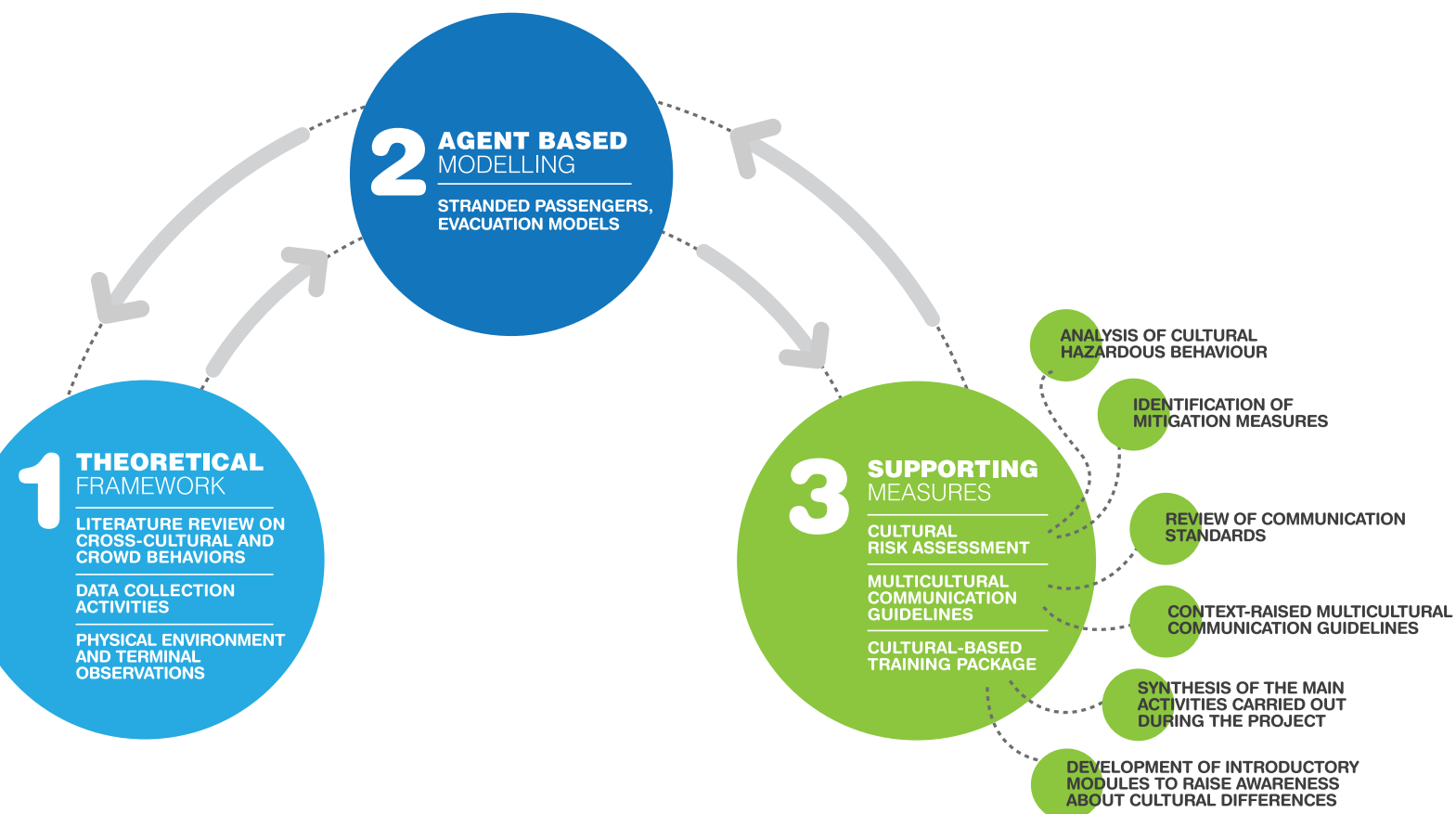# Overview of the main results

IMPACT has analysed the role played by socio-cultural factors in managing safety and security issues related to emergencies in public transport systems. The project has analysed and proposed methodologies and solutions for cross-cultural emergency prevention and management.

2 AGENT BASED MODELLING

STRANDED PASSENGERS, EVACUATION MODELS

1 THEORETICAL FRAMEWORK

LITERATURE REVIEW ON CROSS-CULTURAL AND CROWD BEHAVIORS

DATA COLLECTION ACTIVITIES

PHYSICAL ENVIRONMENT AND TERMINAL OBSERVATIONS

3 SUPPORTING MEASURES

CULTURAL RISK ASSESSMENT

MULTICULTURAL COMMUNICATION GUIDELINES

CULTURAL-BASED TRAINING PACKAGE

ANALYSIS OF CULTURAL HAZARDOUS BEHAVIOUR

IDENTIFICATION OF MITIGATION MEASURES

REVIEW OF COMMUNICATION STANDARDS

CONTEXT-RAISED MULTICULTURAL COMMUNICATION GUIDELINES

SYNTHESIS OF THE MAIN ACTIVITIES CARRIED OUT DURING THE PROJECT

DEVELOPMENT OF INTRODUCTORY MODULES TO RAISE AWARENESS ABOUT CULTURAL DIFFERENCES

1 Theoretical framework

The theoretical framework developed within the IMPACT Project describes key elements of cross-cultural and psycho-social crowd behaviour in transport terminals in routine and emergency situations. Its development is based on work conducted throughout the first phase of the project, including **the state-of-the art literature review and multi-method data collection activities with passengers, members of staff and safety and security officials comprising semi-structured interviews, questionnaire surveys, observations of passenger movement in transport terminals,** the examination of the physical environment of transport terminals, and video **analysis of crowd behaviour during emergencies.** The development of this framework constitutes an important major step in understanding the impact of cultural aspects on crowd behaviour and management in transport terminals, and provides a quantification path that can be replicated in future studies, including an analysis of the probability of specific behaviours occurring within specific demographic and cross-cultural groups.

The theoretical framework is essentially a socio-technical model, illustrating **how cross-cultural and psycho-social factors influence the behaviour of passengers and staff as they proceed through the physical environments of transport terminals,** undertaking the required activities to depart or arrive in their chosen mode of transport, while responding to any emergencies that may arise. By bringing together and considering a range of important, interacting, socio-technical factors that influence crowd behaviour in **routine and emergency situations, these findings provide an important theoretical and practical foundation for understanding and managing crowds in a transport terminal.** Within the IMPACT Project, the cultural aspects described within the framework were incorporated into the agent-based computer simulation models of crowd behaviour and contributed to the development of cultural risk assessment methodology, cultural-based emergency communication framework, and cultural-based training framework – each representing a major output of the IMPACT Project.

Keywords

Crowd behaviour
Crowd management
Cross-cultural emergencies
Transport

2 Agent-based model

IMPACT has used an innovative approach to validate the results of the project. **The behavioural modelling and simulations of the cross-cultural crowd behaviour in transport hubs were performed through agent-based computational modelling.**
Passengers evacuating a transport hub and stranded passengers at an airport were modelled to determine the dynamics of the evacuation processes and group frustration respectively. Important socio-cultural factors influencing these dynamics were found.

Evacuation
helping, falling, social contagion and travelling in groups fastened the evacuation process, while age and familiarity with the environment had small effects. The socio-cultural factors affected the evacuation time up to 30%!

Stranded Passengers
gender influences the group frustration level more than traveller type and emotion contagion can accelerate both the spread and decrease of frustration.

The models were also used for testing new emergency communication solutions.

Evacuation
emergency lighting on the floor guiding people to the nearest exit is only effective for a high crowd density while staff at exits instructing people to take this nearest exit only improves evacuation time when the crowd is unfamiliar with the environment. A multicultural crowd can be beneficial in the evacuation process, creating a faster-is-slower effect when not everybody understands the announcements immediately, creating a phased evacuation, avoiding immediate congestion at the exits.

Stranded Passengers
a chatbot could be more efficient than multilingual staff in helping passengers regulate their frustration, thereby decreasing the group frustration level.

Keywords

Evacuation time
Group frustration
Group dynamics
Testing new emergency communication solutions

3

Supporting measures

Cultural-risk assessment

Multicultural communication guidelines

Cultural- based training package

Cultural-risk assessment

The activity on cultural risk assessment has first of all proposed an approach to **cultural behaviour risk assessment** starting from consolidated international standards (ISO 31000) and modified to take into consideration **hazardous cultural behaviours**, the escalation of consequences due to specific cultural characteristics and the **possible mitigation actions**.

Then the transport hubs have been analysed highlighting the hub characteristics from the psycho-social point of view and the impact on passengers and, consequently, proposing how to indirectly **compute or infer the passengers' cultural clusters** to tune the proposed cultural behaviour risk assessment approach to specific users of the hub.

The next step has been to analyse **culture-specific hazardous behaviours on the basis of past events** identifying the main behaviours that could either **amplifying/diminishing consequences of generic safety hazards or security threats or triggering new hazards.**

Finally, the work has been focused in identifying and reporting, analysing existing standards or best practices on generic emergency management, the **mitigation measures to be applied to specific cultural clusters/ ethical minorities** in the areas of first-aid and long-term health care, communication, training and awareness and signage.

The work done has been then converted into **four specific interactive computer-based training lessons on cultural behaviour risk assessment.**

Keywords

Cultural differences

Risk assessment

Cultural risk assessment

Hazardous cultural behaviour

Culture-specific mitigations

Multicultural communication guidelines

The multicultural communication guidelines were developed for improving **security operators and first responders' situational awareness and intercultural competences in all phases of an emergency.** The multicultural guidelines developed are context-based, in the sense that they are clustered around three categories: "before emergency", "during emergency" and "after emergency". Below an excerpt of the proposed Multicultural communication guidelines elicited.

> **Communication guidelines before emergency aim to:** *(1) exploit time resources, (2) to predefine communication messages and, (3) collect information from customers.*

Inform on behaviours to be taken in case of emergency. The message has to be pre-defined. It has to be designed in order to reach all kinds of passengers. Adopt a multi-language and multi-channel and multi-code strategy and ensure consistency.

Collect relevant information on individual differences and needs. Build an automated database system to collect actual information about the sociocultural composition of the passengers.

Establish contact and build partnership. Establish contact and build partnerships with broadcast media agencies linked to specific cultural groups or other recognized online communities, who may provide support for emergency communication, in case of necessity.

Raise safety awareness: knowledge. Underline on a regular basis the importance of knowledge about safety instructions, providing a hub's safety instruction leaflet, printed and available online, addressed to all cultural groups and translated by mother-tongue professionals in as many as possible languages; be sure the instructions are to be found where related groups may easily find it.

> **Communication guidelines during emergency aim to:** *(1) save lives and reduce injuries, (2) protect property, environment and reputation, (3) facilitate rescue response and (4) promote cooperation.*

Issue effective messages. Issue timely instructions to the public, including the brief description of the event occurring and likely to impact them, the reasoned actions and behaviours to adopt to protect their lives

Ensure redundancy. All warning messages, previously framed for each audience or vulnerability identified, should be issued via any available channel and repeated consistently. Be simple, omit unnecessary details and make every word count.

Reach all audiences. Support with text and audio in different languages the meaning of what is being conveyed graphically and viceversa to ensure comprehension by all vulnerable audiences, validate any automatically translated text with a mother tongue, using existing partnership or staff members, to avoid errors. *Guidelines follow on next page*

Keywords

Multi-cultural emergency communication

Communication guidelines

Crowd management

Promote cooperation. Be inclusive and recommend a helping attitude, especially towards vulnerable individuals or groups. Send trained and multilingual employees. Give similar advices using public audio announcements or pre-recorded videos in different languages and codes.

> **Communication guidelines after emergency aim to:** *(1) exploit time resources to personalize interventions; (2) implement different interventions for short-term and long-term effects of the traumatic event; (3) use information collected in advance to identify passengers with special needs and (4) apply a communication style that takes into account the symptoms experienced by victims.*

Locate people in need of help. Use all two-way communication available, also embedded or wearable sensors, IOT and social media to locate unreached victims and, whenever possible, to establish a direct active or passive feedback.

Help families and groups reunite. Put in place a strategy to identify and bring together people belonging to the same groups, or facilitate the recognisability of different post-event logistic areas, providing provisionary signs and directions addressing all involved audiences. A post-event strategy for communication should be included in the preparedness phase.

Reduce long-term post-traumatic symptoms occurrences. Recognize and connect with people showing post-traumatic symptoms or, more generally, with all the people who may be potentially shocked (i.e. vulnerable subjects) according to personal sensitivity; if necessary, ask support and advice from a team of experts; inform them about the existence of free post event support, both legal and psychological

Learn from experience. Collect all available information about the event occurred, to build a database useful to revise and update emergency communication strategies. They will be of paramount importance for cultural risk assessment management and emergency preparedness.

Keywords

Multi-cultural emergency communication,
Communication guidelines
Crowd management

Cultural-based training package

The development of the e-learning cultural –based training package, starts from the assumption that transport hubs operators deal daily with people who speak different languages, who may not speak the local language, have different habits and beliefs. Therefore, successful operations require operators to have a clear understanding of cultures, traditions, and values of people they interact with.

The IMPACT training package is a **general introductory course aiming at raise awareness about the importance of cultural competence in daily working situations.** For this reason, the training package addresses a wide range of key transport professionals in the different transport domains, who are directly involved in the prevention, response and management of large groups of multicultural crowds during both routine and emergency situations.

The 4 modules developed summarise most of the activities carried out throughout the duration of the project such as: **literature review on cross-cultural and crowd behaviours, agent based modelling, cultural risk assessment and emergency communication strategies.**

MODULE 1 | UNDERSTANDING THE MEANING OF CULTURE
Lesson 1 | What is culture?
Lesson 2 | Discovering cultural differences

MODULE 2 | UNDERSTANDING MULTICULTURAL CROWD BEHAVIOURS AND SOCIO CULTURAL HAZARDS
Lesson 1 | Introduction to crowd behaviour
Lesson 2 | Socio - cultural hazards in transport hubs, an overview

MODULE 3 | COMMUNICATION WITH OTHER CULTURES
Lesson 1 | Cross-cultural interpersonal communication
Lesson 2 | Management of multicultural crowds in transport hubs

MODULE 4 | CULTURAL RISK ASSESSMENT
Lesson 1 | Risk assessment methods and Cultural Factors
Lesson 2 | The complexity of different transport hubs and the factors affecting them in view of a cultural risk assessment
Lesson 3 | Culture specific threads and hazards in transport hubs and stations
Lesson 4 | Control measures to reduce the risk generated by culture – related hazardous behaviours

Keywords

Multicultural training
Cultural differences
Cultural competence
Crowd behaviours
Communication skills
Risk management
Risk assessment