



# **Communication and signage comprehension in crowded and multi-cultural environments**

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# 1. Introduction

Signs and symbols in the physical environment are often misinterpreted, especially in hectic contexts such as transport hubs. We can draw important lessons concerning icons' design that can be applied also to the digital world from European studies exploring signage comprehension in crowded environments such as transport hubs, where people from all countries travel and seek for visual cues.

This document provides service operators, developers, designers and policy makers with key results and lessons learnt from the two past Horizon 2020 projects (i.e., IMPACT<sup>1</sup> and LETSCROWD<sup>2</sup>) related to inclusive and accessible communication, especially when used to provide consistent information both through the physical and digital interfaces of a mobility or delivery service. The rationale behind this document is that all people using a digital mobility or delivery service, including service employees such as riders, drivers or people working for customer care services, have to deal to some extent with physical environments where crowd behaviour, socio-cultural and socio-demographic diversity and capabilities-limitations spectra (see section 3 of D.2.1 Universal Design Manual - version 1) might strongly affect how communication is perceived and understood by end-users (passengers, pedestrians, travellers, ride-sharing users, customers, caregivers etc..). Moreover, there is a strong analogy between the comprehension of signs, symbols and texts in the physical environments and in digital environments, despite the different physical and cognitive effort end-users employ to navigate and interact with them. In this document we aim to create cross-links to ensure that a Universal Design approach is applied also when designing accessible signage navigation systems, consistently on all communication channels and available on all physical and digital interfaces. The INDIMO WP2 research team identified the relevant multi-cultural and emergency communication guidelines in crowded environments, drawing from IMPACT and LETSCROWD projects' results. The recommendations

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<sup>1</sup> Impact of Cultural aspects in the management of emergencies in public Transport, see <https://cordis.europa.eu/project/id/653383>

<sup>2</sup> Law Enforcement agencies human factor methods and Toolkit for the Security and protection of CROWDs in mass gatherings, see <https://cordis.europa.eu/project/id/740466>



adapted to the context of digital mobility and delivery services are collected in the following section. Far from being exhaustive, the following list of adapted multicultural and emergency recommendations has been developed as a complement to the UIL tool and it focuses on the communication with multicultural passengers and supports safe spatial and digital navigation of transport related services.

## **2. Relevant multicultural, emergency and crowded environments communication guidelines**

Safety experts are aware that any emergency communication exchange take place in an environment that provides the reference contexts for a preliminary attribution of the meaning to the messages:

- 1.** Before emergency
- 2.** During emergency
- 3.** After emergency

Moreover, especially in transport hubs and crowded environments, the groups of people involved are very heterogeneous and so are their behaviours, depending on:

- i) The reason why they choose to stay in or move across the specific location: frequent and occasional passengers, one-time travellers, visitors, staff or other service providers;
- ii) the social-group belonging: people from different socio-demographic background and culture, following different social-norms;
- iii) the individual characteristics and ability-limitation spectra: people living with some kind of permanent or temporary impairment.

### **2.1. Multi-cultural communication guidelines pre, during and after emergencies in transport hubs**

The IMPACT project provided insights on how to train and prepare transport hubs operators and staff and properly communicate with multicultural crowds and optimise passengers' reaction time, taking into account the diversity of cultures, experiences and individual attitudes. The aim is to provide information on how to



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exploit positive crowd behaviours in transport hubs, whilst lowering socio-cultural risks that may arise before, during and after emergencies.

The most prominent cultural issues in crowd behaviour and management that are relevant for emergency communication have been identified, as follows:

- Social identity;
- Language and Education Level affecting comprehension of written contents;
- Signs comprehension;
- Individual differences;
- Spatial navigation.

Considering the above, service providers and communication managers shall ensure the same information reaches people with physical or cognitive impairments, that speak different languages, people who are not paying attention to environmental cues and any other vulnerable audience expected to be in the area. For what concerns culture, the IMPACT project recommended to critically reflect on how intercultural interactions might influence events, while avoiding generalisations from individual behaviours to entire cultures: an effective communication keeps in mind diversity considering heterogeneous subgroups and also the different levels of individual perception of risks and contexts.

As recommended by European research bodies, relevant results from previous research shall represent a starting point for further studies. The IMPACT multicultural guidelines represent an important stepping stone to customise and derive recommendations adapted to other mobility related studies.

The INDIMO project works in line with such ambition and adapted IMPACT's recommendations towards inclusive digital mobility and delivery services: in the INDIMO perspective all digital mobility services should take the necessary organisational measures to facilitate the comprehension of communication messages issued before, during and after emergencies in crowded environments, especially in transport hubs by:

- supporting the coherence and inclusiveness across digital channels, by seeking the highest degree of internal consistency with the emergency language and style used locally (e.g. in the region, in the specific transport hub etc.);



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- supporting redundancy by providing prompt and automated translation of emergency information in different languages and for all kinds of users, including those with low digital skills (e.g. via pop-up notifications);
- mitigate the counter effects of the potential miscomprehension of wayfinding signage and safety procedure signs and symbols, by providing a digital version of icons matching with those already provided on site, enriched with labels or additional clarifications both textual and figurative.

A similar approach should be adopted in any context in which an emergency might occur. The following guidelines will hopefully help digital mobility and delivery service providers to become and be perceived as safer and more secure by all users and employees, be it in the physical and digital environment.

### Before emergencies

During routine operations there is no difficulty to hear and catch messages. The challenge is to create messages able to capture the public attention, namely to overcome the filters of selective attention that everybody automatically activates to discriminate the most relevant information from the continuous overloading flow of data and stimuli. **Communication before emergency aims at generating awareness on a possible risk/problem impacting safety.**

#	Original guideline from IMPACT	Transposition as INDIMO recommendation	INDIMO Aspects and roles involved
	<b>Systematically collect relevant information on individual differences and needs.</b> Build an automated database system to collect actual information about the sociocultural composition of the passengers.	<b>Systematically collect relevant information on individual differences and needs while protecting anonymity and privacy.</b> Survey end-users about their needs and build a database system to collect voluntary information about the sociocultural composition to ensure you provide safe and secure information to all (e.g. spoken language/s; willingness to use technology;	Organisational measures (service providers)



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		frequency of service-usage etc.)	
	<p><b>Recruit and train for multicultural competence.</b> Use a database on socio-cultural composition of passengers to recruit, train and employ a front-line staff with multicultural competencies, including communication skills as well as post-traumatic symptoms and recovery awareness.</p>	<p><b>Recruit and train for multicultural competence.</b> Recruit, train and employ staff members with multicultural and accessibility competencies, including communication skills. Take into account the anonymous information you have collected about your end-users to properly address diverse needs.</p>	Organisational measures (service providers)
	<p><b>Establish contact and build partnership.</b> 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.</p>	<p><b>Establish contact and build partnership.</b> 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 need.</p>	Organisational measures (service providers)
	<p><b>Adopt an inclusive approach and be an example for others.</b> Be aware of other countries' practices and cultural codes to help prompt responses and stimulate an open and inclusive approach in others, reducing stress factors in crowds before, during and after emergencies.</p>	<p><b>Adopt an inclusive approach and be an example for others.</b> Be aware of other countries' practices and cultural codes to stimulate an open and inclusive approach in others, reducing stress factors in end-users in all situations, especially when they are more prone to feel at personal or collective risk, when they are more worried about mutual miscomprehension and cultural stigma.</p>	Physical and digital user interface (communication managers)
	<p><b>Reduce communication barriers.</b> To establish a broad and common basic safety procedure manual, provide cards with illustrated instructions and</p>	<p><b>Reduce communication barriers.</b> To establish a broad and common basic safety procedure manual, provide illustrated instructions and actions, widely representing</p>	Physical and digital user interface (designers)



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	actions, widely representing the human diversity, without stereotyping, so as to stimulate a correct perception of risk and the common effort to save and be saved.	the human diversity, without stereotyping, so as to stimulate a correct perception of risk and the common effort to save and be saved. The same approach should be applied prominently but not only for safety instructions.	
	<b>Facilitate information seeking.</b> Help people seek information ensuring that signs, panels, screens, printed materials or displays, delivering safety instructions are placed where people are expected to look for it; the information should be visible, reachable and readable in extreme conditions by all targeted audiences; consider the space needed by people who stopped for reading, to avoid slower evacuations.	<b>Facilitate information seeking.</b> Your application might help people seek information ensuring that signs, panels, screens, printed materials or dynamic displays, potentially delivering safety instructions, are interpreted correctly. In the physical and digital environment adopt safety related signs, labels and texts that are coherent with those used in your service area. Provide such information where the users most need it on their paths. If site-dependent automatic customisation is not easily implemented, follow existing ISO standards or adapt to the style most commonly used in your service area or region.	Physical and digital user interface (designers, developers)
	<b>Prevent cultural clashes.</b> Identify areas in the transport hub where in crowded situations people of different cultures or different needs get in close contact: if in normal conditions people already struggle to get along, there is a high probability for them to compete for survival during emergencies.	<b>Prevent cultural clashes.</b> Identify scenarios and potential situations in which people of different cultures or different needs might get in close contact while using your service, especially those related with safety or security issues: if in normal conditions people already struggle to get along, there is a high probability for them to compete during unfamiliar events or emergencies.	Organisational measures (service providers and communication managers)

**Table 1 - Transposed recommendations about communication before an emergency**



### During emergencies

During an unexpected emergency situation or event it is more difficult for people to hear or catch messages: stress, panic, change of routine, tiredness, or any other individual, cultural or environmental barriers can affect comprehension. Additionally, people presenting special needs including people who do not understand the local language may not have the possibility to be supported by relatives and/or be too incapacitated to ask for help from staff. **Communication related to emergency warnings' aims at eliciting a specific response from all people potentially involved.**

#	Original guideline from IMPACT	Transposition as INDIMO recommendation	Aspects and roles involved
	<b>Ensure redundancy.</b> 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.	<b>Ensure redundancy.</b> All warning messages, previously framed for each audience identified, should be issued via any available channel and repeated consistently, also in the physical context through signage. Be simple, omit unnecessary details and make every word count.	Digital user interface (communication managers)
	<b>Reach all audiences.</b> Support with text and audio in different languages the meaning of what is being conveyed graphically and vice versa 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.	<b>Reach all audiences.</b> Support with text and audio in different languages the meaning of what is being conveyed graphically and vice versa 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.	Digital user interface (designers, developers)

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	<p><b>Boost all useful information.</b> Keep in contact with the partner communities somehow related to the audience involved, to maximize communication dissemination through their channels; other appropriate channels to share and issue warnings and updates are social media, special-needs or cultural communities' dedicated apps or websites.</p>	<p><b>Boost all useful information with broad multi-channel and multi-language communication campaigns.</b> Keep in contact with the all communities somehow related to the audience involved, to maximize communication through their channels; share and issue warnings and updates through relevant social media, platforms, applications or websites.</p>	<p>Organisational measures (social media managers)</p>
	<p><b>Manage the “emotional” atmosphere.</b> Be sensitive to the non-verbal communication of the involved parties, expressed through facial and vocal expression, proxemics (e.g. interpersonal distance), kinesics and gaze. To ‘read’ the emotional display means taking notice of changes in an individual’s body language.</p>	<p><b>Manage the “emotional” atmosphere.</b> Be sensitive to the non-verbal communication expressed through facial and vocal expression, proxemics (i.e. interpersonal distance), kinesics and gaze, body language. Similar rules apply to the all channels used, (e.g. voice/video assistance provided via smart or digital devices, contact points on equipped devices, ticket vending machines etc..).</p>	<p>Physical user interface (contact points, riders and drivers)</p>
	<p><b>Be aware of and control your own body language.</b> Inappropriate non-verbal behaviour might serve as an aversive stimulus that triggers aggressive reactions, and hence a specific training is recommended for front liners.</p>	<p><b>Be aware of and control your own body language.</b> Inappropriate non-verbal behaviour might serve as an aversive stimulus that triggers aggressive reactions, and hence a specific training is recommended for front liners.</p>	<p>Physical user interface (contact points, riders and drivers)</p>

**Table 2 - Transposed recommendations about communication during an emergency**

### After emergencies

Communication in this context may be hampered by anxiety, fear, helplessness and any other psychological reaction impacting attention. When a traumatic



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event occurs, the automatic and ordinary psychological processes can be ineffective. The reactions might be:

- i) Physical (e.g. heart-rate increase, nausea, muscular spasms, etc.);
- ii) Cognitive (e.g. temporary impairment of vigilance and sustained attention, confusion);
- iii) Emotional (e.g. anxiety, irritability, anger, sadness, guilty, sense of helplessness);
- iv) Behavioural (e.g. aggressive attitude, proneness to complain, silence, isolation, hyper-vigilance and hyper-control).

Not only these symptoms combine differently in people, depending on the individual personality, but also cultural differences on emotional expression play a relevant role. For example, some cultures discourage emotional expression and may make individuals more prone to isolation, sense of guilty and silence; while others promote even exaggerate emotional reactions, making individuals more prone to complain and become aggressive. **Post-emergency communication purpose is to help people re-establish the psychological functioning of involved people, in terms of attention, space/time orientation, ability to speak and seek for help, etc.**

#	Original guideline from IMPACT	Transposition as INDIMO recommendation	Aspects and roles involved
	<b>Identify and reach people in need of help.</b> Before any further intervention, a multichannel strategy should be in place to reach as many victims as possible, including people who cannot be easily localized, people who are not prone to ask for support, due to cultural factors or other conditions, people who are not familiar with mobile devices and applications.	<b>Help rescuers identify and reach people in need of help.</b> Through your application you can reach as many potential victims as possible via push-up notifications or similar strategies. Invite them to share their current location with the aim of sending it to official rescue teams in the most intuitive and quick way, considering also incapacitated people or people who are not familiar with mobile devices and applications.	Digital user interface (communication managers)
	<b>Help families and groups reunite.</b> Define a strategy to identify and bring together people belonging to the same groups, or facilitate the recognisability of different	<b>Support families and groups' tendency to reunite.</b> Defina a strategy and provide specific signage and physical path constraints to identify people belonging to the same groups	Digital and physical user interface (communication managers)



	<p>post-event logistic areas, providing provisional signs and directions addressing all involved audiences. A post-event strategy for communication should be included in the preparedness phase.</p>	<p>in the area and dispatch official information about safe gathering areas to facilitate the recognisability of different post-event logistic areas. Whenever possible, include explanations of safety signs in use and an easy access to online digital versions in different languages.</p>	
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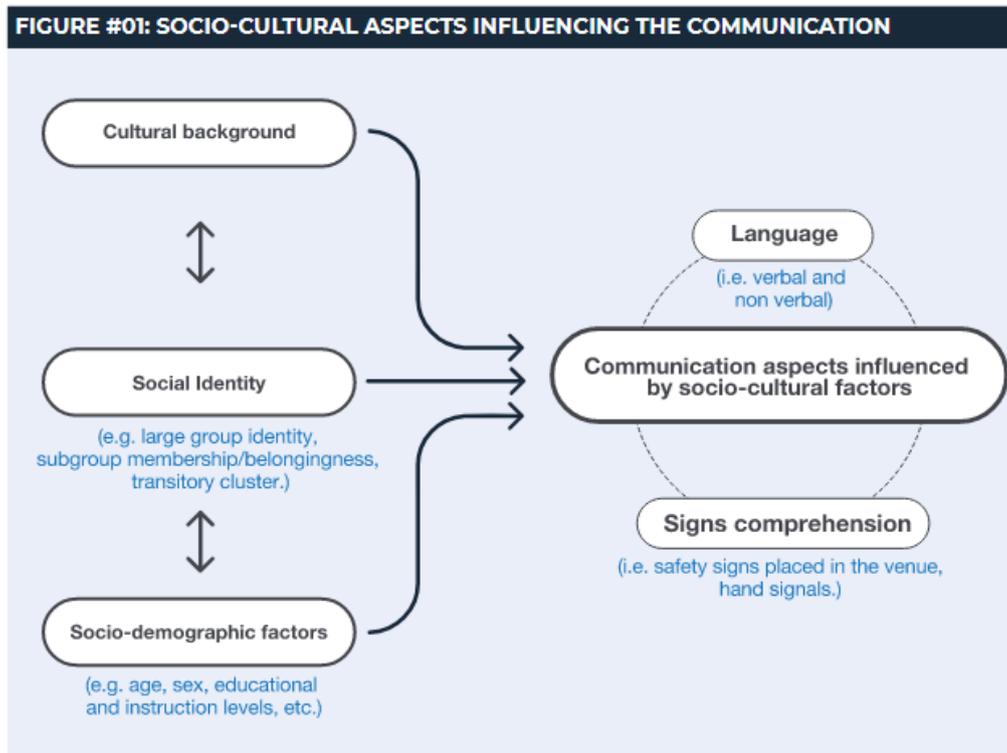
**Table 3 - Transposed recommendations about communication after an emergency**

## **2.2. Socio-cultural aspects influencing the communication in crowded environments**

The LETSCROWD project focused on the communication best-practices to adopt in case of emergency situations in mass gatherings or events. Its communication toolkit included socio-cultural issues and guidelines relevant for communicating with crowds, a set of templates and triggering questions and emergency cards focusing on specific events such as sport gatherings, festivals and music concerts. The project’s main advice overarching all subsequent guidelines, was that of “ensuring that the entire audience is able to receive timely all alerts and warning messages by adopting a multi-channel communication strategy and providing redundancy and coherence of textual and visual cues” (see LETSCROWD - D5.6, Annex 1 - Toolkit). To this aim, socio-cultural aspects should be considered when framing messages and choosing the right combination of channels. The socio-cultural aspects influencing communication are:

- Cultural background;
- Social identity (i.e., in-group “us” versus out-group “them”, Tajfel, 1974 );
- Socio-demographic factors (e.g. age, sex, education level, language etc.);
- Individual characteristics (i.e. capabilities-limitation spectra) and conditions (emotional and psychological status).

The above aspects influence the comprehension of any communication in its broadest meaning (texts, signs and symbols, auditory messages, body-language, gestures, proxemics, etc...), as shown in Figure 1.



**Figure 1 - Lets crowd H2020 Socio cultural aspects influencing communication**

According to the research, a higher consideration of all those aspects leads to more effective and safest communication in all heterogeneous crowded contexts.

There are a few insights that are relevant for the INDIMO research and that service providers and first-liners should be aware of:

- 1) In critical situations, collective resilience (Drury et al., 2009) and a shared identity emerges (i.e. sense of unity, psychological togetherness) can be strongly improved by an effective and inclusive communication, or damaged by poor communication.
- 2) Social identities (“in-group” vs “out-group” dynamics) are powerful drivers of people’s behaviours and one group’s or individual’s action might be interpreted differently across these groups (Tajfel, 1974).
- 3) People have the tendency to seek for confirmation cues, to consult others and to believe a situation is normal as long as they can. It’s essential to inform them not only about the actions to perform, but also the reasons why to perform it.
- 4) People develop mental scripts to navigate in familiar places and tend to follow known routes, so it is important to inform them about changes or risks related to such automatic behaviour.

- 5) Verbal and textual instructions from front-liners shall preferably be accompanied with hand-gestures or signage located in the physical environment that can be interpreted by people with audio-visual impairments or those not speaking the language.

**Before an event**

Before mass gatherings the communication can be carried out with no time pressure and people with specific needs have the possibility and time to seek and find appropriate support, where provided. The messages should inform users about:

- changes in the ordinary logistics of the area, including transports;
- safety and security measures in place and all potential risks;
- useful tips to cope with potential adverse events, including changing weather conditions.

#	Original guideline from LETS CROWD	Transposition as INDIMO recommendation for DDS and DMS	INDIMO Aspects and roles involved
	<b>Reach all users, including those living with permanent or temporary impairments</b> by issuing effective messages that are timely, reliable, credible and concise on all channels.	When a priority information should reach all users, frame and issue contents on all channels in such a way that it is clearly identified as important or urgent. Adopt a different style to ensure it is recognised as a serious content.	Digital and physical user interface (communication managers)
	<b>Identify communication resources and channels that can be used to reach and influence the target audiences.</b> A multi-channel strategy is highly recommended in order to reach as many people as possible in the shortest timespan.	Track and collect the socio-demographic characteristics of people reading emergency/priority messages on the different channels, in order to be able to reframe and reinforce messages if not enough people have received it. You can also circulate surveys or involve targeted end-users to test and trial your strategy.	
	<b>Coordinate and collaborate with other credible sources that will help key</b>	Jointly develop and share emergency and safety information with other service	



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	<p><b>stakeholders to get key messages across with greater effectiveness.</b> Collaborate with the communities and the religious leaders. These ones can offer a greater understanding of how their members may react in certain crises and emergencies. The community mediators play a special role in providing key information regarding specific groups and/ or communities. They are able to assist in dispelling rumour, reducing conflict and facilitating the flow of information to and from the community (ACPOS &amp; NPJA, 2010).</p>	<p>providers in your area or market segment with the objective of coordinating communications in case of emergency situations. All service providers would gain a higher end users’ trust and can also avoid heavy market losses if supporting each other during unexpected events or disruptions.</p> <p>Create long-term links with credible organisations and communities to support all groups of end-users seek and find reliable information about an emergency or other events through trusted media (e.g. large transport disruptions affecting the service on radio channels or website dedicated to specific communities). Also, be available to share on your channels updates concerning safety provisions shared by specific end-users groups and communities’, that are essential for them and provided in ways that are more accessible to them (e.g. changes in regulations, explanatory brochures etc..).</p>	
	<p><b>Translate all written and auditory materials in the major languages. Identify</b> those languages spoken by the people potentially attending the event to ensure that people not speaking the local language or with low English proficiency still have access to warnings and safety related information.</p>	<p><b>Translate all written and auditory materials in the major languages.</b> Identify those languages spoken by the people potentially attending crowded events or visiting crowded environments, to ensure those not speaking the local language or with low English proficiency still have access to warnings and safety related information.</p>	<p>Digital and physical user interface (communication managers)</p>



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	<b>Set up language translation services.</b> Set up and notify the crowd that multiple language information desks or similar multi-language support is available.	<b>Set up language translation services.</b> Set up and notify end-users that multiple language information desks or digital multi-language support is available. Create procedures to identify the most common languages used by your audience and offer the possibility for users to send translation requests	Organisational measures (service providers)
	<b>Identify, hire and/or train multilingual employees.</b> The broadest the languages spoken by your team, the better the assistance you can provide to attendants.	<b>Identify, hire and/or train multilingual employees.</b> The broadest the languages spoken by your team, the better the assistance you can provide to end users.	Organisational measures (service providers)
	<b>Improve signs and signals recognisability.</b> Support the broad comprehension of safety signs and signals by sharing explanatory meanings textual and visual descriptions to de-code contents in multiple languages.	<b>Improve signs and signals recognisability.</b> Support the broad comprehension of safety signs and signals by sharing explanatory meanings textual and visual descriptions to de-code contents in multiple languages, also on the digital service interface.	Digital and physical user interface (communication managers)

**Table 4 - Transposed recommendations about communication before a crowded event**

### During an event

During a mass gathering the communication shall be issued timely to an audience that is or will be undergoing stressful situations, thus their level of comprehension is likely altered and ineffective. People living with impairments may be incapacitated to ask or receive support.

This communication should focus on:

- alerting;
- minimizing injuries and life-losses;
- updating about the current situation;
- facilitating emergency response and rescue;
- promoting cooperation;
- informing the media.



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#	Original guideline	Transposition as INDIMO recommendation	INDIMO Aspects and roles involved
	<p><b>Tell people how to behave.</b> Provide guidance on actions people should take to cope with the specific critical situation. Guidance on actions has to take into account the types of audience involved at different level (i.e. people attending the event inside and outside the venue, citizens and generic public).</p>	<p><b>Timely suggest end-users how to behave in a crowded environment.</b> When end-users reserve or use services potentially linked with a crowded event or context, send them a notification about the availability of a guidance on how to adopt the safest behaviours, also during critical situations. Such guidance should be consistent with official safety provisions and take into account the level of involvement (e.g. people quickly crossing the area, people visiting the area, people staying in the area) and the different types of needs (e.g. frequent users, people with specific needs etc..).</p>	<p>Digital and physical user interface (communication managers)</p>
	<p><b>Facilitate information seeking in the event venue.</b> Help people seeking information by ensuring that safety signs and signals used (verbal, hand signals and pictograms) are placed where people are expected to find or look for them. Address people's concerns with concrete answers and, if applicable, specific actions they can take.</p>	<p><b>Facilitate information seeking in the event venue and the vicinities.</b> Help end-users seeking information in the physical environment by ensuring that safety signs and signals used (verbal, hand signals and pictograms) are placed where people are expected to find or look for them, and ensure you provide consistent pictograms and labels on your digital service interface. Address people's</p>	<p>Digital and physical user interface (communication managers)</p>



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		concerns with concrete answers and, if applicable, specific actions they can take and correct behaviours to adopt.	
	<p><b>Show that you care about the situation and understand what is going on.</b> Empathy is the ability to identify with and understand somebody else's feelings or difficulties.</p>	<p><b>Ensure that service employees directly interacting with end-users, be it a physical or digital contact point, show interest about the potentially stressing/critical situation and understand what is going on.</b> Spread a more sympathetic approach and ensure employees have the knowledge, time and possibility to identify with and understand other people's feelings or difficulties (e.g. anxiety, emotional status, etc..)</p>	Organisational measures (service providers)
	<p><b>An effective communication should reinforce the positive crowd behaviours and mitigate the negative ones of people moving individually or in groups.</b> Individuals are more effective while moving into crowds, especially during exit or evacuation processes, yet they have the tendency to slow down into corners and to follow the people in front of them without paying too much attention to external cues.</p>	<p><b>An effective communication should reinforce the positive crowd behaviours and mitigate the negative ones of people moving individually or in groups in crowded environments.</b> Individuals are more effective while moving into crowds, yet they have the tendency to slow down into corners and to follow absent-mindedly the people in front of them. Groups are much slower, yet they typically exhibit a better coordination and collaboration. Service providers should reinforce the</p>	Digital and physical user interface (communication managers)



	Groups prefer to move as a unit and are much slower, yet they typically exhibit a better coordination and collaborative intention.	safest behaviours by promptly notifying and informing end-users about “to dos” and “not to dos”.	
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**Table 5 - Transposed recommendations about communication during a crowded events**

### 3. Conclusions

If the INDIMO approach would be shared and adopted extensively by all relevant actors somehow related with digital communication and digital transport delivery and mobility services, desk-office employees, call-centre assistants, riders and drivers could quickly benefit of its results and gain a higher mastery of communication processes and other competencies (e.g. body-language, speaking other languages, knowledge about cultural diversity). As a result not only would the overall mobility services’ quality standards strongly improve, but also miscomprehension and risks would be minimised, especially those related with - but not limited to - safety and security issues that are typical in mobility related contexts. Additionally, since digital applications are used on a daily basis by most “digitalised” citizens also during gatherings or while travelling, not only would vulnerable users highly benefit from multi-channel and culturally sensitive communication but the society at large would build upon it in the long term. For each INDIMO pilot, we can provide an example of how the INDIMO project addressed the needs of diverse users taking also into consideration potential emergency situations or crowded contexts (see D. 3.4. Section 3.0):

- P1| Emilia-Romagna: the e-locker location has been defined with users who required a safe, secure and quiet area which was indicated by designated signs using the same “visual” style as the related service application;
- P2 | Antwerp: the auditory assistance application addressing the needs of low-vision and blind users is especially useful in crowded and loud urban environments;
- P3 | Galilee: the service application was translated in the local Arabic language for a more inclusive and female-friendly ride-pooling service in multi-ethnic towns;
- P4| Madrid: the delivery application provided inclusive communication and service training to riders with a focus on multi-cultural aspects;

- P5| Berlin: after end-users input, the ride-sharing service application implemented an emergency button for ride-sharing services.

## 4. References

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