



## Deaf people and their accessibility on ships

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### ABSTRACT

The present paper is focused on the study of accessibility in ships for deaf people, its disadvantages and possible improvements to be implemented. In the first part of this work, we focus on the evolution of disability, the definition of accessibility and the history of deaf people. In the second part, we will see at first different definitions in order to understand in one way or another, more about the deaf community, studying the diversity and the different hearing disabilities that exist and the way in which these users communicate the most, which is in sign language. On the other hand, we expose the characteristics of the ship that we have chosen as a reference to carry out this study. We base ourselves on different regulations on accessibility and rights for users with disabilities.

## 1. Introduction.

### 1.1. What do we understand by accessibility?

Accessibility, a few years ago, was only focused on the need to eliminate "physical" barriers, but this has evolved, accessibility today considers the person and their environment as a "WHOLE", we fight for a world without barriers with the aim that each user can develop independently, having all the same rights and opportunities.

We understand accessibility as the quality that any user must have to have and use the services, buildings and products with the same conditions as others [1].

Accessibility provides comfort for all users, the main objective is that the greatest number of people with disabilities have equal access, as they should have an equal benefit and an easy and comfortable access to the whole environment. Having. We can say that accessibility is one of the biggest challenges facing society and a clear indicator of progress and social development [2,3].

### 1.2. Treatment of disability in modern society.

Over the years, perceptions and treatment of disability have evolved significantly. They are no longer considered "something" negative, in many cases "demonised users", "shame for their family unit", but not in all civilisations they were seen in this way, in other cultures they were something "extraordinary" with exceptional abilities, they were held in great respect and admiration.

Disability has gone through a long process of evolution, and every day these users are accepted in society with all their possibilities, enjoying everything like everyone else. Due to the great evolution and progress we can say that we are facing a more sensitive and curious society, which has led us to carry out studies of the different types of disability. [4] These disabilities can be classified into five types.

- Physical disability.
- Language disability.
- Intellectual disability.
- Psycho-social disability.
- And finally, sensory disability, which is in turn divided into visual disability and hearing disability, on which we will focus our attention.

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## 2. Deaf and hearing impaired people.

Until the 17th century deaf people did not begin to have great relevance, until that date, they were only "sick", "deficient" and "denied" to any kind of reasoning, they were isolated and discriminated by society. People who were placed and compared to "animals", because they were beings who could not learn to use language and therefore could not communicate, they were qualified as "irrational" people, called "deaf-mutes".

Girolano Cardano, in 1501, took the step for society to know these irrational beings, he called them as a collective, a collective of deaf people who could communicate through signs, thus being a manual communication, but, even so, he was not the one who promoted the development for them, Fray Pedro Ponce de León [6] was responsible for their communicative evolution and their correct education.

From the 19th century onwards, the education and importance of deaf people started to be more relevant and interesting. It starts to fight for a barrier-free society [7].

### 2.1. Diversity and types of hearing impairment.

We say that the deaf community is very diverse, we can find different types of deafness, with different ways of communicating, with different individual characteristics and not least with a different family, educational and social context.

We point out that there are three fundamental pillars in the collective of deaf users, which are very important:

- Deaf culture: learned behaviours, rules, language, values, customs, traditions and their own Deaf language and culture.
- Deaf identity: self-acceptance, feelings of belonging to a group, self-identification, self-behaviours, personal and cognitive development.
- Sign language: their natural language, viso-gestural language and use of a manual alphabet, the dactylological alphabet.

We must bear in mind that this group, having a wide diversity, does not have the same needs or demands for all, so we will study later on how specific measures could be implemented for such a large group, thus meeting their needs through different resources, different technical aids and improvements in accessibility, as this will facilitate the integration of these users like the rest of the passengers who sail between the Canary Islands.

It should be pointed out and mentioned in a special way, that this type of hearing disability can be accompanied by other types of disability, such as blindness, deaf-blind people, if it is true that they are users who tend to be more dependent, they always or almost always travel with a companion, as these users need more specific and special measures and needs.

The statistics show that in Spain there are more more than one million people with hearing impairment, this number includes citizens older than 6 years old, we cannot have an exact number of deaf people, because there is no statistic that verifies it, but we can talk about a great number in Spain.

We are going to name the different types of hearing impairment, we say that, if the hearing loss is only in one ear, it is called unilateral hearing loss and if it is in both ears, it is called bilateral hearing loss.

We must bear in mind that the different types of hearing loss can be classified as follows:

1. The moment, depending on when this type of hearing loss appears, we refer to it as follows:
  - Prelocution deafness: the hearing loss appears before the development of language, before the age of two years.
  - Perillocutive deafness: Hearing loss appears between the ages of two and four years at the time when oral language is developing.
  - Postlocution Deafness: Hearing loss occurs after the development of spoken language, around the age of four years.
2. The location, where the lesion that produces this hearing loss is located, we say that:
  - Transmission or conductive deafness: The existence of alterations in the transmission of sound in both the outer ear and the middle ear.
  - Mixed deafness: this is a lesion that exists in the inner ear.

We then classified the different types according to the degree of hearing loss.

According to data provided by BIAP (International Bureau for Audiophonologie) they are:

1. Normal hearing ( $\leq 20$  dB), can be heard without difficulty.
2. Mild Deafness.
  - Loss at 30 dB.
  - Difficulty in hearing sounds and conversations at a distance.
  - Deficits in attention, learning, understanding in louder environments and difficulty in learning spoken language.
  - Deviant behaviours are often seen and are more unnoticed by users.
3. Severe deafness.
  - Loss at 90 dB.
  - Difficulty in picking up screams.
  - Perceive amplified words.
  - Not capable of acquiring language in a natural way.
  - Early on they need technical aids with hearing aids, speech therapy intervention.
4. Profound deafness.
  - Losses exceeding 90 dB.
  - They do not perceive voices, even if they are loud.
5. Kyphosis: Total hearing loss [15].

We must point out that whatever the type of hearing impairment these users have and the different ways they have to communicate, we must point out that, like any other person, they have the same right to share the need to access information and communication without any kind of barrier, a barrier-free environment.

## 2.2. Spanish Sign Language (LSE).

Spanish Sign Language (LSE) is a communication system based on spontaneous manual signs that are developed in order to establish such interaction with deaf people.

Both Spanish sign language and Catalan sign language are covered by the state law 27/2007.

*“Law 27/2007, of 23 October, which recognises Spanish sign languages and regulates the means of support for the oral communication of deaf, hearing impaired and deaf-blind people”.* [16]

It should be noted that the historical heritage council agreed in 2018 that both Spanish and Catalan sign languages should be recognised as part of the intangible cultural heritage.

Thanks to this law, through the Spanish government and the ministry of social rights, the centre for the linguistic normalisation of Spanish sign language was created. Its aim is to guarantee the right to all users who make use of this language, taking into account its recognition, its standardisation and exposing it for use in teaching, in all public services, in the different means of communication and in the different fields of activity, whether private or public [17].

Over time, sign language has become a language that spreads in different social contexts and spheres; it is no longer a language that is only focused on a domestic sphere.

This is a subject that starts to be more sensitive to all users and by means of different learning resources, the number of hearing users who want to learn how to communicate with deaf users by means of sign language is increasing [18].

We have to take into account that, in each country, like languages, sign language is different.

In the world there are more than 300 sign languages, according to the data of the world federation of deaf people, but we must say that it is a minority compared to the more than 7000 oral languages that exist.

In the Canary Islands, the movement of these users on ships is becoming more and more significant and for this reason, different regulations are beginning to be applied to ensure that these users enjoy a better crossing, even so, it is still not enough. The Organic Law 1/2018, 5th november, reform of the statute of autonomy of the Canary Islands, states in article 16 **“Rights of people in a situation of disability and dependence”** section 4 that:

*“The use of Spanish sign language and the conditions to achieve equal treatment of deaf people who choose this language, which will be taught, protected and respected. To this end, and among other actions, the necessary measures shall be adopted to allow communication through sign language between deaf people and the administrations of the community”.*

## 3. Deaf people and maritime transport.

Formerly deaf people were limited to travel, these users lacked resources to make the journey independently, because of the deficiencies that existed in the ships in the past. To make a journey on a ship for a deaf person was more than a challenge. The lack of visual information, warnings, communications, protocols, etc., if not only audible information, mostly through public address systems, made it almost impossible for these users to consider travelling independently.

Nowadays this has changed thanks to technological advances, such as the installation of televisions, the use of signage and images that improve and enable better information to all passengers, and there are even shipping companies that are becoming aware and adapting their fleet, not only for deaf people, but to have ships that are totally more accessible for all users. This is just the beginning of true inclusion, as we are still facing a society with barriers [8].

### 3.1. Training for crew members on “Caring for people with disabilities in maritime transport”.

Two of the most important companies at a national level sail in Canary Islands waters; companies that, as time goes by, improve the infrastructure of their ships, therefore, their accommodation and services are updated and improve access to all users, creating more universally accessible ships.

As ships are updated and improvements are made, the training of crew members is taken into account, as this is a key and important factor within them.

“The Real Decreto 1544/2007, of 23 november 2007, establishes the order of application in the training of crew members on Spanish passenger ships”. This makes the ship more accessible and safer for everyone, especially for deaf people, which is the target of this project.

The regulation states that the minimum number of crew members who must have the training certificate is three in the case of conventional ships and two in the case of high-speed ships (provided that the navigation does not exceed five hours).

This type of certificate can be obtained in different public schools located on land, it is a course approved by DGMM (Dirección General de la Marina Mercante).

The course has a total duration of about 14 hours divided into two parts:

#### 1. Part 1: Basic concepts.

- Module 1. General, in relation to maritime transport and users with disabilities.
- Module 2. General staff training.
- Module 3. Primary care.

#### 2. Part 2:

- Module 1. Introduction.
- Module 2. Physical disability.
- Module 3. Neurological/cognitive disability.
- Module 4. Visual disability and deafblindness.

- **Module 5. Hearing Impairment.**

- Module 6. Other disabilities.

In this section we will focus mainly on module 5, which deals with hearing impairment. In this module the following points are studied:

- Deafness and hearing impairment. The different consequences of hearing loss.
- Diversity in the deaf community and modes of communication.
- Accessibility to information and communication: guidelines for communicating correctly with a deaf person.
- Spanish sign language.
- Different means of communication support.
- Technical hearing aids.

Learning how to communicate with a deaf person would be fundamental, simply because we are talking about a disability that is “invisible” in the eyes of society, but very much present.

We have to take into account that there are different types of hearing impairment and also each deaf user has a different level of ability, that is why it is not less important to know a little bit more about the deaf collective and the different ways to communicate with all these users.

“Order PRE/3028/2011, of 4 November, establishing the protocols for action and training of the crews of passenger ships and the training of the staff of shipping companies providing services in port terminals for the care of persons with disabilities” (Annex 1).

Passenger ships have to establish a certain protocol in order to be able to act in a way that leads to dignified assistance, improved accessibility and relevant support for disabled passengers during embarkation, disembarkation, crossing and in any emergency situation.

By virtue of this order, shipping companies operating on regular passenger lines must check that the number of crew members assigned by the regulations have the course “Attention to people with disabilities in maritime transport”.

We have to take into account that deaf users are mostly very independent people, but they are confronted every day with infinite accessibility barriers, not only in terms of information but also in terms of awareness.

Observing previous times we have been growing and advancing in front of this “deaf community” but it is not enough. Today there is still little awareness of this issue, there are hearing people who do not know what it is to “be a deaf person”, the types of deafness and the different ways of communicating.

For deaf people the main limitation to be able to function comfortably and safely is communication.

### 3.2. Deaf people and how to get their attention in the right way.

In this section we are going to analyse the correct way to call a deaf passenger if he/she does not have visual contact with the crew member.

To get their attention we must take into account that when approaching and having contact it must be in a soft and subtle way, there are two points to touch in order to get their attention, a soft touch on the upper part of the shoulder or another option is to provide a light touch on the leg, for example, when the deaf passenger is seated. Never tap on the back or head area.

Figure 1: Getting the attention of a deaf person.



Source: asogra.es.

To call a deaf person or a group of deaf people who are far from our reach, the best way is to make movements with our hands, “fanning hands”, not abrupt movements, but wide and long ones until we get their attention.

Figure 2: Fanning your hand to get their attention.



Source: asogra.es.

One way of attracting each other’s attention is to make small, soft knocks causing vibrations, which they feel immediately, this way of attracting attention is an informal, more casual way of attracting attention. In the case that a deaf person is at the bar in the cafeteria area and we cannot get their attention in any other way, this would be a last option, because sometimes it can be annoying.

It is always important to have eye contact, to position oneself in a strategic way where the user has an overview of the place where he/she is and with whom he/she is going to establish communication, to keep the right distance to be able to make any movement during the conversation.

### 3.3. Communicating effectively with deaf people.

We have to take into account that there is a preconceived idea about deaf people. Deaf users are not "DEAF-MUTE". Deaf-mute is a pejorative, annoying and offensive term for the whole deaf community, since a deaf person can develop speech because this disability does not prevent him/her from developing in oral language.

We must emphasize that there are deaf people who not only communicate by sign language, but can also communicate in oral language, so we say that a deaf user is one who can not hear, but if you can learn to use his voice.

Therefore, deaf users can communicate by sign language or oral language within their abilities, written or spoken.

Just because a deaf user can use spoken language does not mean that all deaf people can do so. When it is said that, "All deaf people can read lips", it is a big myth, to arrive at that thought is a mistake because as it is well defined, oral language is created to communicate orally and to be perceived by hearing, not by sight.

Lip reading is a skill that deaf users develop, but not in the same way, something that we must take into account. In order to have a good lip reading, it is necessary to observe the factors that could make it difficult, for example:

- Lack of light.
- Poor vocalisation.
- Incorrect postures.
- Incorrect sender positions/postures.
- Speech rate.

Sometimes we can forget how important these factors are in order to establish a correct communication, not only with a deaf or hearing impaired person, but also with any user who speaks a foreign language.

Learning sign language could be a key factor for crew members. This language, as the Organic Law 1/2018 of 5 November indicates, was a reform of the Canarian statute, therefore, it should be taken into account for our deaf passengers who make daily journeys between our islands.

*"The use of Spanish sign language and the conditions to achieve equal treatment of deaf people who choose this language, which will be taught, protected and respected. To this end, and among other actions, the necessary measures will be adopted to allow communication through sign language between deaf people and the administrations of the community".*

According to the WHO (World Health Organisation), there are more than 400 million deaf people in the world and 95% of them communicate using sign language. This language is recognised in different countries around the world and Spain is among them.

There are different levels of Spanish Sign Language, from the simplest, basic user level (A1) to a more advanced level (B2), which is currently available in the Canary Islands. According to several deaf users interviewed, a basic level would

be sufficient, as they would already have knowledge of how to facilitate communication.

An alternative would be for the shipping companies to have some kind of agreement with some of the different entities focused on the deaf community in the Canary Islands. These entities would facilitate the training in sign language to the crew members from the most basic to the most advanced level on a voluntary basis and also giving the option to do it online, so it would not overlap with their schedules or their different routines, without ties, dedicating themselves to it in their free time.

The most correct would be that this training would be given by a person specialized in sign language, having a direct contact and dealing with a deaf teacher, this way, he himself would facilitate to obtain information about the deaf community and to make known the different communication strategies.

We have to keep in mind that communicating with a deaf person by means of signs is not only using the hands. Facial gestures and body movements are crucial to facilitate better understanding because body movements are the "tone" that we as listeners give to the words.

We can summarise these terms as follows:

- Hands: are their phonemes. A movement, an orientation and a place of articulation accompanied by non-manual expressions (body and face).
- Facial expression: they give important information, it is the "context" of each word. According to the facial expression we will give the meaning. Movement of eyebrows, gaze, cheek, mouth, tongue...
- Body movements: expression of roles (inclination, position of shoulders, body...) or the type of sentence (interrogative, exclamatory, hesitant, etc.).
- Grammar: phonology, syntax, semantics, pragmatics, everything changes. Classifiers and thematisation in sign language are particularly interesting.

As mentioned above, people with a hearing impairment are independent users with an "invisible" disability, so we should develop this module further and learn more about these users.

Learning the alphabet should be a key point during the training. It is not that it is an effective communication, but it would facilitate short communication.

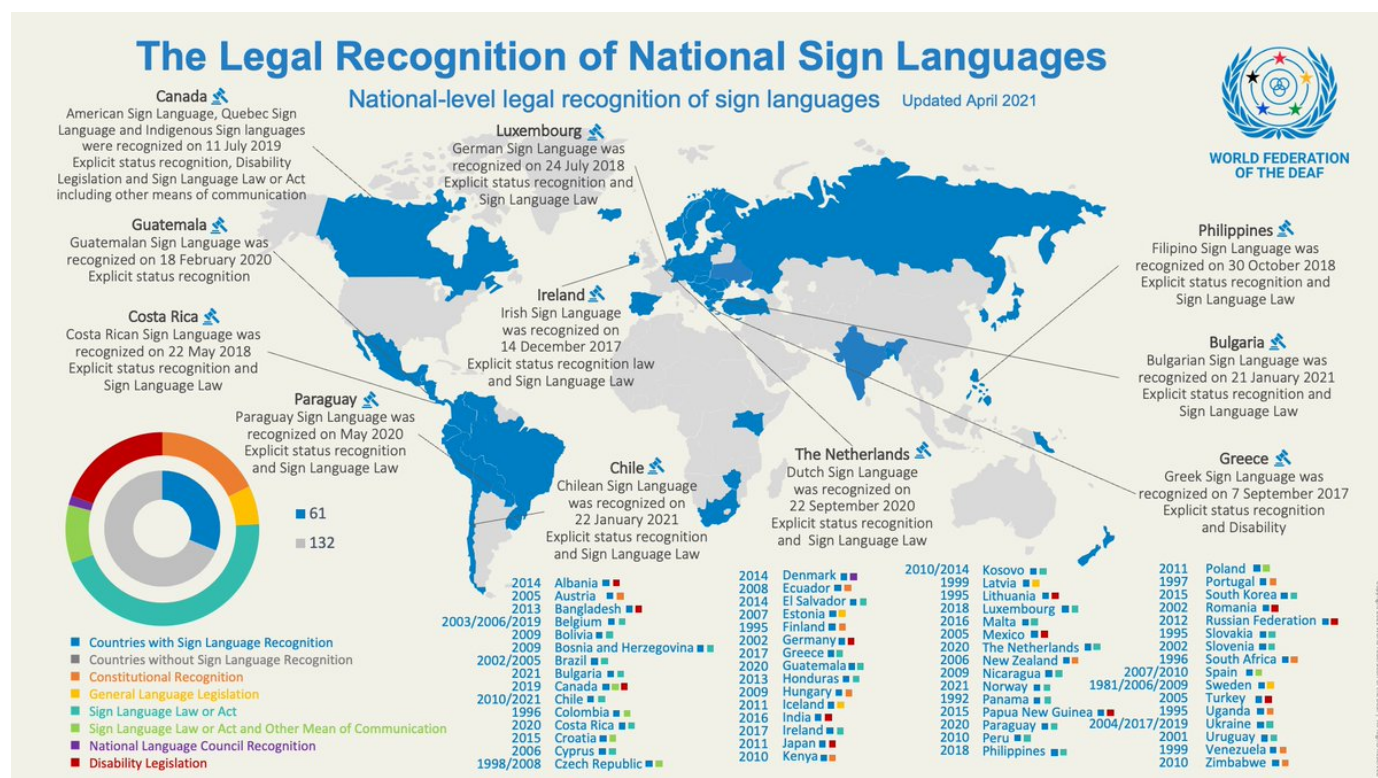
This is a learning system that is currently available to everyone.

If there is a qualified crew with sign language skills on board, they should be correctly identified, for example with a small identification badge indicating their knowledge, so that deaf users would know who to contact immediately in the event of a query, search for information, emergency, etc.

The identification badge would carry a logo that would show the accessibility in sign language. The image would be as follows:



Figure 3: The Legal Recognition of National Sign Languages.



Source: World Federation of the Deaf.

Figure 4: Sign Language identification logo.



Source: asogra.es.

### 3.4. Other resources to facilitate communication and reception of information.

Another resource that we should take into account in order to be able to communicate with a deaf person would be the design of small pictograms/infographs.

We must bear in mind that this alternative would not only facilitate accessibility not only for deaf people but also for any passenger who finds it difficult to communicate with the crew.

The design of pictograms/infographics for the attention of these users inside a ship would provide a lot of confidence and comfort, not only to the passenger but also to the crew.

The pictograms/infographics would be designed in a clear and specific way, items, accessories, areas... that can be found inside the vessel.

### 3.5. Measures to improve information, signage and communication with both hearing impaired and deaf users.

We will expose different alternatives as improvements for different users with hearing disabilities, we must point out that adequate information and signage in any space is a benefit, not only to these users, but to any passenger, as it would facilitate their orientation on any space, product or service.

It should be pointed out that article 8 of Law 7/2010, of 31 March, General Law on Audiovisual Communication, states that all users, both hearing impaired and visually impaired, have the right to access all information, thus being a universal communication and having equal conditions with the rest of the people.

The ships have a number of televisions exposed in the different areas and decks of the ship, through which different information sessions are broadcasted, such as the evacuation system, in case of emergency, the use of waistcoats, the different leisure areas inside the ship... but we often find that there are only subtitles in English, but not in Spanish, this affects the deaf users because they can not access all the information.

An option, very demanded by these users is to be able to obtain this visual information, subtitled in Spanish and accompanied by an interpreter in sign language, being this way more accessible for all deaf users, because we have to take into account that not all of them have the same level of reading and understanding capacity.

This information should have a simple reading format, being as clear and direct as possible, also taking into account its

size, its placement, its height, the type of lettering, thus being accessible to all passengers.

One idea, and perhaps a simpler one, would be to install QR codes at different points on the ship, where these users could access all the information available via their mobile phones during boarding.

This information could be displayed in sign language, showing information about the ship in general, areas and decks of the ship, availability of waistcoats and their correct fitting, in case of emergency the different protocols to follow, meeting points... and, above all, indicating, if available, that there are qualified personnel identified, so that they have a point of reference of where to go in case of inconvenience or doubts.

These codes would be located in strategic areas. Areas such as the different access doors, the access doors from the garage to the main deck, the access doors to the Premium area or the part where the lift is located, which accesses the main deck.

These QR codes would be well identified, they would be accompanied by the most frequent symbol used to indicate the availability of accessible videos in sign language. This symbol includes the representative icon of sign language and was recognised with the Spanish standard: UNE 139804.

Referring to the installation of magnetic loops, magnetic or induction loops is a sound system that transforms the audio signal that we can all hear into waves that are transmitted to hearing impaired people, we are talking about a magnetic field, which is picked up by specific hearing aids, these hearing aids must have the option called "T" position.

Users with cochlear implants can also use this system. A cochlear implant is a small device surgically implanted in the head, under the skin, which stimulates the nerve endings and provides sound to both severely hearing impaired and deaf people.

It should be noted that users of hearing aids or implants may find it difficult to hear in spaces with ambient noise or where the acoustic signal is poor, it is not always an effective system and can cause unpleasant sensations for users. Just because a deaf person has a hearing aid does not mean that he or she hears fully, only that in many cases it improves sound reception.

The availability of hearing loops on the ship is also indicated by a corresponding symbol. Many ships are already equipped with this system, modern ships that are more sensitive to this disability.

Figure 5: Illustration of symbols to access accessible information..

QR Code	
Symbol. Accessible video in sign language	
Magnetic loop	

Source: Modified from asogra.es.

Another alternative that has been studied is the installation of digital LED panels accompanied by a small indicator light.

This type of panel could transmit messages such as small delays, problems encountered during navigation... in general, messages that are transmitted in audio, through the public address system, and which are simultaneously connected to the flashing indicator lights, signalling in "warning" mode that a message is being sent or transmitted.

These devices would be placed at various strategic points within the ship, for example, near the televisions. They are LED panels, so their power consumption is low.

#### 4. Results and feedback from deaf passengers on board.

We have carried out a brief initial survey with the aim of finding out the characteristics of the hearing impaired passengers that we have found on the ship that has served as an example, the Fast ferry "Almudaina Dos" from Naviera Armas.

More than 80% of hearing impaired passengers are over 30 years of age and 36% are over 40 years of age, so we must rule out that most of the passengers are older people, according to the data collected, more than 60% are under 40 years of age.

Almost 65% of users state that they travel on board frequently throughout the year, which implies a significant number of potential users who must be addressed in the best possible way and in accordance with the regulations in force.

However, more than 75% of these passengers do not travel independently, but are accompanied by family members or support staff. The rest say that they travel alone. Perhaps if the

accessibility conditions on board of ships were improved, the number of deaf people travelling on board would be higher.

It is relevant that in case of doubt more than 60% of passengers with deafness turn to the crew, although there are almost 30% of passengers who do not do so. When these passengers were asked, they did not hesitate to state that there is a lack of means to provide greater accessibility to deaf people on board and that they miss out on a large amount of information, given that a large part of the information, especially that related to issues occurring in real time (bad weather, delays, cancellations, etc.) is given over the loudspeaker, which prevents these users from having the maximum amount of information available to them during the crossing. In general, we can say that the shipping companies are not prepared with the means for this type of users to be able to make an optimal crossing while overcoming the barriers imposed by their disability.

## Conclusions.

After the study on accessibility within ships for people with hearing disabilities, we can find the number of inconveniences that these users can find when making a journey.

Our experience carrying out the training of attention to people with disabilities in maritime transport and carrying out this project, We have come to the conclusion that the content should be developed in a general way. Focusing on section 5, we would propose a series of improvements.

- Meet with the deaf community to learn about the types of limitations they may have while traveling in ships.
- Basic references to be able to carry out communication without the need to use sign language (vocalize, use short, clear, and precise words, keep the visual as the emitter)
- Basic signs that can be used during the journey and didactic alphabet.

Regarding maritime transport, we would divide it into two blocks, the first of them referring to the accessibility and accommodation of the ship, and the second in the human and professional part.

In the first of them, during the development of this paper, we have exposed some solutions to improve the user experience, such as the incorporation of pictograms or infographics that would improve not only the attention of the passenger but also that of the crew member, helping communication among them. We have to take into account and we want to emphasize that deaf people do not have the same level of written comprehension, which makes it difficult to understand, so it is important that subtitles are not only used to transmit information but also that they are accompanied by a sign language interpreter. With the technological development that we currently have, it would be a quick, effective and simple solution to apply.

In the human part, I believe that a series of protocols should be carried out on how to act toward deaf users. Previously, I presented a series of improvements in the care course for people

with disabilities in maritime transport that I would also extrapolate to this section. It would give greater visibility to people who know sign language and are crew members, by means of identification badges where users can easily recognize the qualified personnel to attend to them.

Perhaps this would be the simplest and key solution of this entire project, qualified personnel to improve the quality of these users.

Having sailed with deaf people and having coincided with them during voyages has made we reassess the many difficulties that these users have inside the ships, that is why we wanted to do my bit to raise awareness about this issue and show the great inconveniences that these users have; users with an “invisible” disability.

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