Innovative changes in air transport research for universally designed services
European Commission, FP7 Project 314563
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1. Final publishable summary report

1.1. Executive Summary

Freedom of movement is a right preserved under EU treaties and it is also aligned with the UN Convention on the Rights of Persons with Disabilities. However, regarding accessibility to air transport for disabled people and the older, these basic rights are currently not fully realized, thus creating social exclusion.

To achieve this objective, the ICARUS consortium has gathered organizations with the knowledge, expertise and network of contacts required to produce planned project outcomes, results and impacts.

ICARUS' **work plan strategy** has been based on proven ex-ante evaluation methodologies. Firstly, ICARUS' researchers have identified the nature and scale of the problem, the involved process and activities, and the technologies and existing solutions. Afterwards, they've analyzed needs and preferences through the users', stakeholders' and experts' perspective, including real-life observations. Then, the gap between the current situation and the needs has been assessed and a preliminary list of solution areas has been identified. After that, researchers have defined the R&D fields and innovative solutions and best practices. Finally, a socio-economic analysis has been conducted, providing recommendations following the principles of economy, cost-effectiveness, and European Added Value.

The main objective of ICARUS has been to identify, characterize, justify and prioritize research and analysis approaches towards improving access to air transportation for people with disabilities and older people.

ICARUS aims to contribute to initiate change in aircraft cabins and in activities and services to allow easier access to aircraft for all citizens, by providing insights on R&D areas that may alleviate the air transport access issue.

According to the general objective of the Project mentions above, the specific objectives of ICARUS has been:

O1. Establish the current situation in terms of stakeholders, problem, needs, accessibility chain and solution areas.

O2. Establish the base line in terms of how the current implementation of the existing solutions meets the different needs of the various target population subgroups.

O3. Identify solution areas with the greatest achievable contribution to the EC´s stated objective of ensuring access for people with disabilities to transportation, among other facilities and services.

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O4. Characterize these solution areas in terms of effectiveness, cost, risks, bottlenecks and technical and social obstacles.

O5. Propose and justify appropriate research and analysis approaches for the most promising solution areas considering all of the above as well as the Added Value of Community involvement.

O6. Contribute to initiating actual change, specifically through awareness and knowledge dissemination among the main players in the accessibility chain that fosters adoption of effective solutions.

The partners that have made up the **Consortium** of the Project have been:

1. FUNDACION ONCE PARA LA COOPERACION E INCLUSION SOCIAL DE PERSONAS CON DISCAPACIDAD - FONCE. Spain (Leader)
2. UNIVERSIDAD CARLOS III DE MADRID - UC3M. Spain
3. AEROCONSEIL SAS - AERO. France
4. ALITALIA Compagnia Aerea Italiana S.p.A. - ALIT. Italy
5. FUNDOSA TECHNOSITE S.A. - TECH. Spain
6. FUNDOSA ACCESIBILIDAD S.A. - FASA. Spain

Final Results and Expected impact

As a Support Action, ICARUS aimed at providing insights and recommendations on the most promising R&D areas that may positively contribute to alleviating the problem of air transportation accessibility.

ICARUS outcomes expects to initiate a set of impacts, starting at highlighting the paths for R&D, which in turn would lead to the development of innovative solutions and ultimately to mainstreaming accessibility, being all end-users benefited by a more inclusive air travel environment in the medium-long term.

1.2. Summary description of the project context and objectives

ICARUS Project is squarely targeted to support the European Disability Strategy 2010-2020 and its implementation plan. ICARUS tackles the stumbling blocks that are currently hindering freedom of movement. It also aims to identify, characterize and prioritize solution areas with a great potential towards improving access to air transportation for disable and older people. This will provide a solid base to the EC and direct stakeholders to undertake change in aircraft cabins. Moreover, it will enhance easier and more comfortable access for disabled throughout the chain of services involved in air transportation. Whenever feasible, it should also strive to initiate actual change, specifically through awareness and knowledge dissemination among the main players in the accessibility chain that foster the adoption of effective solutions.
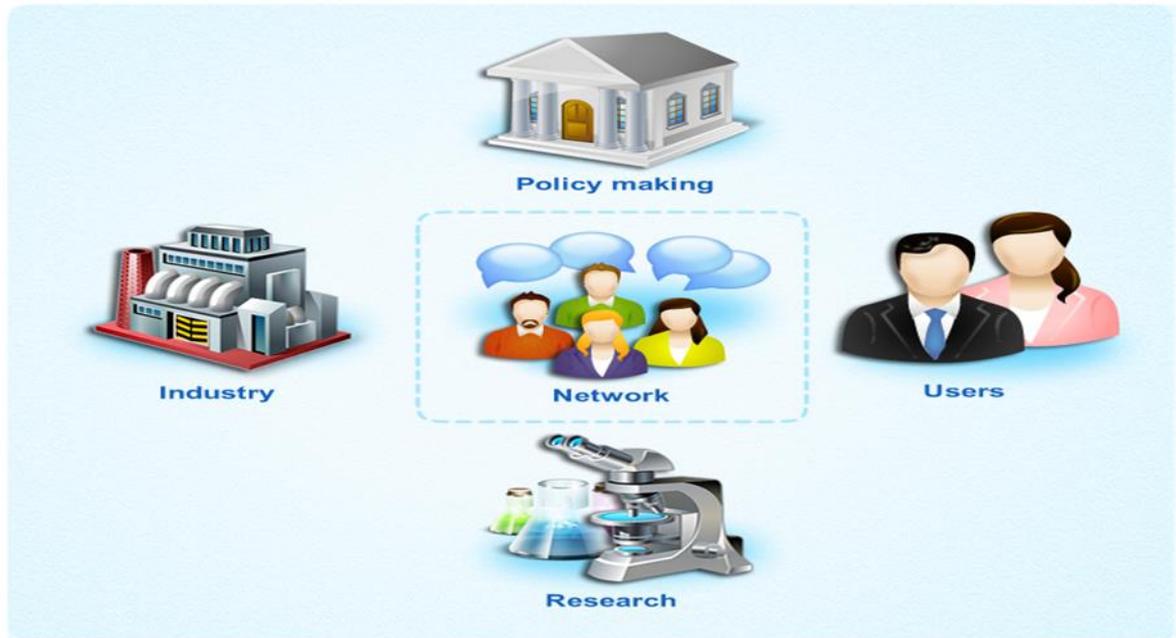
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Figure 1. Accessibility Chain

These are the main objectives defined at the beginning of the project:

- Definition of the current situation in terms of stakeholders, problem, needs, accessibility chain and solution areas

- Identification of the base line in terms of how the current implementation of the existing solutions meets the different needs of the various target population subgroups

- Identification of the solution areas with the greatest achievable contribution to the EC"s stated objective of ensuring access for people with disabilities to transportation, among other facilities and services

- Characterization of these solution areas in terms of effectiveness, cost, risks, bottlenecks and technical and social obstacles

- Propose and justify appropriate research and analysis approaches for the most promising solution areas considering all of the above as well as the Added Value of Community involvement

- Contribute to initiating actual change, specifically through awareness and knowledge dissemination among the main players in the accessibility chain that fosters adoption of effective solutions

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Figure 2. Stakeholders Network

Accessibility of disabled and elderly people in air transport is currently not as satisfactory as it should be. In spite of the improvements already achieved in the common legal framework, the current conditions are not satisfactory yet. Considering the importance of air travelling in terms of leisure and free-movement, air accessibility should be a policy priority since currently, it is far from expected.

Existing EU legislation on air passenger rights, Regulation EC 1107/2006, came in full force in July 2008 and ensures the right to non-discrimination related to disability and reduced mobility. Disabled people and persons with reduced mobility have the same right to travel as people without such mobility limitations.

According to the above Regulation "'disabled person' or 'person with reduced mobility' means:

"Any person whose mobility when using transport is reduced due to any physical disability (sensory or locomotive, permanent or temporary), intellectual disability or impairment, or any other cause of disability, or age, and whose situation needs appropriate attention and the adaptation to his or her particular needs of the service made available to all passengers".

The European Union is committed to modernize and adapt the existing infrastructure to the increasing passenger flows, whilst also improving their rights and safety. In order to do this, the EU is working to implement accessible air transportation. The legislation on the Single Market for air transport defines the granting of operating licenses, the monitoring of airlines and their access to the market. It guarantees a competitive air transport market, quality services and more transparent fares.

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For the last years, a lot of changes have been produced on human mobility in the Common European Space. New regulation, technical advances and ICTC solutions have been developed and applied to the air transport sector (Darvishy, Hutter, Frueh, Horvath and Berner, 2008; Deloitte, 2011; Euro-access, 2008). At the same time, life expectancy of European population has increased. Some groups of population such as elderly and people with disabilities demand normalized access to air transport services (Chang and Chen, 2011; Daniels, Drogin, Wiggins, 2005). European authorities might promote equal opportunity and ensure access to air transportation for people with disability and the elderly (EC, 2003b, 2010a).

Another aspect important enough to be taken into consideration is the market niche that seniors and people with disabilities represent for companies that offer leisure and tourism, where the air transport industry develops a relevant role (Anca, 2010). The increase in life expectancy and the achievements of the welfare state have put the elderly in a unique position as potential consumers. On the one hand they have a substantial amount of time available and, on the other, they have a considerable purchasing power due to the access of pension rights result of years of work (Barbeau and Leclerc, 2010). The similarity between the two population target groups is related to our life cycle that shows how humans in the aging process are affected by limitations in our functional ability with an enormous similarity, sometimes identical, to those that affect people with disabilities (Barret, Heycock, Hick and Judge, 2003; EC, 2003a). As the report "Mobility: Rights, Obligations & Equity in an Ageing Society" concludes: "There are strong economic and social imperatives to ensure that we enable older and disabled people to be as independent as possible for a long as possible. The way that we plan and maintain our urban and rural environments and the way that we design and operate our transport services will have a profound impact on how well we can achieve that goal" (Frye, 2011).

Some questions must be answered to clarify the situation in this sector. What are the main mobility difficulties in air transport? Which groups are the most affected by air transport services barriers? What are the processes and activities, including technological and non-technological elements that end users confront when travelling by air? What is the regulatory framework? What accessibility solutions are being currently applied in airports and in the services provided? What solutions do airlines apply in their aircraft? Who are the recipients of those accessibility solutions? At which stages of the accessibility chain in the Lifecycle of Air Travel are those solutions aimed?

1.3. Description of main results/foregrounds

Regarding on the state of the art of the air transportation, the main conclusion has been that improvements which are typically viewed as only catering to needs of persons with disabilities also help older adults with less severe impairments, and in most instances, facilitate all air travelers on their journey.

From the user perspective there are still wide gaps concerning accessibility when travelling by plane. As it has been explained in the Project, the trip as such begins months before the actual journey. Having identified the different parts of the journey as well as the main disabilities affected, it can be concluded that more standardization is needed.

Regardless of the degree of implementation of the currently applied accessibility solutions in the air transport system or the extent to which they meet the needs of people with disabilities or reduced mobility (including older people), these currently known solutions that may be applied

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to each and every one of the processes that define the air travel Accessibility Chain stages and substages. Even where accessible solutions are put in place, different standards increase the sense of uncertainty among disabled users.

A report on the results of the observation of the users in the real-life environments has been issued, showing that there are a high number of barriers of problems detected by the users-observers with regards to PRM assistance services. This has shown that the assistance services do not work properly and that it is one of the aspects to be improved and adjusted to the needs and preferences of passengers with disabilities or reduced mobility (including older people). These barriers are distributed among all the travel stages and sub-stages in which there is an interaction between the passenger and the assistance service staff; but reception of passengers on arrival at the terminal of origin, and, above all, boarding and disembarkment procedures are critical procedures with respect to these barriers in provision of services.

A baseline of the current level of fulfillment of the various needs of the target has analyzed the degree in which current implementation of air transport accessibility solutions meets the needs of the target population (PwD and older).
This Baseline showed that there is still considerable scope for improvement both in terms of the actual level of accessibility and of reducing the current level of variability and therefore uncertainty. Two key trends reinforced the importance of further improving accessibility and of reducing its variability. On the one hand, population aging in Europe, along with the high correlation between age and disability, implies that the share of the PwD and the older among the European citizens is bound to increase significantly. On the other hand, this analysis has revealed that the existence of fear thereof of accessibility barriers has a substantial impact in the likelihood of the target population to engage in air travel; a reduction of progressive elimination of these barriers will presumably increase their use of this transportation medium.
Furthermore, today's older come from generations in which air travel was not as generalized as it is now; tomorrow's older are more likely to engage in air travel. The foreseeable combined effect of these trends will be a substantial increase of the share of the PwD and the older among the European air travellers.

Also, a preliminary list of priority solutions areas with the greatest potential to fill the observed gap has been derived, integrating the causal analysis/process and mapping with the baseline and seriousness assessment analysis. In addition to these solution areas, which are essentially sections of the causal network/process maps, several "Convergence solution areas" have been identified, in which various "causal links" intersect, thus constituting a relevant testing bed for the evaluation of new solutions.
Additionally, an illustrative example of a "Tentative solution approach" was presented, to provide a foretaste of type of integrative solution approaches.

In the subsequent stages of the Project, a Research & Development Roadmap was released, containing the final list of R&D, innovative and best practices solutions. This final list aims to bridge the observed gap because of the current barriers and problems faced by travelers with special needs when using air transport. The solutions included were categorized according to the time lapse that the specific research project could take from the research kick-off until the ultimate market implementation. Also they were characterized into 3 groups: R&D, Innovative and best practices solutions.

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Finally an integrated analysis report of all the solutions was made; taking in account the socio-economical analysis of the foreseeable of the solution areas, in such aspects as costs; potential increased revenue (through expanded customer segments or increased satisfaction); potential decreased revenue if applicable (e.g. in approaches that might reduce capacity); social impact (through increased access to transportation by target population) and regulatory compliance. This analysis was the starting point for the list of the Project Recommendations that were released as the last activity of the Project.

1.3.1.   Main findings

After the first year of research reviewing regulation, literature, past works as well as observing users travelling and asking them about the accessibility problems, the project concluded that:

Legislation is poor or at least is not well accomplished, according to experts. More audits and monitoring are needed, especially if accessibility was a condition in the public procurement tenders. The main claim related to this issue is concerned with the poor enforcement of the useful legislation available. Some experts pointed out the importance of fines whereas others fostered the idea to link powerful performance with financial rewards. One of the examples brought was the assessment of the PRM services in since the service performance is aligned with the monetary reward to the company delivering the service.

Standardization is for most experts a solution since legislation only gives a big picture. Through standardization, legislation has to be translated into performance and on the other hand fragmented legislation can aim for harmonized standards.
For instance, the coordination of different services in different airports around Europe is sometimes very poor; a standard is such a service will give certainty to users and professionals. This desired standardization will foster proper coordination among different stakeholders through the whole chain is necessary. Standardization gives certainty, an essential feeling for a disabled user.

Moreover, there is a severe **lack of training** and awareness by industry and professionals regarding legislation. Accessibility is jeopardized from the beginning. When an infrastructural project is designed badly in terms of accessibility, the whole chain suffers. From professionals who design airports and venues, to professionals handling the PRM services there should be information and training campaigns for professionals.

User involvement when designing accessible goods and services is far from being accomplished. Most of the times, users are not involved in the process of designing a service targeted for them. More feedback from disabled users will end up in much better services. Remarks made by users represent a free quality check many times undermined.
At the end of this year, and as a product of these observations and interviews, a set of barriers were described in order to end up with a baseline scenario. Developing further these set of barriers, on the second year, the project ended up with the assessment of a set of solutions, separated by R&D, Innovation and existing Best practices, that were released in the deliverables D.4 of the Project.

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Finally, after an extensive assessment of the areas identified in the previous deliverables: R&D, Innovation and Best Practices, a thorough study of prioritization, impact measurement and overall synthesis was made, in order to end up with a set of **recommendation areas** and their description. The summary of these areas is gathered in the table below:

Table 2. Recommendation areas

Recommendation Areas
Recommendation area 1: Facilitating accessibility in access to aircraft and its cabin, in particular for mobility equipment users
Recommendation area 2: Transversal measures. Promoting user involvement in the design of processes, environments, products, and service
Recommendation area 3: Increased autonomous use by people of mechanisms and machines providing services or for airport control and security
Recommendation area 4: Facilitating the right to information for all people regardless of their various capabilities
Recommendation area 5: Involving stakeholders in the application of the solutions that solve the needs of older travelers and travelers with disabilities
Recommendation area 6: Promote the adoption of Corporate Social Responsibility (CSR) strategies

1.3.2.   Outcomes

Solid State of the Art: In D1.1, the consortium has produced an extensive review of the existing published material on accessibility in the air transportation. This review of secondary sources aimed to set an initial baseline in order to locate the main research trends, identified challenges and investigative gaps. The analysis is done by breaking down every step of the accessibility chain. The report is publicly available in the project´s site.

Mystery Shopper method & Observations: One of the main efforts in the field work was to produce a reliable methodology for observing and assessing the level of accessibility of a whole travel journey. This was achieved by establishing the mystery shopper technique in the observations in real environments with disabled users. This technique was taken from existing practices on retail, nonetheless its standardization will enable it to be applied in other existing fields (tourism, work environment, etc). The description and application of this technique can be found in the deliverable D2.2. User´s insights

Solution Assessment: In Work Package 4 an important effort was made in order to assess different and various aspects of solutions. Applied studies of technological & innovation

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prospective are rarely openly published due to its high financial value. Existing studies of technological solutions and innovations often focus on one or two variables, such as estimated price, potential market impact, etc, nonetheless in the three reports produced in WP4, over 20 variables were assessed in a set of 66 solutions. These three reports are also available on the website; moreover partners who are part of the Stakeholder Network have communicated the interest risen by these three reports and what can represent to the sector.

Stakeholder Network: The ecosystem created around the project has been successful on its bidirectional approach. On the one hand, the network was important to gather actors, organizations and individuals from a whole range of disciplines and interests in order to be the recipient of dissemination actions, and on the other, these actors together were crucial in order to obtain and convey input and feedback for eventual scientific results.

Project Website: The project website has remained as the main channel to communicate our findings and upload useful information. The website has been updated on weekly basis and all that content has been created and promoted throughout our Facebook, Linkedin and Twitter accounts. The number of visits has remained rather positive, even though its variation depending on the project news was noticed.

Final Recommendations report: The final report on recommendation areas represent a solid guide for policy makers and planners in order to get a grasp of priorities in the accessibility of the air transportation. The report is "D5.2 Project Recommendations and it will be available on the web once the European Commission validates it".

1.4. Potential impact and main dissemination activities and exploitation results

According to the Sales funnel paradigm, there are four incremental stages when disseminating a project; those are Awareness, Informing, Engagement and Promotion. Hereby the impact of dissemination activities will be described according to each of those components.

In the consecutive dissemination reports, the target audiences and channels were defined in order to clarify a work plan and to account and track each dissemination action.
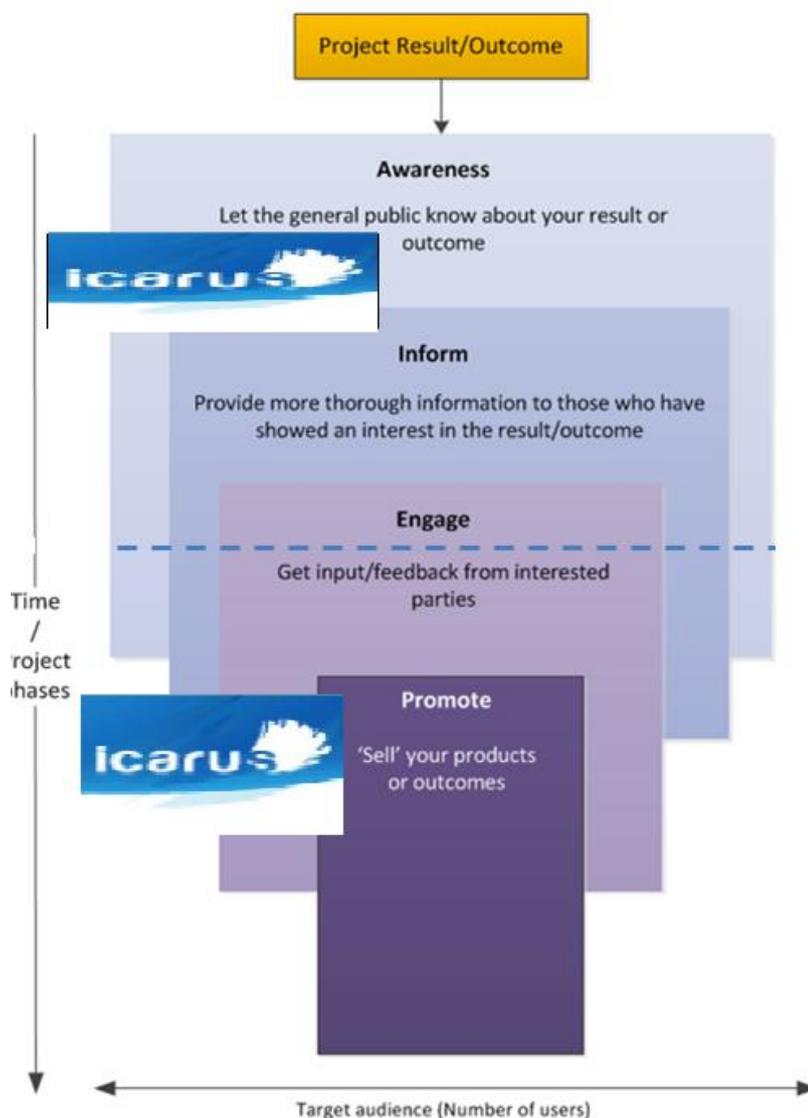
Awareness: One of the main marketing and communication mantras is to locate, identify and define the problem in order to propose solutions in the subsequent actions. Here the problem and its message was clear, "Air transport accessibility is far from being acceptable and new approaches to solve it are needed". This has served to attract different kind of stakeholders and experts. The website has been central in order to position the project in defense of accessibility by publicly denouncing lack of accessibility and giving a voice to different accessibility efforts.

Inform: Once the awareness is raised, the next step that can also be impact is to tell your audience how the project intends to address the problem or at least part of it. For this the different dissemination materials such as the leaflet, project presentations, briefings and meetings have played an important role.

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Engage: Throughout the course of this second year there was a real interest in the engagement of stakeholders due to the need to convey feedback from them. This engagement could only be possible by raising a proper awareness and convincing that our proposal was valid. This proactive involvement in the project proceedings of external stakeholders has been one of the main added values for the project since it establishes a structure that did not exist previously.

Promote: The engagement also enhanced the spread of ICARUS´ mission and message by these stakeholders. Stakeholders published our results, interacted with us through social networks and invited us to workshops and conferences.

Figure 3. Sales funnel approach diagram

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In order to hold some accountability and to be instrumental in the dissemination strategy, a set of channels were defined, those are:

1.4.1. Channel 1- Project Website

The project website has been the central focal point where most of the communication material was released. The dissemination team has managed to publish an average of a weekly post or news in order to keep the dynamism of the site. Partners and stakeholders submitted their own news or relevant facts in order to be published in the public area. The social media (Channel 5) is embedded with this one. As it ~~have~~has been reported in each dissemination report, the average number of monthly visits has been of 7.500.

Figure 4. Screenshot of the news section in the project´s website

1.4.2. Channel 2- Dissemination Material

The three main items belonging to this channel are the project flyer, project roll up and project presentation. These have been very important in raising awareness and informing briefly about the project. The initial engagement and image projection was done by these items. The project flyer has been distributed in every conference, workshop and meeting held whereas the project roll up was used in the different conferences and workshops where any partner had a booth.

Figure 5. ICARUS Project leaflet

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1.4.3. Channel 3- Partner's official channels and websites

Partners had very important official own channels, such as the on-board Alitalia magazine, UC3M University Magazine or ONCE´s Magazine. These ones have been used in order to raise the awareness of the project among a general public. Moreover, corporate websites and journals of all partners have included references to the project especially each partners 'social network.

1.4.4. Channel 4- Specialised Blogs, forums and websites

This channel of specialised blogs & websites was merged with the one dealing with media attention since nowadays it is difficult to separate both. The profiles of these media channels has differed from generalist media such as l newspapers digital editions to aviation or disability blogs. The connection with different accessibility projects has enabled to publish ICARUS news on their channels, that is the case of ATIS4all and APSIS4all projects.

Figure 6. Screenshot of the discapnet portal mentioning ICARUS project

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1.4.5. Channel 5-Social Networks

Social Networks have been essential in reaching our different set of target audiences. This channel has enabled us to combine with others such as the website and conferences. The three main tools used by the project are tweeter, LinkedIn and Facebook. Towards the end of the project, the dissemination taskforce realised that in terms of return of time invested, tweeter was more effective. On the other hand, LinkedIn has been used mostly to contact experts and give high-value content to stakeholders (reports uploaded in the web, useful scientific or industry information), it is important to highlight that LinkedIn has served as the main communication channel (along with email) for the stakeholder network. Facebook, ultimately has an impact, mainly with end-users and user organisations but for a project is more difficult to look for your audience and mingle with a diverse range of audiences.

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Figure 7. Screenshot of the ICARUS Facebook page

1.4.6. Channel 6-Meetings, conferences and workshops

The Consortium has managed to have face to face meetings with important stakeholders in order to make them part of the stakeholder network and attract their interests; moreover attendance to difference conferences and workshops has been very high since the project´s topic enabled to fit it into a very wide range of audiences such as transport, accessibility, disability, etc. Finally, two annual workshops were held at the end of each 12 month period in order to present results. Additionally a presentation workshop for potential stakeholders was held in Málaga (Spain).

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Figure 8. Picture of the workshop held in Málaga at the Railway Cluster (CTF)

1.4.7.   Channel 7-Journals

As it was compromised at the beginning, the consortium has managed to end up with two important publications in impact journals and presented at a relevant conference. Both papers were presented in Málaga (Spain) the 24th of July, under the framework of the XX International Conference on Industrial Engineering and Operations Management. Regarding Open Access, after these papers have been presented at the Conference, they are now undergoing a second peer-review process (incorporating feedback from the presentation itself) to determine where will they be published.

If they are published in the Conference Proceedings, there will be full open access to the full papers through the conference organizer's web, as in previous conferences.

However, if either of them is selected for publication in "Lecture Notes in Management and Industrial Engineering", as per Springer's policy only the title / abstract will be fully accessible; access to the full paper would require a fee."

Figure 9. Conference Flyer

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1.5. Address of project public website and relevant contact details

- Website: www.icarusproject.eu

- Twitter: https://twitter.com/ICARUS_EU

- Facebook: https://www.facebook.com/pages/ICARUS-Project/420833927981516

- Linkedin: http://www.linkedin.com/pub/icarus-project/58/40a/1a6

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