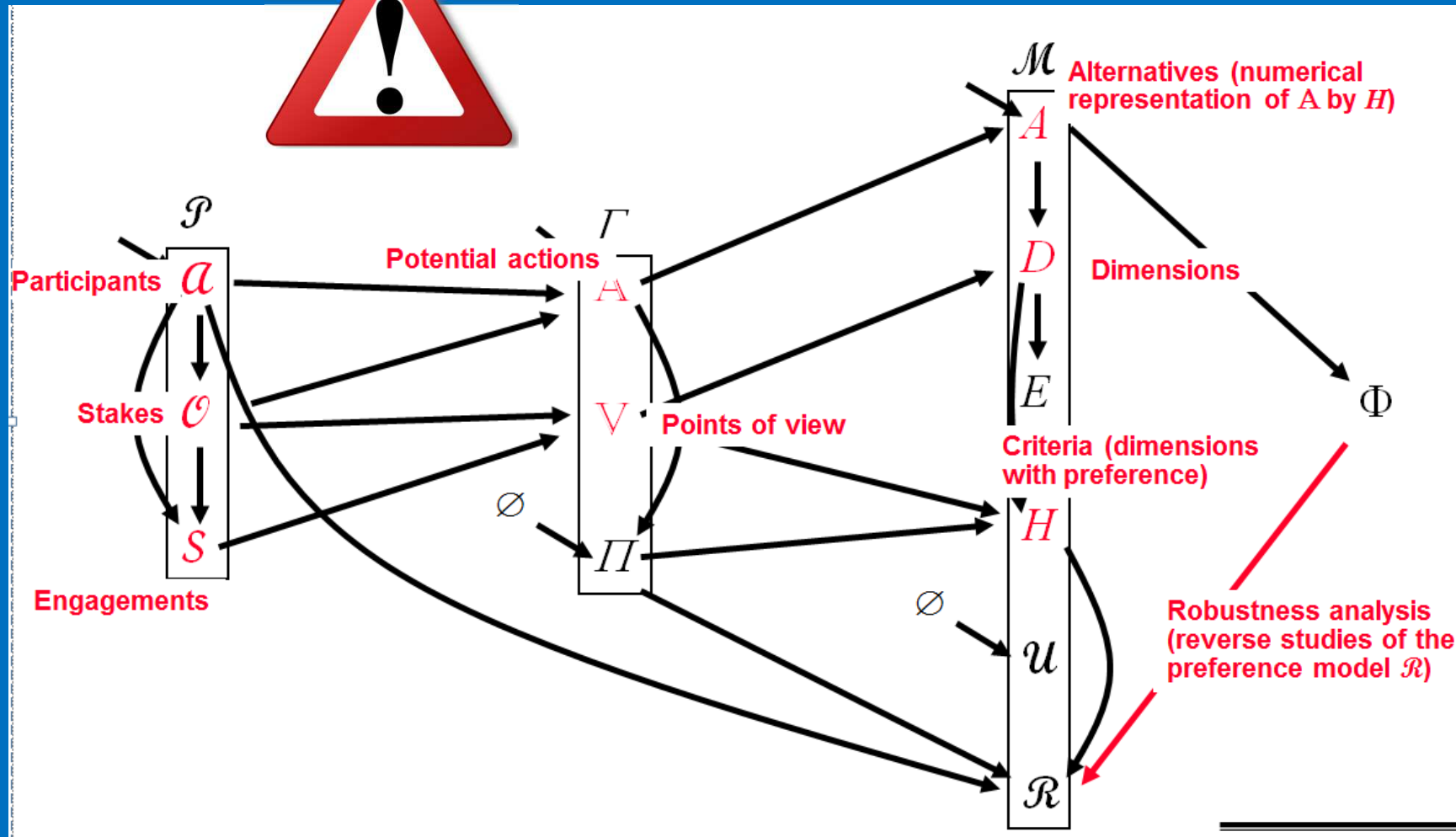


- [Tsoukiàs, 2007]
- Clarification of Procedural rationality, with a client- analyst relationship
- Seeks to reduce the decision making irrationality:
 - **Problem situation \mathcal{P}** : in understanding the problem itself
 - **Problem formulation Γ** : in expressing the problem solutions
 - **Evaluation Model \mathcal{M}** : By providing a model for identifying the most accurate solution
 - **Final recommendation Φ** : By coming back eventually to reality





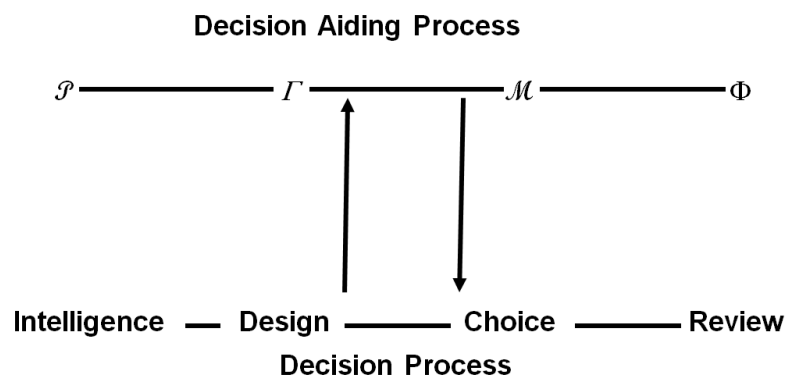
Decision aiding process: the matrix





The matrix: a great tool...

- To identify the structural incoherencies
- To integrate new concepts and new equipments
- For a better integration of human factors, for enhanced decisions on the field





First model based on Simon Decision Process



- **Intelligence:** welcoming prior the checkpoint
 - Checking boarding pass, advising passengers on the security procedures...
- **Design:** preparation
 - Divesting, loading bags onto th conveyor belt, monitoring passengers
- **Choice:** screening of PAX and BAG
 - Searching for prohibited items with Xrays...
- **Review:** filtering
 - GO to restricted area, or call for LEO





Identification of incoherencies

- Theory: Decision Aiding Process [Tsoukiàs, 2007]
 - Filling in the boxes of the matrix
 - Litterature: ICAO documents, ECAC, studies...
 - Observations, interviews, in CDG, ORY, NICE...
- 7 incoherencies identified



Identification of incoherencies

- 1. Passengers = participants of the problem**
 - PAX endure the screening
- 2. Security= stakes **not clearly expressed****
 - Tensions between security staff and PAX
- 3. Passengers under **contradiction****
 - All passengers treated as a potential terrorist



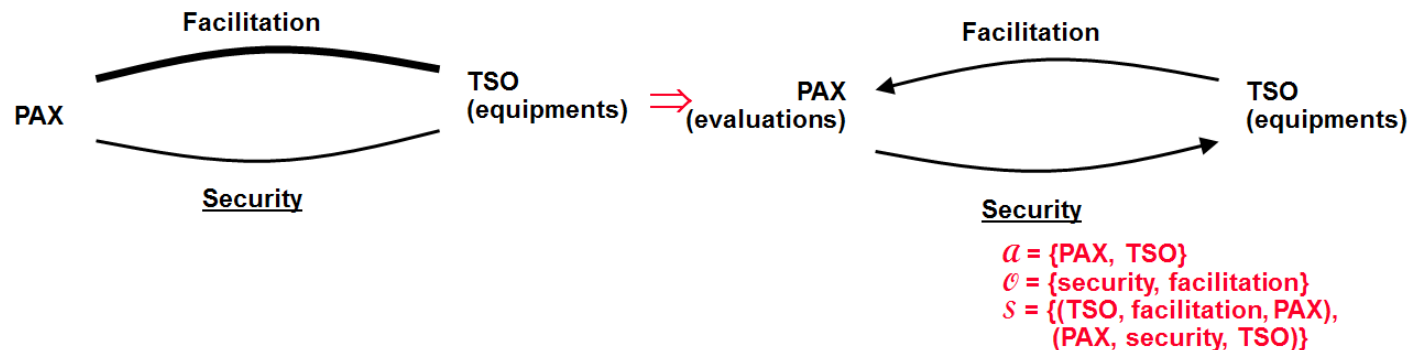
Identification of incoherencies



- 4. Passengers:** stakeholders and targets of the decision
 - good preparation helps looking for real threat
- 5. Technical robustness:** Equipments cannot detect evolutive threats
 - Human perception and technological responses need to be complementary
- 6. Security staff:** judge, and stakeholder
 - Maximum supervision, lack of initiatives
- 7. External performance evaluation**
 - Penalty when error, preventing continuous improvement



Recommandations on \mathcal{P}



- PAX engagement
 - PAX as co-actor of security
- Security staff empowerment
 - Security staff as a source of progress
- Sensemaking
 - Performance evaluation based on operational significant data



Conclusion



- **Scientific** and **operational** approach to provide guidance for checkpoint evolution
- First step of the study: **headlines** for a better inclusion of Human Factors
- **Decision Aiding Process**: a powerful tool towards security: reliability, robustness, resilience, dissuasion...
- **Coming up**: numerical approach for real time decision making, and optimized monitoring



Any question ?

Email:

Ludovic.marechal@aviation-civile.gouv.fr