D3.3.3

RESULTS AND FEEDBACK ANALYSIS – FINAL – 2ND VERSION

October 2015

ABSTRACT

This document provides an overview and a comparison of the results of all experimentations with Smart City Scenarios of FI-CONTENT 2 in Brittany, Berlin, Cologne and Barcelona. It reports on the respective implementation of the experiments and summarizes, in a condensed form, the processes from planning and execution of the experiments to evaluation of the collected user data in the 2nd experimentation cycle. This is the update of deliverable D3.3.2 including the experimentations in Valencia and Tenerife (linked to Cologne).

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DISCLAIMER

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EXECUTIVE SUMMARY

The aim of this document is to provide an overview and a comparison of the results of the second cycle of Experimentations of Smart City Service platforms, which was focused on planning and running large-scale experiments. The document also contains: (i) a final report on first cycle experiments that were continued after M12 and became finalized until M24, and (ii) an updated version for M31 including also the two experiments in Valencia and Tenerife, incorporating the results of the new open call partners. This second part is the new part, compared to the previous related deliverable (D3.3.2).
The report covers all phases of experimentation, from planning and execution to the evaluation of the collected data, in a condensed form.
Researchers worked with a different set of methods to involve the users and to capture the feedback. The document will put all approaches and results next to each other to allow a comparison of the outcomes and to facilitate the knowledge exchange between all sites. In conclusion, generalized findings and recommendations are presented.
The results especially address new Phase 3 projects, intending to make use of the featured technologies to benefit from the experiences, outcomes and findings.

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ABBREVIATIONS

API	Application Programming Interface
AR	Augmented Reality
BLE	Bluetooth Low Energy
CG	Computer Graphics
CENR	Content Enrichment SE
FAQ	Frequently Answered Questions
FI	Future Internet
FI-PPP	Future Internet – Public Private Partnership
GE	Generic Enabler
GPU	Graphics Processing Unit
HTML5	HyperText Markup Language, version 5
MTSA	Metropolitano de Tenerife, S.A.
OCDB	Open City Database SE
POI	Point of Interest
SCC	Smart City Services
SCG	Smart City Guide
SE	Specific Enabler
SUS	System Usability Scale
UX	User Experience
XML3D	Three Dimensional Extensible Markup Language

1 - FINAL REPORT ON FIRST CYCLE EXPERIMENTS

1.1 - Overview on continued first cycle experiments

Date	Site	Scenario	Leading Partner(s)
September 2013	Berlin	On site visit	Fokus
March 2014	Berlin	On site visit	Fokus
March 2014	Barcelona	On site visit	Fokus, I2CAT
April 2014	Barcelona	On site visit	Fokus, I2CAT
February 2015	Barcelona	On site visit	Fokus, I2CAT
February 2015	Lancaster	On site visit	Fokus, Lancaster

Table 1: Overview on continued first cycle experiments

1.2 - Scenario: On Site Visit (Barcelona, Berlin)

1.2.1 - Introduction to the tested application and the experiment

The Berlin experimentation site was officially opened during IFA, the world's largest trade fair for consumer electronics, which took place in Berlin from 6th until 11th September 2013. Fraunhofer FOKUS demonstrated a very early version of the Smart City Guide (SCG) Web App based on our HTML5 compliant web application. 19 users of different age, gender and background recruited from consumer and trade visitors at IFA 2013 to test the SCG web app. The app offered several functions ranging from access to the Open City Database (OCDB) to receive information on sights, a map to find and localize Point of Interests (POIs) as well as the creation of user generated content. The visitors tested the content creation feature of the SCG app by creating new points of interest, uploading photos and complement existing database entries.

Since the first experiment, further enablers have been integrated into the SCG web app, which are the Content Enrichment (CENR) SE and the Object Storage GE. This second version of the app was tested in the FOKUS iTV lab with five users in March 2014 as a preparation for the Barcelona test at the end of the month. The objective of this experiment was performance and usability testing. We integrate user interactions to like and rate POIs with the app. The CENR SE was integrated and users could mark interesting elements in a photo and give further information to this element.

The experimentation was then brought over to the Barcelona site, for a further round of field tests with users. Two connected experiments were planned, in March and May 2014, to probe deeper into aspects of the user experience with the proposed application. A final user trial, in the shape of a geocaching competition with the SCG, was conducted in February 2015.

1.2.2 - Update on test objectives

For the first experiment we wanted to know if people with completely different backgrounds would use such a smart city app and on what device they prefer. This was also the first live test out of the Fokus environment of the OCDB for this time interval. We wanted to find out if the OCDB is stable enough to handle many changes and users at the same time.

With the second experiment we developed the SCG with a new JavaScript framework called Meteor. We had this small test to find if the new navigation design is clear to the user and if there are any bugs that should be solved for the bigger experiment one month later.

The objectives of the experimentation in March and May in Barcelona were the validation of user experience (how high users rate several facets of the app), usability (to detect user pain points and figure out ways to solve these), to obtain feedback on functionalities (favorite, least used, suggestions for additional ones), and to generate data on what was missing in the app from the user's point of view (features, information currently not covered or not well covered in the app).

For the final experiment in February 2015, the user trials had two goals: First, to validate a successful field deployment of the demonstrated enablers in a comprehensive and integrated web app. And second, to showcase, via an innovative user-driven experiment format for the SCG, such as the geocaching competition, the flexibility, adequateness, and readiness of the demonstrated enablers to support innovative use cases in the field of geo-located services.

1.2.3 - Update on applied methods and tools for evaluation

At the IFA in September 2013 the users decided by their own if they want to test new FI-CONTENT 2 technologies like the SCG. After testing the app they could fill out a two pages questionnaire.

For the second experimentation the five students with informatics background tested the app on different smartphones and tablets. The bugs were reported immediately in a bug tracking system. Design issues were discussed face to face with the designer and developer.

The methodology used for the first two Barcelona experiments can be described as a task-based outdoors user test. A panel of users were given a set of tasks that they had to attempt to complete, and sent around the city to predetermined POIs. Data from these POIs was collected and analysed by the FOKUS team.

Additionally, after the test, the users returned to the venue and were administered an online questionnaire with overall user experience metrics: System Usability Scale (SUS), recommender score and other aspects of User eXperience (UX). The experiment ended with a debriefing focus group session with the test users, in which the participants were prompted to explain their experience with the test application. A researcher probed further into the recurring issues and topics, and asked users to think about solutions and recommendations.

The evaluation framework of the geocaching experiment was based on a post-event focus group, and an online questionnaire with SUS and UX items. This allowed for a situation in which the qualitative feedback could be used to contextualize and understand the user behavior that was observed through the quantitative analytics.

1.2.4 - Update on infrastructure requirements

For the first test in Berlin in September 2013 the SCG was hosted on *Mashweb*, a Fraunhofer Fokus Server with Port 3008. The Web App was optimized for the Samsung Galaxy 3 (Android).

As an outcome from the first experiment we decided to deploy the SCG on an own server for the next experimentations. The SCG and the OCDB run on the same machine and could be find on scg.fokus.fraunhofer.de and ocdb.fokus.fraunhofer.de

For all three Barcelona tests, each participant was required to provide his/her phone and data connection for the experiment, thus ensuring that a broad range of devices was available for testing. Since the version of the web application that was used for the tests had been optimized for Samsung Galaxy S III, lower-end devices were not recommended; nevertheless, no volunteer was turned away on the grounds of not having a good enough device. The relevant enablers (OCDB) and the experimentation web app (SCG) were deployed on an own server in Fraunhofer FOKUS' premises, to test the performance of the app and its enablers when accessed from a distant location.

1.2.5 - Update on user recruitment and user involvement

The experiment in September 2013 was conducted during the IFA trade fair. Visitors to the FOKUS stand were recruited to test the app, fill in questionnaires and be interviewed. Students from the Beuth University conducted the interviews. FOKUS staff were on-hand at all times to oversee the process and answer any questions or deal with any technical problems that arose in the course of the experiment.

For the second experimentation was decided to act with students of Fraunhofer Fokus. They received different smartphones and tablets to test the app mostly of its functionality.

The participants of the March and May 2014 Barcelona test groups were recruited independently, to avoid learning effects that could potentially affect the validity of usability results. A total of 12 users took part in the experiments, seven in the first and five in the second. The profile of participants was mixed, in terms of professional profiles (including some developers and some frequent travelers, but also professionals from the humanities), socio-demographic composition (with men/women and younger/older participants), and residence (some users were residents of the city and some of them lived outside). Knowledge of the English language was not essential, as setting such a requirement would have skewed the sample heavily towards the college-educated.

For the February 2015 experiment, a mixed group of 20 volunteers with technical and non-technical backgrounds was sought. About 50% of participants were technology-related professionals (either still in college or already practising). The remainder of the test group had a background in the humanities, the arts, or business services (i.e. human resources).

In sociodemographic terms, the average age was 30.75 years old, within a variable range of 20-45. Despite our best efforts to obtain a gender-balanced mix, the number of men in the test group was larger, in a proportion of 30% women and 70% men.

1.2.6 - Report on running the additional experiments

The first test in September 2013 went technically very well. We properly expected some more testers at the IFA, but we were happy about the qualitative results. The visitors of the IFA spend much time to play with the app and fill out the questionnaires. All participants used the same smartphone devices.

To prepare the third experimentation we tested the SCG on different devices. There were some design issues by displaying the app on the older smartphones and tablets. The participants were in a very close contact to the developer. All bugs were documented at a bug-tracking tool. The participants tested the bug again after the developer marked this specific task as resolved.

The third and fourth experimentation at Barcelona was a little bit difficult. We got the test round in Berlin before with some older devices, but in Barcelona the participants bring their own devices with them. Some of them got such a bad Internet connection that they were not able to test the SCG and the on-site visit scenario.

1.2.7 - Report on the final outcomes

At the first test in September 2013 the users filled out questionnaires after testing the app. The outcomes of these were that the design was particularly well received by the users. Similarly, the use was rated very positively by the simple operation of buttons. But some actions of the buttons and navigation were unclear.
In addition to the graphical properties, it was noted that there is a great interest to use such an smart city app. Particularly the app would be accepted on the smartphone (18), but there is also interest to use it by tablet (5), PC (2) and TV (2) (multiple answers were possible).

With small changes of the design and navigation the users of the second experimentation in March 2014 were more satisfied then the results of the first one. The users found some bugs by the CENR SE feature, which we tried to allocate till the next experiment. The user management worked very well and the manipulation of the OCDB too. The tests also shown, those students mostly like to use the SCG on a smartphone or a tablet. The PC and TV were not interesting for them.

At the Barcelona experiments, the data-generating instruments put in place for the tests allowed for the gathering of useful quantitative and qualitative evaluation data. The log analysis and online questionnaire results were further complemented by the focus group inputs, which provided invaluable information to contextualize user behavior observed in the application logs (i.e. why users seemed to get stuck at particular points).

In the March and May 2014 experiments, a set of UX metrics and user statements (responses to open-ended questions) were collected, indicating that although the concept of a SCG was very attractive to users, there were some critical issues with the test version of the web app that needed urgent fixing. These issues were alone responsible for the lower scores collected at some key usability and user experience metrics, and were deemed to be very likely to improve sharply if these issues were corrected according to the users' contributed suggestions for improvements.

This assumption was proven correct at the final February 2015 experiment, where the SUS scores of the web application rose to an acceptable level (see Figure1 below).

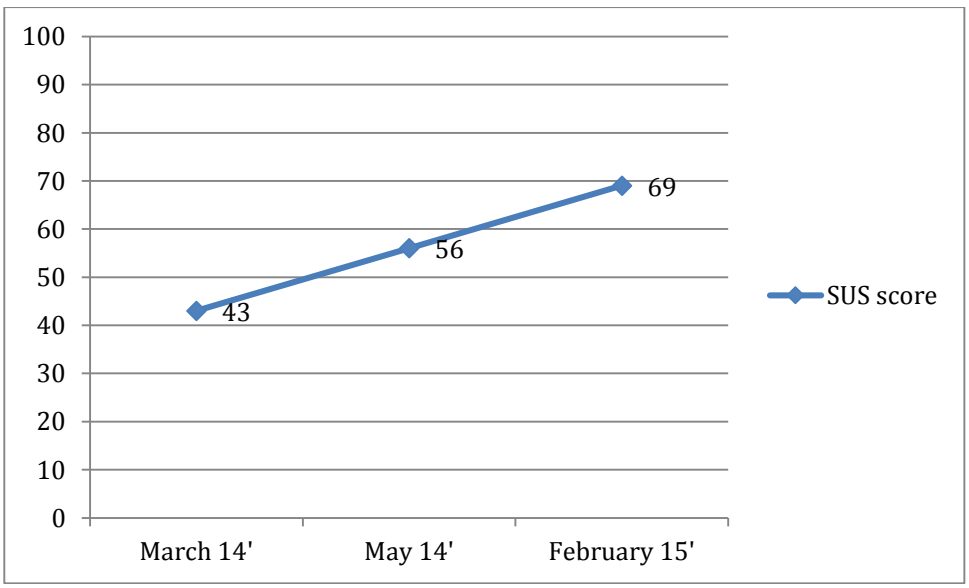


Figure 1 Evolution of System Usability Scale (SUS) scores throughout the experimentation phase

Also, at this final test several key dimensions of the application were also rated favorably by the users, as can be seen below in Figure 2:

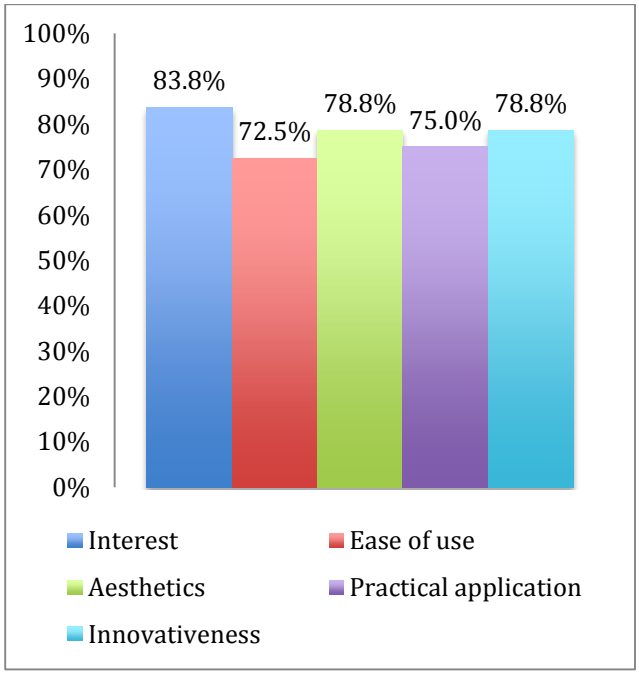


Figure 2 Scores on several dimensions of user evaluation of the SCG

1.2.8 - Summary of findings and evaluation

The first experimentation has shown, that there is really interest in such an application and mostly for mobile devices. But also there were some problems in the design of the button and the swiping thru the layers.

The outcomes of the second experiment were more technical then in the first experiment. The students found bugs and reported them. That helps for a solving of the issues and retesting again. Also it makes the app more stable for the next experimentation.

The March and May 2014 experiments in Barcelona provided valuable data on the application's technical performance in demanding real life conditions, and allowed the FOKUS team to tackle several important issues with the deployment of the enablers. Many usability problems were detected, to which user co-created solutions were worked on. The most troublesome issues were with the responsiveness of the application on different devices, and with some problems with parts of the user interface. On the user experience side, the most important user pain points were spotted, to be addressed in subsequent versions of the SCG. Also, a list of recommendations and suggestions for improvements and enhanced functionalities was compiled, which can provide useful inputs to developers in future work to enrich and complement the web app.

In the final February 2015 experiment, the innovative gamification scheme devised for the user trials succeeded in capturing the attention of the test users. The competitive and ludic social dynamics generated on the SCG application were able to feed the tested technologies (the application and its constituent enablers) with a stream of user-generated activity and data that tested the deployment of the enablers in a demanding real-life scenario.

Overall, the SCG web-based application worked as intended, and was able to provide the innovative technological foundation for the geocaching competition. On the front end, there were some layout and UI responsiveness issues with several devices and browsers, which made it somewhat difficult (but rarely impossible) for some users to take part in the competition. This had a somewhat negative impact in the user evaluation of the application in terms of its ease of use and practical application, but did not affect the positive scores in terms of the application's interest for users, its aesthetic value, and its perceived innovativeness.

2 - SECOND CYCLE EXPERIMENTS

2.1 - Overview on new Scenarios and Experiments in 2nd exp. Cycle

Date	Location	Scenario
December 2014	Brittany	Transmusicales Festival
March 2015	Valencia (Demo)	Data fusion
May and June 2015	Tenerife	Tenerife Transit Experience

Table 2: Scenarios and Experiments in 2nd Experimentation Cycle

2.2 - Scenario: Festival (Brittany Experimentation Site)

2.2.1 - Introduction to the tested application and the experiment

The Festival scenario has been tested during the "Transmusicales" Festival in Rennes between the 4th and the 7th of December 2014.
Each year, this festival gathers about 65.000 attendees. Among them, about 300 have volunteered to test the applications we proposed, and 100 agreed to fill the feedback questionnaires.
During this festival, four apps were tested:

- *Screen:* Enable the broadcast of real-time updates, display social feeds, see the following shows and venues, show festival map and advertising from partners and sponsors
- *Staff/Contributor:* EvenTribe provides volunteers and security staff with an amazing tool to improve their efficiency: they can send live messages to all screens and apps, and manage different crowdsourcing operations easily.
- *Stand:* The staff needs to be focused on their job: serving customers. This app allows them to broadcast offers and messages to all attendees through screens, in a fast and intuitive way.
- *EvenTribe:* A festival is way more than concerts. Let the attendees' benefit of a groundbreaking immersive experience through the app: Augmented reality view, real time updates, social feed, schedule...

List of the tested functionalities:
Screen:

- I see the live map with the affluence level of all services and locations.
- I see logos and adverts.
- I see the planning and venue of the current and next shows.
- I see the news feed the staff decided to put on.

Staff / Contributor:

- My staff or volunteers update the status of each location.
- I can push featured news and update the screen's news feed.

Stand:

- I can identify my location with a QRCode.
- I can push updates with a very simple 3 button UI.

EvenTribe:

- I see the live map with real-time info overlays around my location.

- I can launch the augmented reality view of the map.
- I witness what people are putting on social networks during the festival.
- I check the current shows, and the ones coming right next.
- I see a planning of all the shows of my festival.
- I see my partners' logos and a QRCode to share the app with my friends.

2.2.2 - Test objectives and expected outcomes

Through this large-scale experimentation, we aim at:

- Delivering valuable apps, based on FIWARE technology (including specifics enablers developed under the FIContent project, to bring new services and create a new experience of festivals for both attendees and staff members.
- Getting information regarding the level of attractiveness and utility of these applications
- Improving the applications by taking into account the feedback of real users.
- Identifying technical problems and evaluating reliability of the applications
- Making the final validation before launching the products and deploying these applications in others festivals.

2.2.3 - Applied methods and tools for evaluation

During development phase:

The first step of the methodology was to collect the needs of festival organizers. We considered that they were best placed to give these inputs. Moreover the festival already had a smartphone application and we should therefore develop applications that provide additional features without competing with the existing application. Several constructive working sessions helped define with the festival organizers the new functionalities they needed.

Then developers from eBIZ built mock-ups to ensure that demands of end customers were well understood. Several intermediate versions were produced, which helped refine the product.

Finally, a final version was produced for experimentation.

Customers would have wished that the application could run on Android and iOS. Unfortunately, deadlines were too short and only the Android version was ready for the December festival.

During and after the experimentation:

To get user's feedbacks regarding the usage and usability of the applications, several methods and tools were used:

- Create log files
- Ask the users to answer to one questionnaire

The log files is the observation of usage statistics from applications, which were provided by eBIZ.

An online questionnaire developed by ILB has been submitted to users at the end of the experimentation to gathers the feelings of users. This questionnaire integrates questions to evaluate the user experience in term of usability, attractiveness and appearance for each of the applications.

100 users have completed the questionnaire.

2.2.4 - Infrastructural requirements

Terminals:

Dedicated to screen App:

13 TV set with HDMI port, Android HDMI key on each

(As the festival took place simultaneously in several concert halls it was necessary to cover these different places).

Dedicated to evenTribe App:
Smartphones (Android) provided by festival attendees
Power Bank (rechargeable batteries): provided by the FIContent Project to attendees, in order to have a self-sufficient energy for the experimentation

Dedicated to staff/contributor and stand Apps:
Smartphones (Android) and tablets provided by the staff and ILB.

Wifi Network:
A dedicated Wifi Network was deployed for the experimentation, to allow attendees reaching the evenTribe APP without bottleneck phenomenon.

Servers:
Servers were provided by eBIZ.

2.2.5 - User recruitment and user involvement

An information message dedicated to the FIContent2 experiment was put in line on the Transmusicales Web Site and on the Images-et-réseaux blog (Le mag numérique) some weeks before the festival, as well as through the social networks. In this message, it was asked for interested people to register on the ImaginLab Portal. So, we got 256 registrations before the beginning of the festival. In addition we let the opportunity for people to register directly at the FIContent2 booth during the 3 days of the experiment. Thus, around 300 people were involved in the experiment.

Two days before the event, registered people were asked, through a mass mailing, to download the EventTribe App and to join the FIContent2 booth when arriving at the festival in order to check that the app was downloaded and running properly. A Powerbank (high capacity charger for smartphone) was available for interested people. People were informed at the same time that they would be asked to answer a questionnaire at the end of the experiment.
Most of the testers came as soon as the first day of the festival and could experiment during two or three days. Some of them came only the second or third days.

2.2.6 - Report on running the experiment

A FIContent2 booth was set up for the whole duration of the experimentation, where the users could find all the technical support (by eBIZ) and logistical support (by ILB) they need.
The most positive effect of the experimentation was the fact that new users came to the booth to register.
On the other hand, some users got trouble with their smartphones which were too old to run these new apps which required an android version >=4.0

2.2.7 - Report on Outcomes

Two days after the end of the experiment, a survey was sent to the users registered for the experiment. At the end, we finally got exactly 100 answers with the following users profiles.

2.2.7.1 - *Users Profiles:*

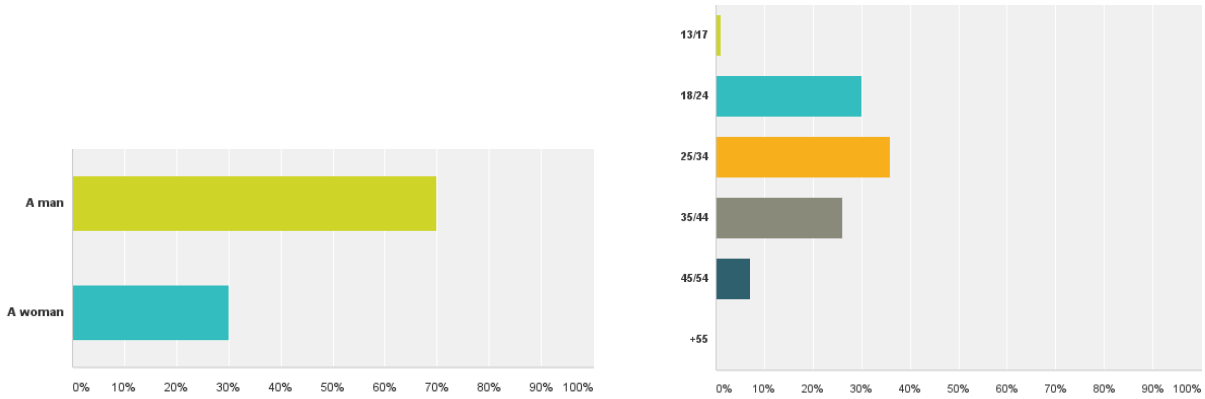
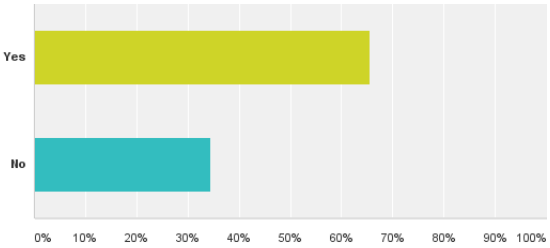


Figure 3: Users profiles (genre and age)

2.2.7.2 - *General feeling about evenTribe App*

66% of the users said that this application made their festival experience globally more comfortable



And 70% shared the application with other people around them

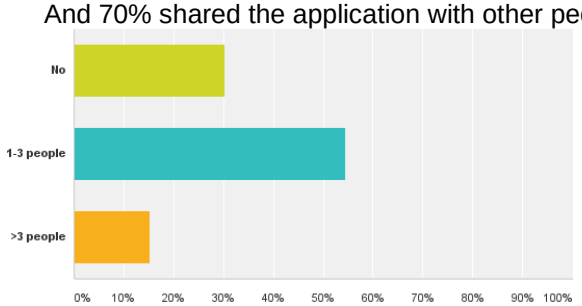


Figure 4: General feeling about evenTribe App

2.2.7.3 - *Most attractive features:*

When asked about their favourite features, festival attendees answered that they preferred information about current (90 %) and future (86 %) programming, and then about the affluence to the various points of interest, as shown by the following figure.

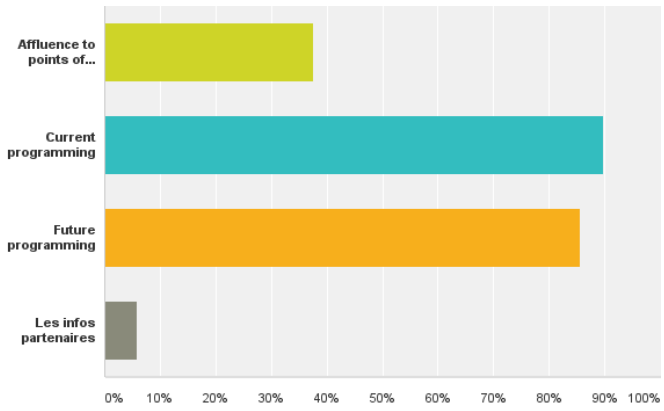
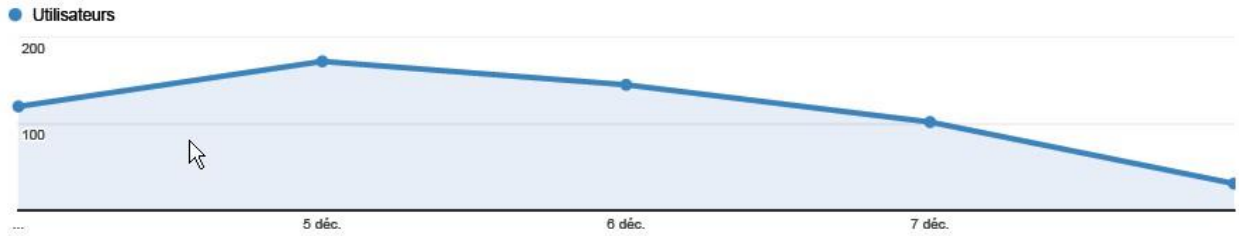


Figure 5: Most attractive features

2.2.8 - Traffic observed during the experiment

Number of users:



Registered Users	Opened Sessions	Visualized screens	Screens/session	Average length of sessions
279	4203	5799	1,38	6 mn 51 s

Number of events recorded on the server:

Statistics stored on the server have shown the number of requests to the server by each feature during the experiment. It seems the Map 3D is by far the one that consumes the most resources and probably explains the limitations observed with some older smartphones.

3D MAP	39502

2D MAP	2424
CURRENT PROGRAMING	712
SOCIAL BUZZ	468
FUTURE PROGRAMMING	442
TOTAL	43458

Figure 6: Traffic observed during the experiment

2.2.9 - Summary of findings and evaluation

Function "Affluence to point of interest (2D Map)

82% used it and found it interesting.
And 90% found it innovative.
But it had an impact of their wanderings for only 38% of them.

Suggested improvements:

- To be able to locate friends on the map
- To give the name of the artists by clicking on the "Hall" icon
- Having access to concerts and restaurant menus by clicking on the icons
- Issuing an alert when the gauge is almost reached for the next concert taking place in 15 minutes
- Linking programming and halls fill rates
- Colors of pictos: take into account the needs of color-blinds.

Function "Affluence to point of interest (3D Map)

This function could be launched only on 69% of the smartphones (not on the oldest one).
82% of those who tested it found this function innovative.
But 87% considered it's doesn't help them in their wanderings (ergonomic limitations?).

Suggested improvements:

- To optimize the application so that the less powerful phones can have optimal and fluid rendering
- Zoom too large, difficult to identify in relation to the whole site

Function "Social buzz"

Users have predominantly (> 40%) not used this feature, either because they did not understand how to use it, or because they considered that it did not bring improvement compared to already existing functions.

Suggested improvements:

- Enable to click on the pictures to enlarge them
- It would be nice to allow users to interact with each other like a forum

Function "Schedule"

The users deemed this feature most useful. More than 80% of them have used it.

Suggested improvements:

- To simplify presentation for readability
- To be able to put alerts on certain groups to be notified a few minutes in advance of their stage

- It would be nice to address directly the current concerts rather than always the 1st schedules.
- Indicate for each artist: music genre, a small summary, as can be found in the official program.

Function "Screen

Nearly 70% of users have enjoyed this feature that seemed to them innovative and useful although some of them would have wished larger screens.

Suggested improvements:

- To have larger screens for better visibility
- To have on the same screen at the same time the concerts and affluence

2.3 - Scenario: Fallas Festival in Valencia (linked to Cologne Experimentation Site)

2.3.1 - Introduction to the tested application and the experiment

The Festival scenario has been tested during the "Fallas" Festival in Valencia between the 15th and the 19th of March 2015. Some initial tests were made before (previous days), as some events linked to the Fallas Festival take place from March, 1st. This provided also the opportunity to promote the test through a mobile app during these days.

Each year, this festival gathers about 2.000.000 attendees, counting Valencia citizens, province citizens and tourists. In order to provide a large scale tool to test FIC2 technology, a mobile app was developed both for the Android and iOS marketplaces. More than 8000 users downloaded the mobile app and used it during the Fallas Festival.

The App was published on Google's Play Store on the 1st of March, 2015, and updated with the new version and some fixes in the following days.

Unfortunately, the publication on Apple's App Store suffered a series of issues with Apple rules (link to a website –livefallas.com- where an Android logo was displayed, bad categorization because the App included a contest for winning iPads and the suggested category was leisure and not contests, etc.). That delayed a lot the publication of the App till March, the 17th. This certainly leaded to a low download and use of the App for iOS platforms.

During this festival, the tested mobile app included 4 basic services:

- *Fallas: Find and locate Fallas on a map, filtering by activity, etc. It also allows user interaction and includes an automatic recommendation tool;*
- *Events: Shows the official events of Fallas (from March 1st to march 19th)*;
- *News:* Shows RSS news associated to Fallas;
- *Activity map: Shows real-time social activity on the map, in order to find activity hotspots in the city of Valencia.*

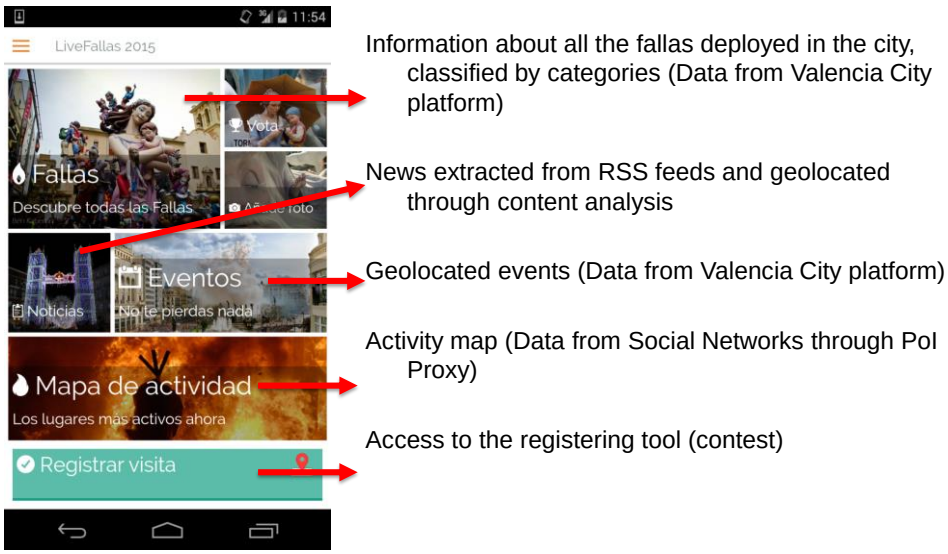


Figure 7. Main page of the Fallas mobile app

The interest in the Fallas Festival had the following reasons:

- *The Festival takes place in a real and big outdoor environment, nothing to do with controlled environments like labs;*
- *The Festival is very social. Valencian citizens (falleros) group into 350 'casales' during the festival. Tourists and friends attend the festival in a social way, not individually;*
- *The Festival is massive. During the Festival, Valencia city doubles its size (around 2 million people);*

- *There are certain events during the festival that can be better analysed (such as 'masclets', fireworks and 'Flower offering').*

The previous features provided an excellent scenario for tracking and analysing activity in social networks and test and disseminate FIContent2 technology by means of a mobile app that integrates several users.

List of functionalities:

Fallas:

- I select the Fallas I want to see/display
  - The most rated ones (those which are better rated by users);
  - The nearest ones (those which are closer to my current location);
  - The most active ones (those which have more social activity);
  - Fallas by category (from special section to section 7, this relates to the relevance of each Falla and the budget assigned to it);
  - Recommend me Fallas: there is a recommendation engine that suggests me the next Falla to visit based on my previous activity, current location and interesting Fallas.

Figure 8. Fallas main submenu

- I see a list of Fallas (after the previous option), where
  - I see basic visual information of each Falla item: a thumbnail, the name of the Falla, the motto, the rating value, the distance to my location, the activity, the number of comments, the number of check-ins and the position in the current year's award. For each Falla item I can also see if I had previously check in;
  - I can display the list of Fallas on a Map (Google Maps view) in order to provide a map view;
  - I can further order this list of Fallas by: name, distance, rating, social activity and section.

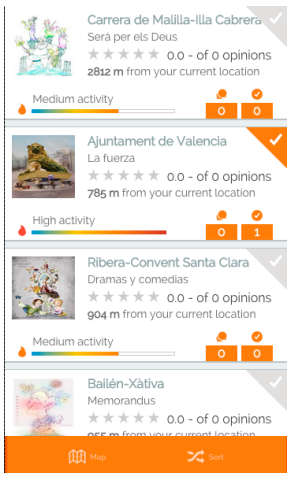


Figure 9. List of Fallas

- If I click on a particular Falla item I see more details of this Falla:
  - A small map (Google Maps view) locating the Falla;
  - A descriptive photo of the Falla. Clicking on it guides me to a slideshow/photo gallery of other users that have made photos related to his Falla. I have even the possibility to upload photos of this Falla;
  - Related media in social networks (e.g. show photos on Instagram made near this Falla);
  - Number of comments of this Falla. The comments are also included;
  - Number of check-ins;
  - Position in the official Fallas competition: this information is only available from March 16th.and is published by and institutional judging Board;
  - More details related to this Falla: president, artist and Main Fallera;
  - I can display on a map how to get from my current location to this Falla.

Events:

- I can see the official events (time and place) of the Fallas today;
- I can scroll throughout time (March) to see past and future scheduled official events.

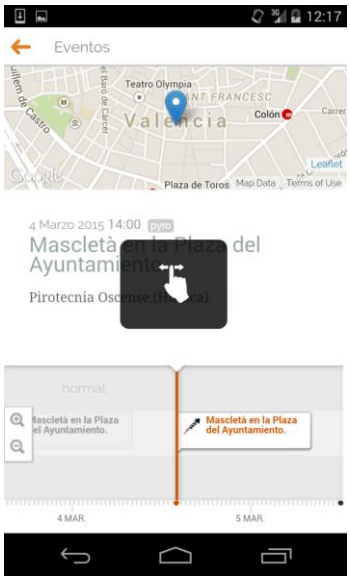


Figure 10. Fallas Events

News:

- I can read local news, associated to a particular Falla today;
- I can scroll throughout time (March) to read past news.

Figure 11. Fallas News

Activity map:

- I see the live map with real-time info overlays around my location. I can even click on the markers (e.g. Twitter marker) to read what's going on;
- I can zoom in/zoom out and can see a heat map of the whole city of Valencia.

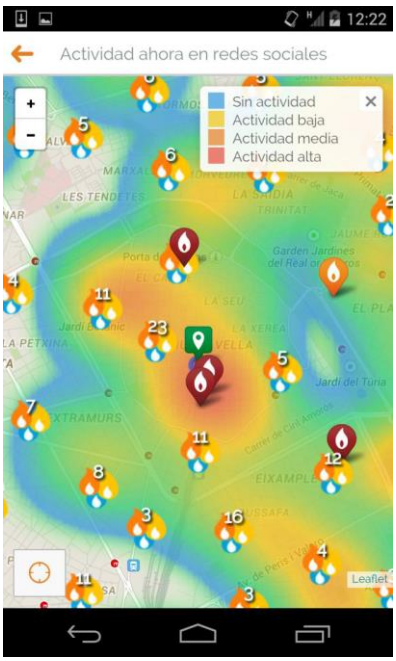


Figure 12. Fallas activity map

2.3.2 - Test objectives and expected outcomes

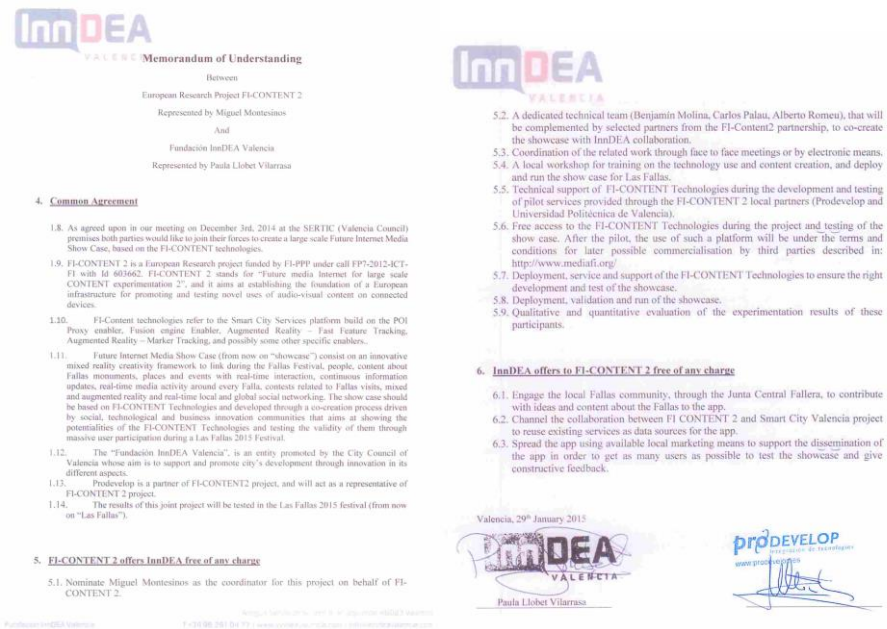
Through this large-scale experimentation, we aimed at:

- Delivering a valuable app, based on FIWARE technology to be used in large scale festivals and events providing a new experience for attendees;
- Integrate as much enablers as possible developed within FIContent2 in the areas of Smart City Guide;
- Analysing ways of promoting a large scale app for a reduced region (city) during a reduced period of time. This includes promoting the download and the usage of the app;
- Getting information regarding the level of attractiveness and utility of this application;
- Improving the app by taking into account the feedback of real users. This includes new releases (updates) of the app in the marketplaces;
- Identifying technical problems and evaluating reliability of the app and the backend servers in a near production environment.

2.3.3 - Applied methods and tools for evaluation

Before development phase:

The first step consists in searching for some sort of alliance with the administrative entity in charge of the Fallas Festival. In this case the regulation body is the "Junta Central Fallera" which in last term depends from the city council of Valencia. A Memorandum of Understanding (MoU) was signed with Valencia City Council through its InnDEA Foundation. The Valencia InnDEA Foundation is a body promoted by the Valencia Town Council with the aim of supporting and encouraging development in the city by innovation in its various forms.



Memorandum of Understanding

Between

European Research Project FI-CONTENT 2

Represented by Miguel Montesinos

And

Fundación InnDEA Valencia

Represented by Paula Llobet Vilarrasa

4. Common Agreement

1.8. As agreed upon in our meeting on December 3rd, 2014 at the SERTIC (Valencia Council) premises both parties would like to join their forces to create a large scale Future Internet Media Show Case, based on the FI-CONTENT technologies.

1.9. FI-CONTENT 2 is a European Research project funded by FI-PPP under call FP7-2012-ICT-FI with Id 603662. FI-CONTENT 2 stands for "Future media Internet for large scale CONTENT experimentation 2", and it aims at establishing the foundation of a European infrastructure for promoting and testing novel uses of audio-visual content on connected devices.

1.10. FI-Content technologies refer to the Smart City Services platform build on the POI Proxy enabler, Fusion engine Enabler, Augmented Reality – Fast Feature Tracking, Augmented Reality – Marker Tracking, and possibly some other specific enablers.

1.11. Future Internet Media Show Case (from now on "showcase") consist on an innovative mixed reality creativity framework to link during the Fallas Festival, people, content about Fallas monuments, places and events with real-time interaction, continuous information updates, real-time media activity around every Falla, contests related to Fallas visits, mixed and augmented reality and real-time local and global social networking. The show case should be based on FI-CONTENT Technologies and developed through a co-creation process driven by social, technological and business innovation communities that aims at showing the potentialities of the FI-CONTENT Technologies and testing the validity of them through massive user participation during a Las Fallas 2015 Festival.

1.12. The "Fundación InnDEA Valencia", is an entity promoted by the City Council of Valencia whose aim is to support and promote city's development through innovation in its different aspects.

1.13. Prodevelop is a partner of FI-CONTENT2 project, and will act as a representative of FI-CONTENT 2 project.

1.14. The results of this joint project will be tested in the Las Fallas 2015 festival (from now on "Las Fallas").

5. FI-CONTENT 2 offers InnDEA free of any charge

5.1. Nominate Miguel Montesinos as the coordinator for this project on behalf of FI-CONTENT 2.

5.2. A dedicated technical team (Benjamín Molina, Carlos Palau, Alberto Romeu), that will be complemented by selected partners from the FI-Content2 partnership, to co-create the showcase with InnDEA collaboration.

5.3. Coordination of the related work through face to face meetings or by electronic means.

5.4. A local workshop for training on the technology use and content creation, and deploy and run the show case for Las Fallas.

5.5. Technical support of FI-CONTENT Technologies during the development and testing of pilot services provided through the FI-CONTENT 2 local partners (Prodevelop and Universidad Politécnica de Valencia).

5.6. Free access to the FI-CONTENT Technologies during the project and testing of the show case. After the pilot, the use of such a platform will be under the terms and conditions for later possible commercialisation by third parties described in: http://www.mediafi.org/

5.7. Deployment, service and support of the FI-CONTENT Technologies to ensure the right development and test of the showcase.

5.8. Deployment, validation and run of the showcase.

5.9. Qualitative and quantitative evaluation of the experimentation results of these participants.

6. InnDEA offers to FI-CONTENT 2 free of any charge

6.1. Engage the local Fallas community, through the Junta Central Fallera, to contribute with ideas and content about the Fallas to the app.

6.2. Channel the collaboration between FI CONTENT 2 and Smart City Valencia project to reuse existing services as data sources for the app.

6.3. Spread the app using available local marketing means to support the dissemination of the app in order to get as many users as possible to test the showcase and give constructive feedback.

Valencia, 29th January 2015

Paula Llobet Vilarrasa

Figure 13. MoU between PRO and InnDEA

The MoU signed with the InnDEA Foundation has enabled a great support on dissemination actions. The following activities have become achievable due to this MoU:

- Collaboration with VLCi, Valencia's Smart City Platform (FI-WARE like) for accessing Fallas 2015 official data;
- Collaboration with the Valencia Council Computer Systems Department for becoming an official App;
- Collaboration with Junta Central Fallera for promoting the experiment;
- Collaboration with Valencia Tourism agency for dissemination activities.

Two important aspects are here important:

- The Fallas app uses local open data collected from the official Valencia OpenData portal (Valencia Datos Abiertos), which depends from the city council;
- The city council of Valencia is possibly the first one to incorporate a 'FIWARE node' to expose its local open data, thus they were also interested in combining and integrating FIContent2 technology, even if this FIWARE node was not officially released in March. As FIWARE node we refer to the commercial environment set up by Telefonica for various cities.

During development phase:

Before starting development PRO and UPVLC had some meetings with the InnDEA Foundation and the city councillor not only for administrative issues (MoU) but also for gathering inputs for the future mobile app. We identified the major areas they thought it would interest, attract and engage users: Fallas, events, news and social activity, all of them georeferenced in order to facilitate positioning and navigation to the user.
Several internal versions were produced and tested before producing the first official release at the beginning of March. This allowed to test not only the app but the way the app will be evaluated. Various methods have been used:

- OCD database: some useful information can be extracted from the OCD itself, as it stores user interaction. Graphs will be described later in the result section;
- Piwik: it is the leading open source web analytics platform that gives you valuable insights into your website's visitors. It is similar to Google analytics, and allows evaluating the incoming traffic. Graphs will be described later in the result section;
- Internal review: 'friendly' (technical) users from UPV's and PRO's working lab were asked to test the app and give their opinion, in order to catch fast feedback. Graphs will be described later in the result section.

An online questionnaire has been submitted to users at the end of the experimentation to collect user feedback. This questionnaire integrates questions to evaluate the user experience in term of usability, attractiveness and appearance for each of the applications.

2.3.4 - Infrastructural requirements

Terminals

For a large scale experimentation in a relatively big city such as Valencia one has to consider using users own mobile phone, thus we developed the app for the two most widely marketplaces: Android and iOS. The app was completely free and didn't include any adverts inside.

Servers

Servers were provided by both UPVLC and PRO. LCI provided also its own server for the recommendation facility. UPVLC servers performed initial offline data fusion and textual RSS analysis, which didn't require any special infrastructure. PRO used Amazon S3 cloud infrastructure, in order to scale rapidly if the amount of users increased. LCI used Google AppEngine as cloud platform. Both PRO and LCI have experience in previous cloud platforms, and at this time (March 2015) FILAB could not be considered a riskless production environment.

2.3.5 - User recruitment and user involvement

The following marketing activities were performed to reach the maximum number of users, as approved by the marketing plan.

Advertisement on buses

An advertisement campaign was purchased to the municipal transport company. Two side images plus a back image was placed on buses for a number of bus lines during all the month of March 2015.
Contracted bus lines were:

- 27
- 79
- 81
- 89

Nevertheless, some extra lines were gotten due to the availability and personal negotiations without extra cost.

Figure 14. Advertisement on buses.

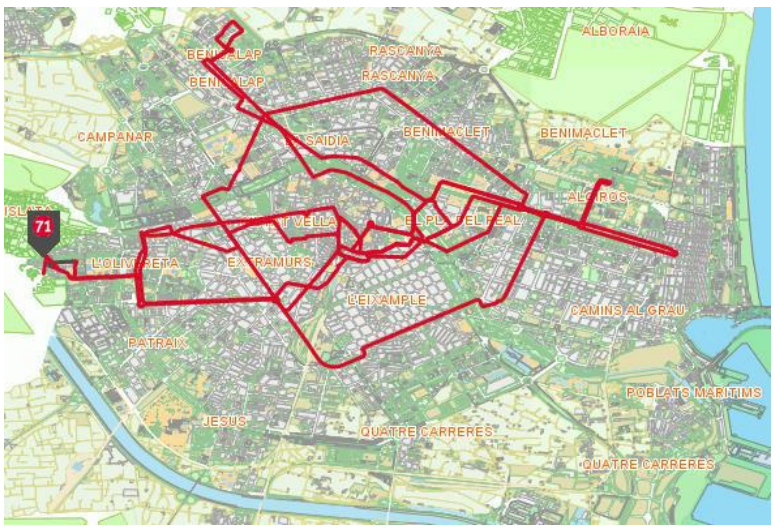


Figure 15. Bus routes through the city of Valencia.

Web page

A simple Web page was built as a landing page for those willing to get more information about the App.
It was placed on:

www.livefallas.com

Figure 16. Fallas app web page

The app included also a direct link to get the app both for Android and iOS if user access this webpage with their mobile phones.

Flyers

Flyers for spreading the App were designed and printed on two-sided A6 leaflets. 20.000 flyers were printed and distributed.

Figure 17. Fallas app flyer

The flyers were delivered mainly in the following points:

- Four Tourism Offices of Valencia City;

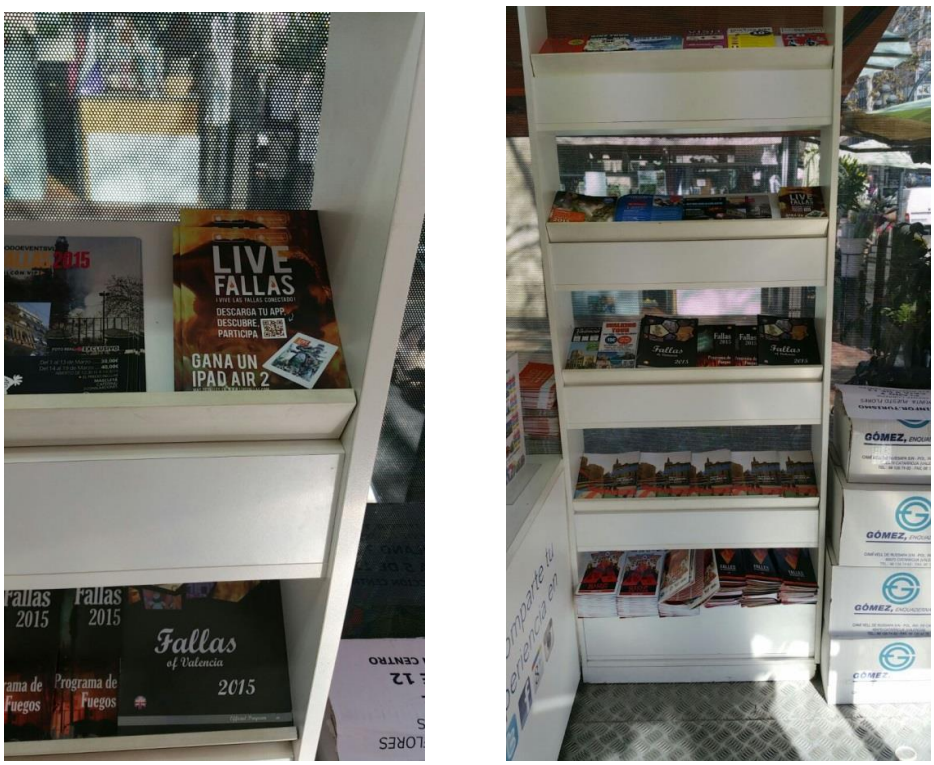


Figure 18. Tourist info in Valencia

- All faculties in UPVLC.

Posters

Posters with the same image than the flyers were placed at all the Schools of the Universidad Politécnica de Valencia.

Figure 19. Posters at Arts and Design faculties

Some of them were also delivered at public places known by Prodevelop and UPVLC team (e.g. Ninot Exposition).

Ad-words campaign

An Ad-Words campaign was set up for the period 1st March to 19th March. The campaign was aimed at directing to the installation of the App from the smartphones.

The campaign was configured to be published on smartphones and tablets only, with the link to install the App directly from the marketplace. Specific terms, ads and bid strategy were customized to optimize the results of the investment.

The look of o real live ad running on a smartphone was this one:

Figure 20. Fallas app on Ad-Words

Dissemination through the Junta Local Fallera

The Junta Central Fallera (JCF) is the organization that coordinates the Fallas Festival for the City of Valencia. It's the one who delivers the prices for the different Fallas and organizes the official events on behalf of Valencia City Council (live gigs, fireworks, parades, etc.).
Thanks to the MoU and agreement with Valencia City – InnDEA Foundation, JCF collaborated with us on the experiment.
JCF sent an e-mail with an introduction to the App to each one of the 347 Falla commissions, making the App known in the Fallas world.
JCF also agreed that our App could use the official Fallas logo.

Dissemination through mass-media

A press release with the aim of FI-CONTENT2 project, the experiment for Las Fallas 2015 and the main innovations and features of the LIVE FALLAS 2015 App was distributed to the main mass media of the City and the country.
The communications area of UPVLC helped us to write and disseminate this press release.

Blogs, Twitter

Direct contacts were made with the most popular bloggers, twitter users and webs about Las Fallas Festival to make the App known through these social media channels.

2.3.6 - Report on running the experiment

2.3.6.1 - *Media impact*

The App and the experiment appeared on a number of media.

2.3.6.1.1 - *Newspapers*

We had impact on a number of newspapers at regional and national scope, on printed and on-line versions:

- **ABC**
  On-line newspaper with regional/national scope with 498,000 daily readers for the printed version and 1,660,000 unique visits per month for the on-line one.

ABC.es | C. VALENCIANA

C. VALENCIANA / FALLAS 2015

Fallas 2015: una APP indica en tiempo real las tendencias en las redes sociales

ABC / VALENCIA | Día 10/03/2015 - 12.41h

La aplicación permitirá a los usuario conocer cuáles son los temas más comentados de la fiestas en cada momento

EFE
Imagen de la mascletà de este lunes

Investigadores de la Universitat Politècnica de València (UPV) y la empresa Prodevelop han desarrollado Live Fallas 2015(http://www.livefallas.com), una APP social que **permite descubrir "en tiempo real" lo que ocurre alrededor de cada monumento fallero**, saber cuáles son los puntos de la ciudad con más actividad en las redes sociales o estar informado de las últimas novedades relacionadas con la fiesta, entre otros muchos servicios.

Según ha informado la institución académica en un comunicado, **el usuario puede subir también sus propias fotos a la app**, compartir sus opiniones sobre cada una de las fallas que visite, votar por sus monumentos favoritos o conocer qué es lo que opina el resto de usuarios sobre cualquier monumento fallero.

"Live Fallas 2015 ofrece la posibilidad de descubrir las Fallas de Valencia de una manera diferente. Se trata de una app activa, en la que el usuario puede opinar sobre lo que ve y siente, compartir lo que ocurre a su alrededor, sus experiencias y sus fotos", ha explicado el director técnico de Prodevelop, Miguel Montesinos.

Además, también puede ver "**comentarios, valoraciones y fotos de los demás**". "Es una forma diferente de recrear y vivir la fiesta fallera, aprovechando todo el potencial que ofrecen los medios sociales", ha apuntado.

La aplicación **se ha desarrollado en el marco de FI-CONTENT2**, un proyecto de investigación financiado por la Unión Europea, con el apoyo de la Fundación INNDEA Valencia, dentro de la red VIT Fallas.

0 COMENTARIOS
IMPRIMIR
COMPARTIR

Noticias relacionadas
- Fallas 2015: Llega la VI Edición de la Horchatada y la Naranjada Fallera

Lo más ...
VISTO EN VALENCIA
1. Toni Cantó se acerca a la candidatura alternativa de Irene Lozano para liderar UPyD
2. Los diez restaurantes de moda en Valencia
3. Diez lugares en Valencia para ir con niños en vacaciones o el fin de semana
4. Mil valencianos celebran las Fallas en Toledo con un monumento de El Greco
5. Las primeras investigaciones apuntan a que se enganchó en una rejilla
6. El desprendimiento en Cortes de Pallás obliga a evacuar a 70 trabajadores de la central

AHORA EN PORTADA
INTERNACIONAL
Cuatro muertos en un tiroteo en el Palacio de Justicia de Milán
El autor de los disparos, ya detenido, podría ser un imputado en un caso de bancarrota fraudulenta. Uno de los muertos es el juez que seguía el caso
ECONOMÍA
Elvira Rodríguez respalda a Linde en defensa de las medidas del Gobierno
La CNMV espera que dentro de un mes esté solventada la situación de los fondos de inversión de Banco Madrid
Ir a la portada de ABC

Lo más...

Figure 21. Fallas app on ABC newspaper

- **Levante**
  Leader newspaper in Valencia Region with 259,000 daily readers for the printed version and 371,000 unique visits per month for the on-line one. The App appeared as a reference application for Las Fallas.

MIÉRCOLES, 11 DE MARZO DE 2015 | 19
Valencia

POR FALLAS ▶ LA FIESTA ENTRA EN EL BOLSILLO

FALLAS VALENCIA 2015
Una guía útil
▶ La guía de Mahou Fallas 2015 ofrece la programación y permite consultar la historia y las fotografías de los monumentos falleros de Secsalen Especial, consejos y datos históricos.

LIVE FALLAS 2015
Los sitios más calientes
▶ Live Fallas 2015 se presenta como la primera «app» social para mejorar la experiencia de las Fallas que ofrece los lugares y fallas con más actividad en el momento de la consulta.

CREA TU «MASCLETÀ»
Los ruidos de la fiesta
▶ La descripción dice: «Te sentirás como el señor pirotécnico». Todos los cohetes y el ruido de la fiesta fallera: la «despertà», la «mascletà», los castillos de la «nit del foc», la «crema»... Todo con un dedo.

LA FALLERA VOLADORA
Un juego con contexto fallero
▶ Un juego básico en el que una fallera vuela y debe esquivar objetos en forma de petardo que salen a su paso. Es un «remake» fallero de un juego popularizado en internet.

TU FOTO DE FALLERA
Ponte en el lugar de un fallero
▶ La aplicación da la opción de colocar la cara sobre modelos reales de falleros y falleras a los que se le ha quitado el rostro. Una especie de Photoshop a la medida de la fiesta

El teléfono echa humo... y «masclets»

▶ Una ola de aplicaciones falleras llega a los móviles: desde la posibilidad de crear una «mascletà» con distintos toques de cohetes hasta la opción de «disfrazar» fotos con vestidos y complementos falleros o conocer los puntos más calientes de la fiesta en tiempo r

PACO CERDÁ VALENCIA

Figure 22. Fallas app on Levante newspaper

- **El Economista**
  On-line/printed media about finance news with 730,000 unique visits per month. National scope.
  http://www.eleconomista.es/apps/noticias/6548111/03/15/Live-Fallas-2015-la-crem-20.html

Figure 23. Fallas app in El Economista

- **VLC news**
  Local newspaper with printed and on-line version.
  http://valencianews.es/2015/empresa/una-app-sobre-los-puntos-falleros-con-mas-actividad/

Figure 24. Fallas app in VLC news

- **Valencia Plaza**
  Local newspaper with printed and on-line version.

http://www.valenciaplaza.com/ver/151440/live-fallas--la-app-que-te-descubre-en-tiempo-real-todo-lo-relacionado-con-la-fiesta.html

Figure 25. Fallas app in Valencia Plaza

2.3.6.1.2 - News agencies

- Europa Press
  Spanish leader news agency at a national level.
  http://www.europapress.es/turismo/destino-espana/turismo-urbano/noticia-app-permite-conocer-tiempo-real-puntos-falleros-mas-actividad-redes-sociales-20150311134524.html

Figure 26. Fallas app in Europa Press

2.3.6.1.3 - Government media

The App has become an official Valencia application integrated with Valencia's FI-WARE-like Smart City platform, as it can be seen in the Valencia City Council website (www.valencia.es): http://www.valencia.es/ayuntamiento/datosabiertos.nsf/resultadoAplic/6C76C34DD3805A58C1257E05003D3ECB?OpenDocument&lang=1&nivel=6&seccion=&bdorigen=&idapoyo=0E2C55ED97CCBB41C1257C670044963D

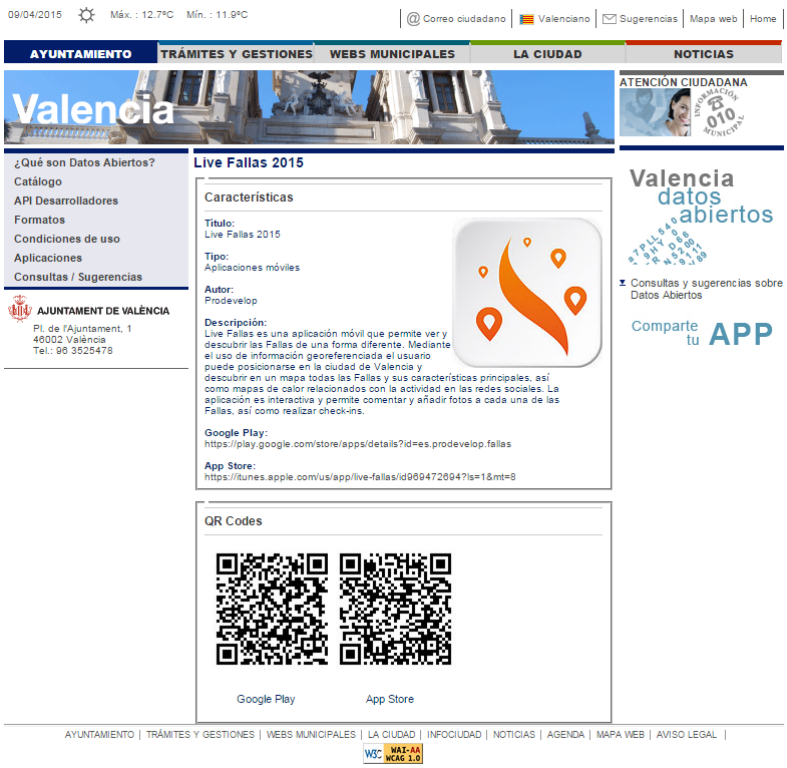


Figure 27. Fallas app in Government media

or the **AppValencia** App, the official App Launcher:

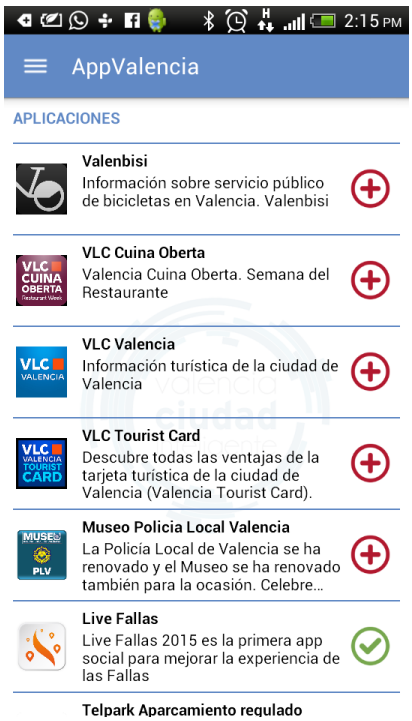


Figure 28. Fallas app in official Valencia app

2.3.6.1.4 - *Radio Stations*

- **LA SER**
  An interview was made by LA SER, the Spanish leader radio station with 4,447,000 daily listeners at a national scope.

Figure 29. Prof Carlos E. Palau interviewed by La Ser journalist on March, 12nd

2.3.6.1.5 - *TV*

- **TVE1**
  An interview was made by TVE (LA1), the public Spanish TV broadcast with 13,4 % market share at national level and 13 million minutes per person and day.

Figure 30. Prof Carlos E. Palau interviewed by La 1 (TVE) journalist on March, 12nd

- Los Desayunos de TVE 13th March, 2015
  News program leader in the morning range at National Scope.

http://www.rtve.es/alacarta/videos/los-desayunos-de-tve/desayunos-tve-esperanza-ona-candidata-del-pp-malaga-parlamento-andaluz/3041416/
Minute: 24:00

Figure 31. Miguel Montesinos interviewed by a TVE journalist

- **La 1. L'Informatiu. 13th March, 2015**
  News program in the afternoon range at Regional Scope.

http://www.rtve.es/alacarta/videos/linformatiu-comunitat-valenciana/linformatiu-comunitat-valenciana-2-13-03-15/3042131/
Minute: 3:25

Figure 32. Prof Carlos Palau interviewed by a TVE journalist

2.3.6.2 - *Code and content review*

As for any mobile app exploited on a large-scale market, developers have to react to continuous problems in the code, in the server, etc. Some updates have been done at server level (without user being aware), but others imply an update in the app. We made two updates in the Fallas app. We had no major problem with the Android version, whose team reviewed and approved the app in a short timeframe, but we had some problems with the App team, whose technical group delayed the approval until March, 17th. This issued impacted in the fact that most app users were Android users.
Some continuous content review was also necessary, as user were able to comment and upload photos to the platform. We designed here a simple interface for human control, in order to delete any potential offensive content. Fortunately, we were gladly surprised that no comment or uploaded photo needed to be discarded.

2.3.7 - Report on Outcomes

2.3.7.1 - *Marketplaces Statistics*

2.3.7.1.1 - *Overview*

In a first step, a beta version of the App was submitted to Google Play Store and Apple's AppStore on February. It was published in Google Play Store in a few hours, and in one week in Apple's AppStore, before the end of the month.
The stable version was submitted on March, the 1st. It was published the same day in Google Play Store, but it wasn't published in Apple's AppStore until March, the 17th. As a result, the AdWords campaign was only targeted at Android devices. This is the reason why the number of installations is quite lower than the Android version.
The total number of installations of the App has been of **8,547** by the end of Las Fallas 2015. The number of installations for every platform has been the following:

- Google Play Store: 7,602.
- Apple's AppStore: 945.

We consider that achieving more than 8,000 users in less than 3 weeks is a great success for the experiment.

2.3.7.1.2 - *Google Play*

2.3.7.1.2.1 - *Total Installations per User*

The total installations per user was **7,602** as of the end of Las Fallas.

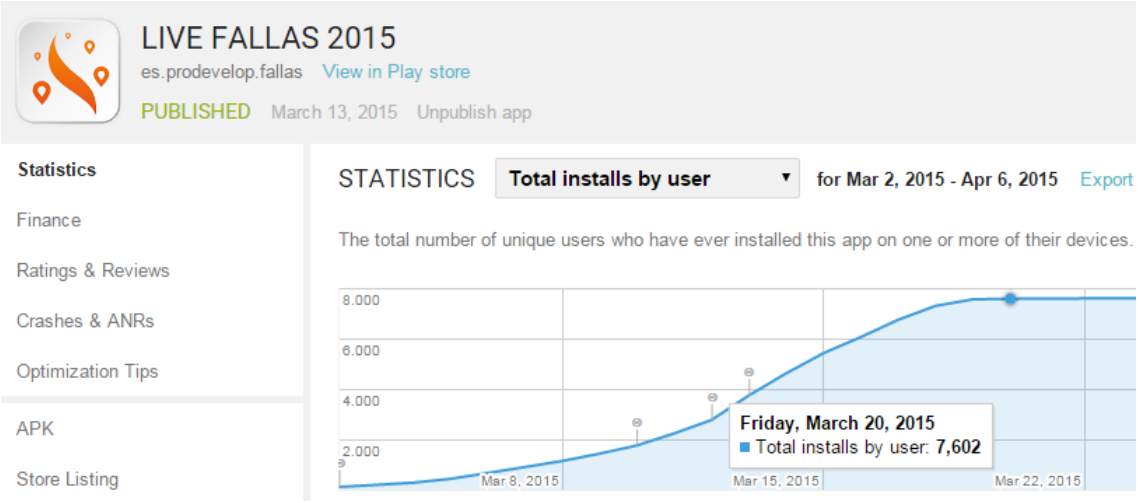


Figure 33. Fallas app. Total installations (Google Play)

2.3.7.1.2.2 - Country distribution

The App was mainly installed by Spanish users, which is logic due to the big proportion of national visitors and the impact of national media using Spanish language.

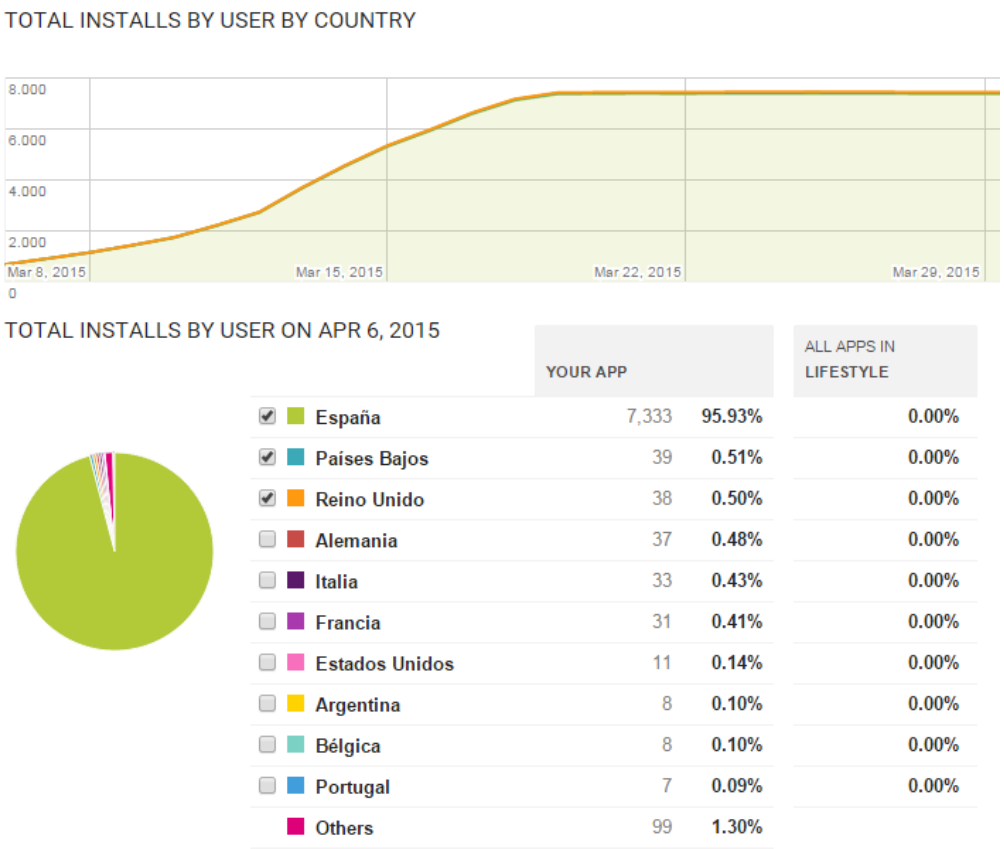


Figure 34. Fallas app. Country distribution (Google Play)

2.3.7.1.2.3 - *Language distribution*

The most prominent language of the devices that installed the App was Spanish.

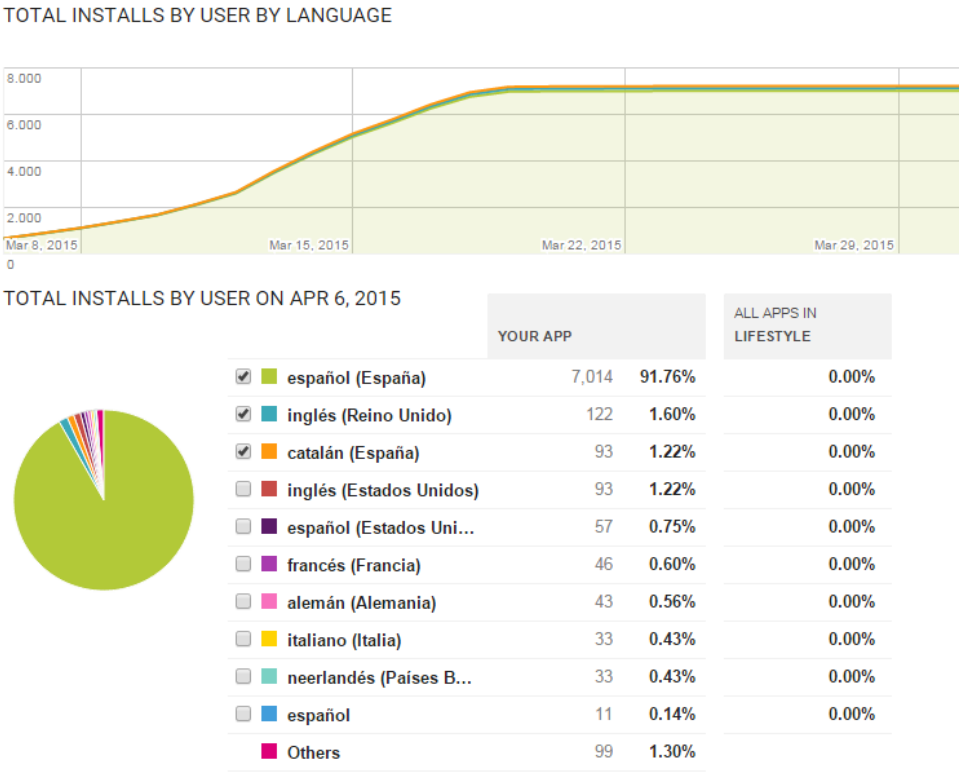


Figure 35. Fallas app. Language distribution (Google Play)

2.3.7.1.2.4 - *Android version*

The android version distribution is displayed below. Around 50% of the devices had Android 4.4 installed.

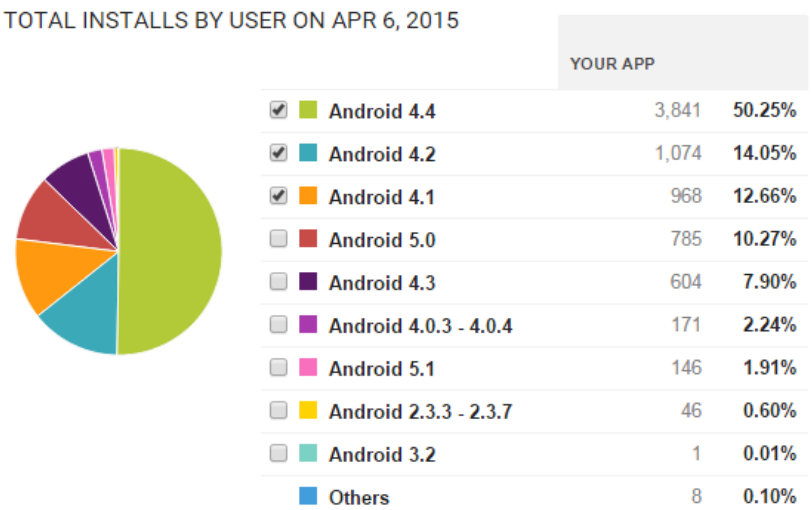


Figure 36. Fallas app. Android version (Google Play)

2.3.7.1.3 - Apple App Store

2.3.7.1.3.1 - Total Installations per Day

In a first step, a beta version of the App was published on February. The final stable version wasn't published until March, the 17th. As a result, the AdWords campaign was only targeted at Android devices. This is the reason why the number of installations is quite lower than the Android version.
The total number of installations is **951**.

Figure 37. Fallas app. Installation per day (App Store)

2.3.7.2 - *OCDB Statistics*

User activity is stored in OCDB, such as check-ins, likes, comments and photos. As mostly any type of interaction includes a timestamp, it is possible to make statistics by day, by hour and even by POI.

Besides getting information about the Fallas event, the user could interact with the application in 4 possible ways: generating a checking event for each Falla if he/she is nearby, uploading photos to the server in order to share them with the rest of the users, writing a brief comment of any Falla and evaluating (rating) it.

The following graphs show different statistics about the user interaction, but it has to be taken into account that this data is generated by the 529 registered users, representing a small percentage (6.2%) of the 8553 installations that were made.

Figure 38 shows the total activity generated by the registered users during the experimented days. We can see the most used feature were the "easiest/fastest" ones to use (check-ins and ratings), and the least used were the ones that were a little bit more time consuming (photo uploading and comment writing).

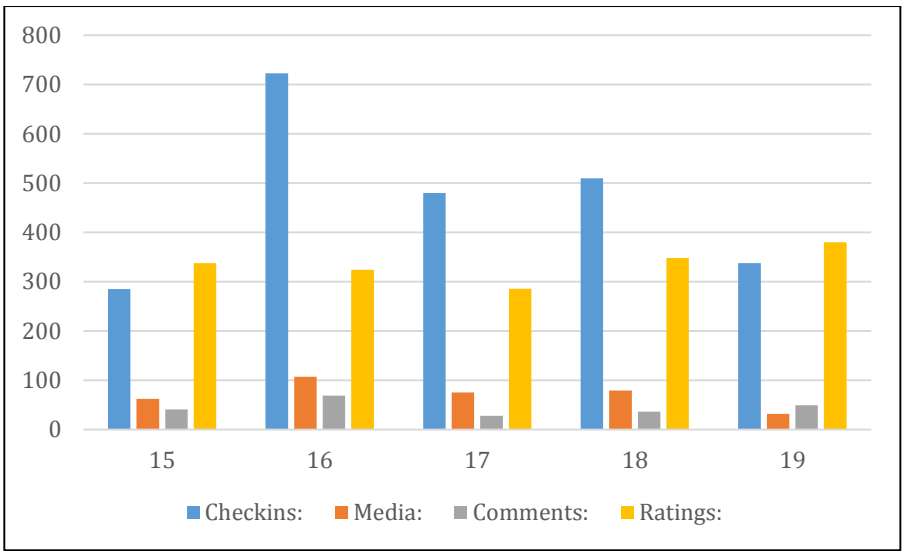


Figure 38. User activity each day

The next four graphs show the distribution of the user activity during the day; it's clearly visible that users were more active between 12pm and 8pm.

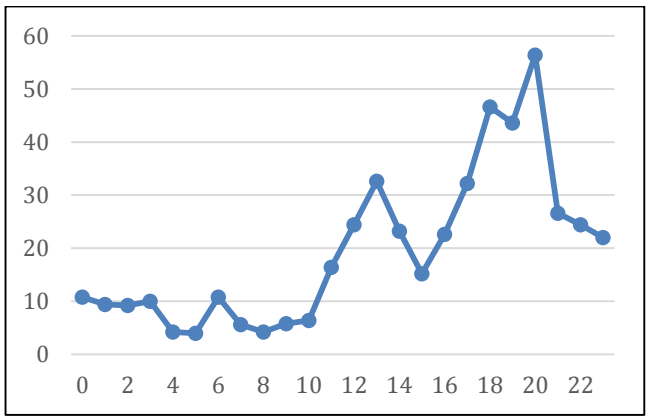


Figure 39. Average Check-ins per hour

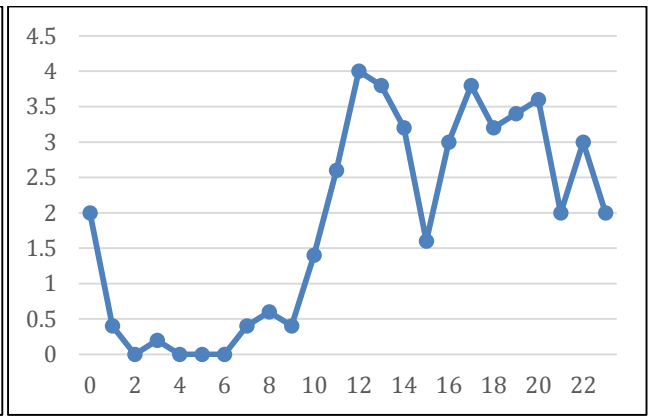


Figure 40. Average Comments per hour

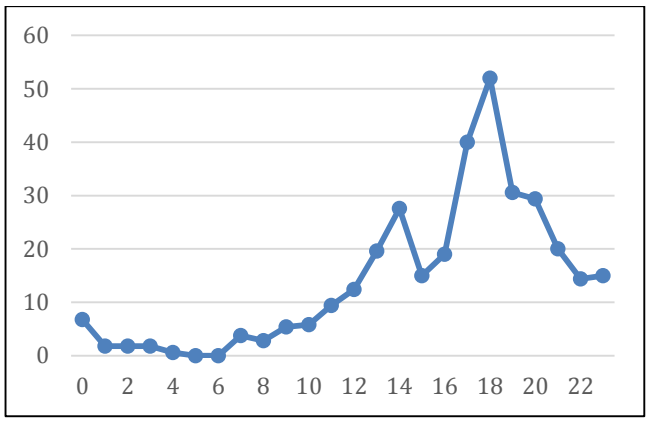


Figure 41. Average Ratings per hour

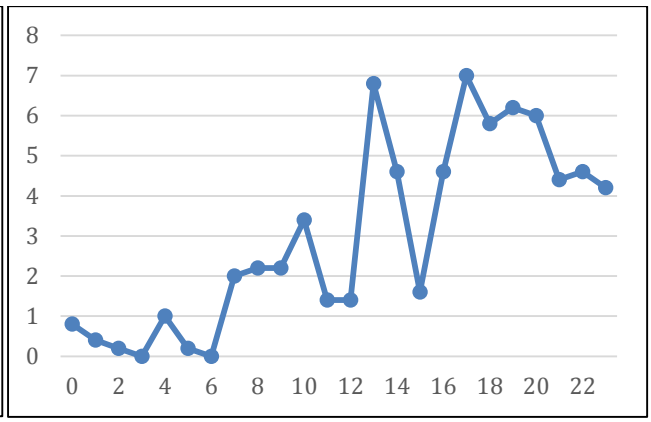


Figure 42. Average Media uploads per hour

Every user interaction is associated to a single Falla; between all of them, the Fallas that belong to the Special Section were the ones that received more attention. Figure 43 shows the distribution of the different user actions among the Fallas of the Special Section. The winner of official Fallas Awards was “Pilar”, coinciding with the Falla that aggregates more user interaction as shown below.

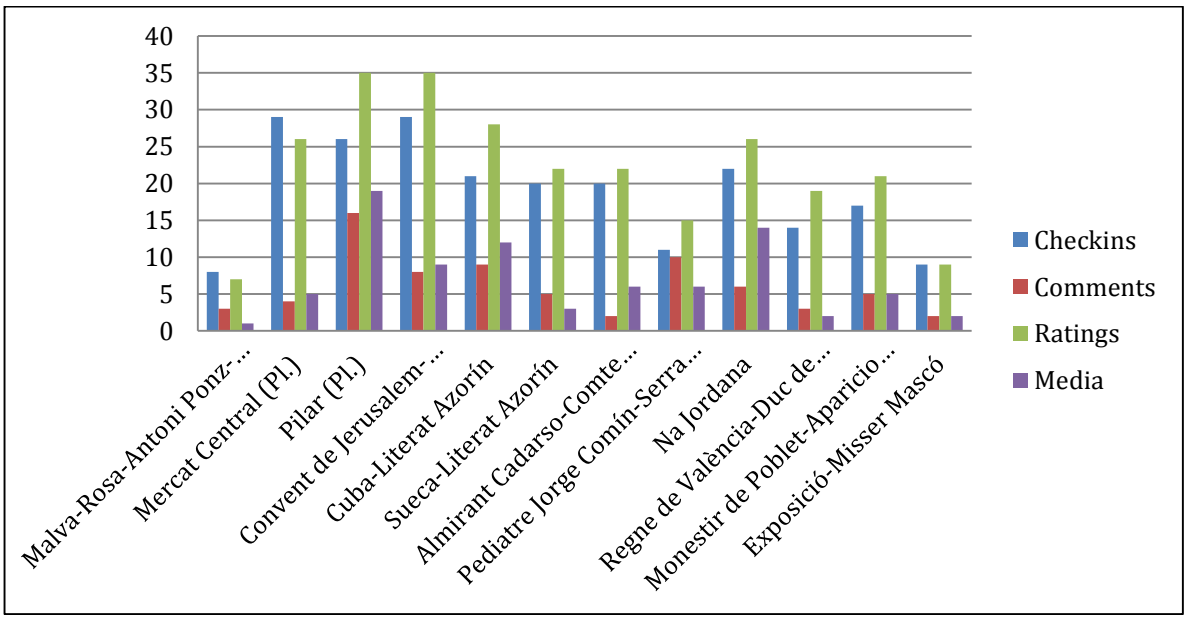


Figure 43. User activity for each Falla of the Special Section

The last graph of this section shows statistics about the engine that processed all the RSS news during the experiment. Half of them were rejected (mostly because of repetition due to the aggregation of different feeds) and only 3 of every 10 accepted news were successfully georeferenced to a Falla. This is not a bad analysis, it is simply revealing that RSS are typically of general scope and do not directly target a specific Falla.

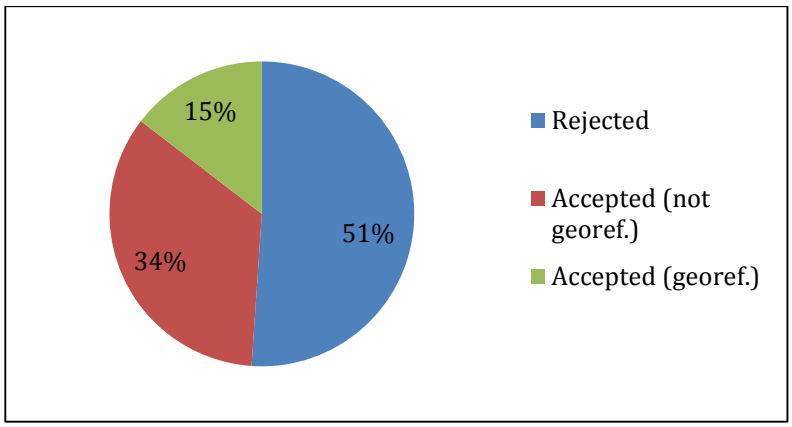


Figure 44. Processed news each day

2.3.7.3 - *Recommendation Engine Statistics*

Regarding the Context aware Fallas recommendation functionality we have analysed Google App Engine logs and Google Data store entity group and the following statistics are derived (we have logged only actions related to Especial, 1A and 1B sections of Fallas):

- 233 registered users are detected (users who have checked-in or rated Fallas from Especial, 1A and 1B sections);
- Total number of logged actions (recommendation requests, check-ins and ratings of Fallas in three covered categories Especial, 1A and 1B) is 2314:
  - 562 ratings from registered users,
  - 563 check-ins from registered users,
  - 1000 recommendation requests from unregistered users,
  - 189 recommendation requests from registered users.

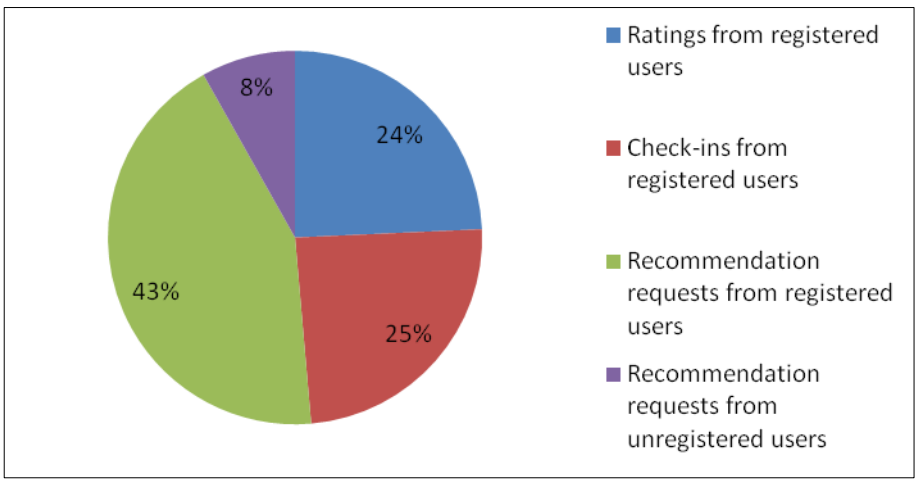


Figure 45. Detected user actions derived from logs and dedicated Google Data store

- At least 45 successful recommendations were registered. Every time the user requested Fallas recommendations a set of three Fallas are recommended based on his/her previous activity (check-ins and ratings) and location. Recommendation was successful if the next Fallas to which user check-ins or rates is in these three recommended Fallas. At least 17 users checked-in or rated Fallas from recommendation directly after the recommendation was made.

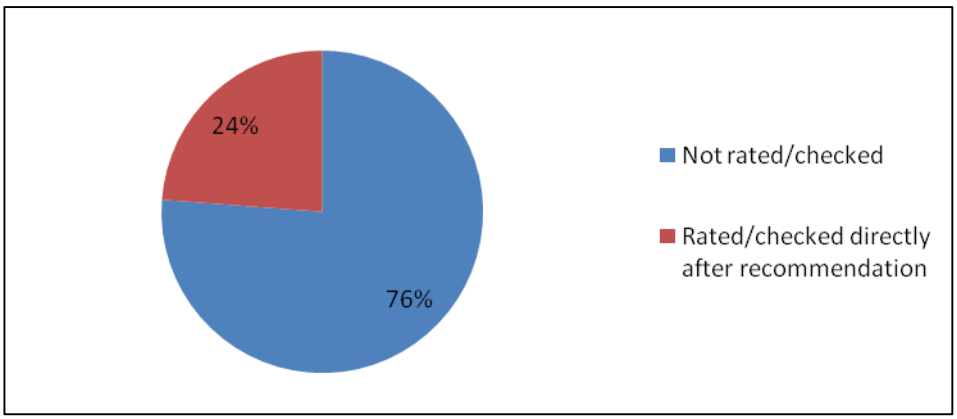


Figure 46. Successful recommendations

- At least 116 out of 189 recommendations resulted in “eventual” check-in or rating from the moment Fallas was recommended until the end of the event. At least 21 user eventually checked/rated to recommended Fallas.

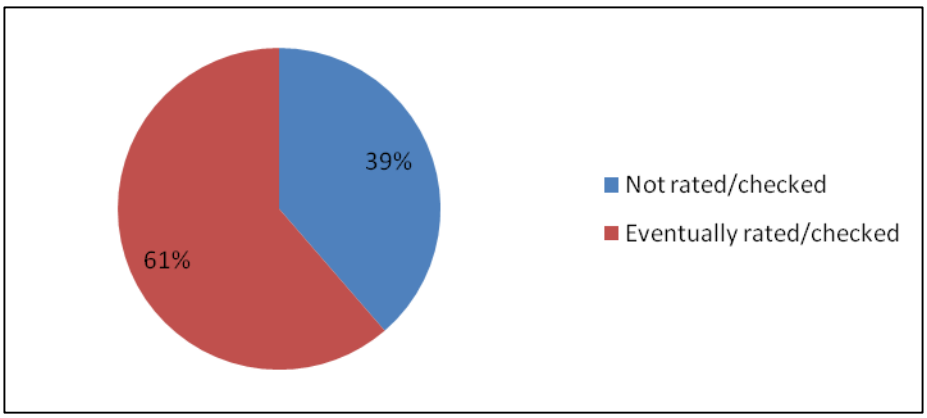


Figure 47. Eventually visited Fallas from recommendation

- At least 104 registered users requested Fallas recommendation at least once.

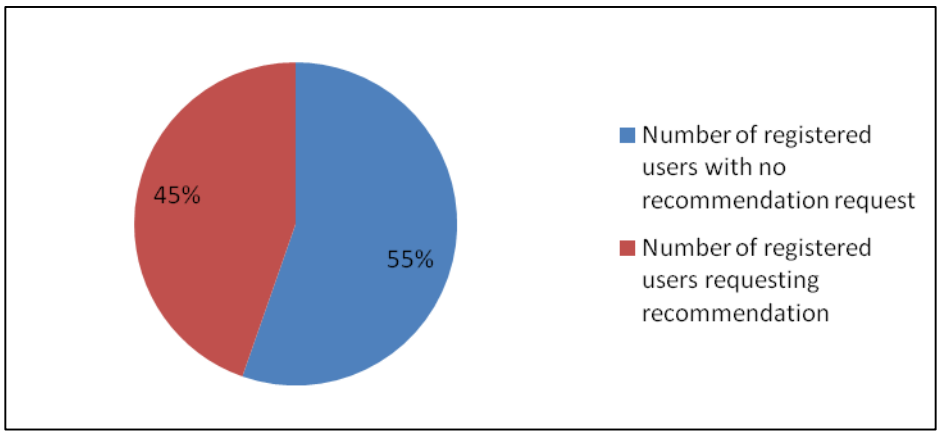


Figure 48. Fallas recommendation requests among registered users

- At least 76 users requested recommendation only once, at least 15 registered users requested recommendation exactly twice and at least 13 users requested recommendation at least 3 times.

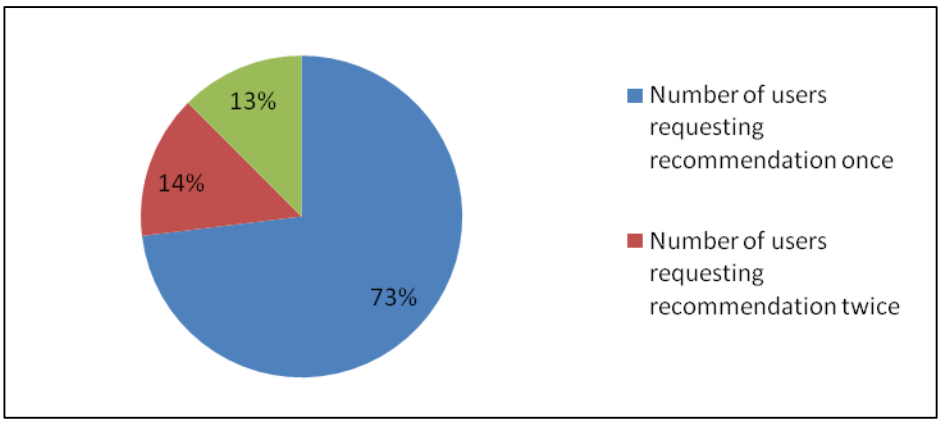


Figure 49. Number of Fallas recommendation requests from registered users who requested recommendation at least once

NOTE: We use “At least” expression in bullet points above because of the high number of unregistered users who requested Fallas recommendation (1000). Therefore we believe that it is very likely that recommendations to some unregistered user resulted in his/her registration (immediate or eventual check-in or rating) which would increase the number of successful/eventually successful Fallas recommendations and the number of recommendation requests among registered users.

2.3.7.4 - *User assessment*

The following user assessments have been collected:

2.3.7.4.1 - Google Play ratings and comments

149 ratings were made by App users, with an average score of **4,37**, which proves the success of the experiment.

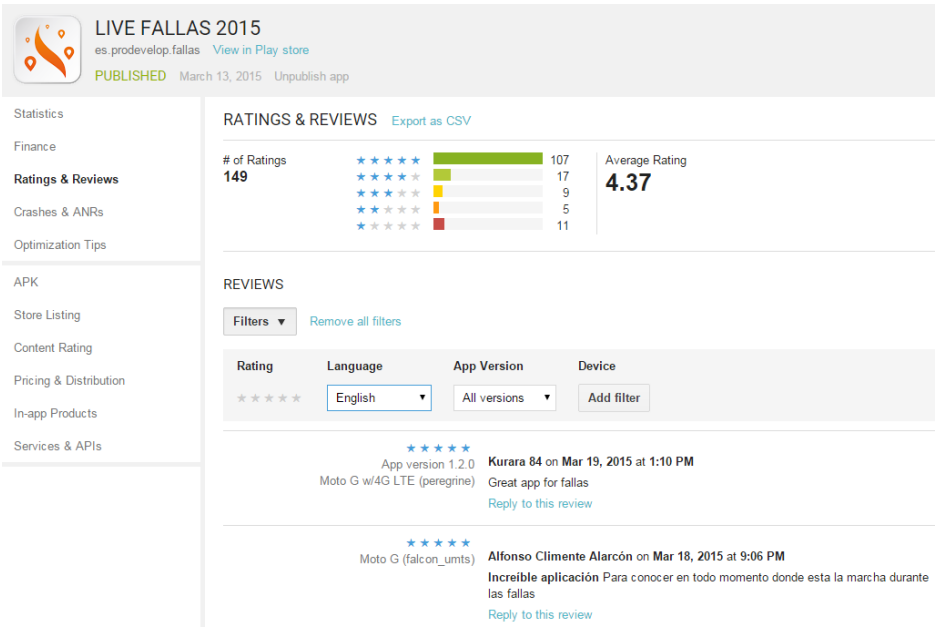


Figure 50. Fallas app. Google Play ratings

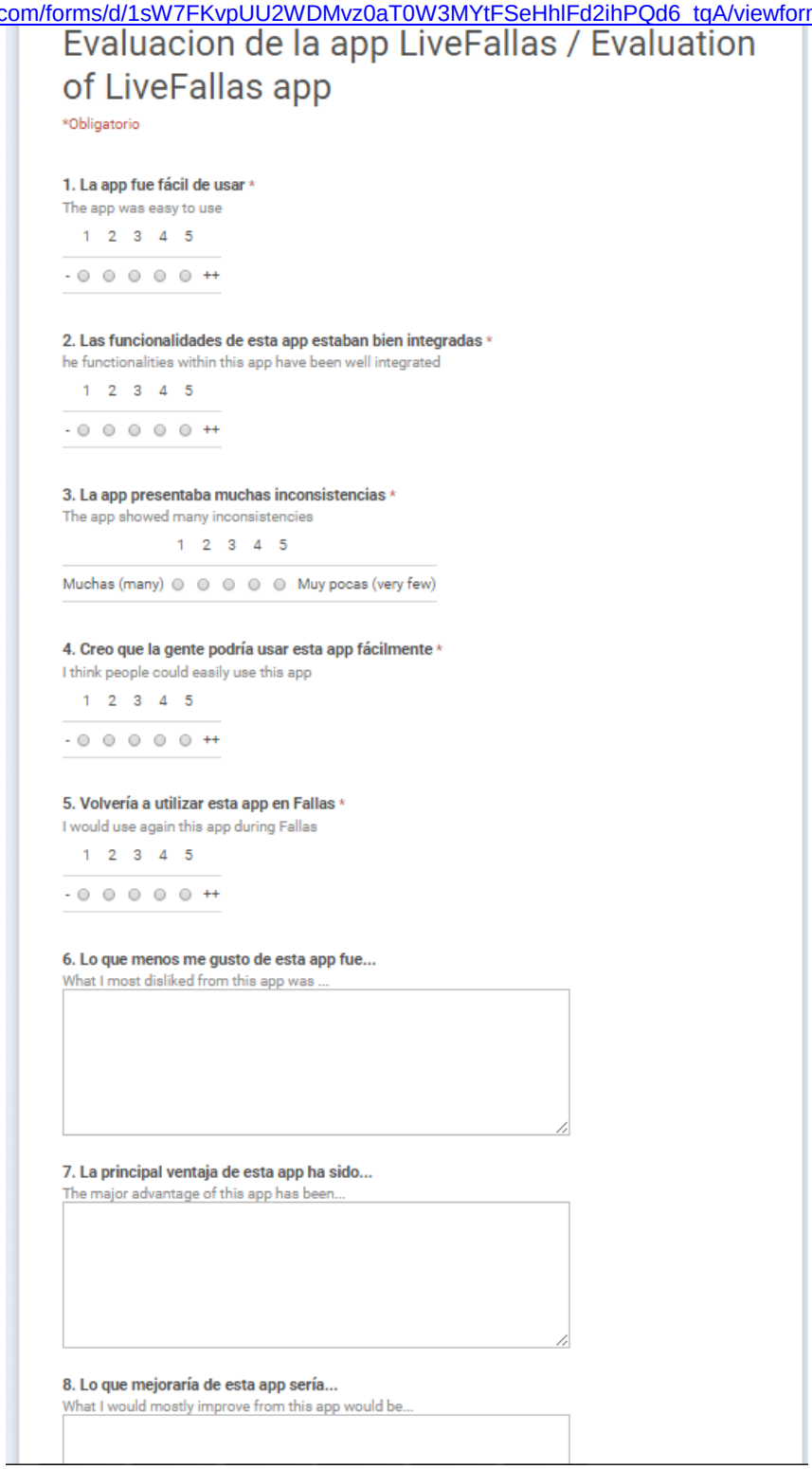
2.3.7.4.2 - App Store ratings and comments

No enough ratings were collected for App Store to make an average of the ratings.

2.3.7.4.3 - User survey

After the experiment was finished, a survey (developed via Google Docs) was sent to all the users that had actively participated with comments, ratings, photo uploading or check-ins within the App. The survey was very easy to fill to facilitate user feedback.

https://docs.google.com/forms/d/1sW7FKvpUU2WDMvz0aT0W3MYtFSeHhlFd2ihPQd6_tqA/viewform



Evaluacion de la app LiveFallas / Evaluation of LiveFallas app

*Obligatorio

1. La app fue fácil de usar *
The app was easy to use
1 2 3 4 5
- ○ ○ ○ ○ ○ ++

2. Las funcionalidades de esta app estaban bien integradas *
he functionalities within this app have been well integrated
1 2 3 4 5
- ○ ○ ○ ○ ○ ++

3. La app presentaba muchas inconsistencias *
The app showed many inconsistencies
1 2 3 4 5
Muchas (many) ○ ○ ○ ○ ○ Muy pocas (very few)

4. Creo que la gente podría usar esta app fácilmente *
I think people could easily use this app
1 2 3 4 5
- ○ ○ ○ ○ ○ ++

5. Volvería a utilizar esta app en Fallas *
I would use again this app during Fallas
1 2 3 4 5
- ○ ○ ○ ○ ○ ++

6. Lo que menos me gusto de esta app fue...
What I most disliked from this app was ...

7. La principal ventaja de esta app ha sido...
The major advantage of this app has been...

8. Lo que mejoraría de esta app sería...
What I would mostly improve from this app would be...

Figure 51. Fallas app. User survey

The number of answers was 125.
The results for the score answers are displayed below (for the translation of the questions see the form above):

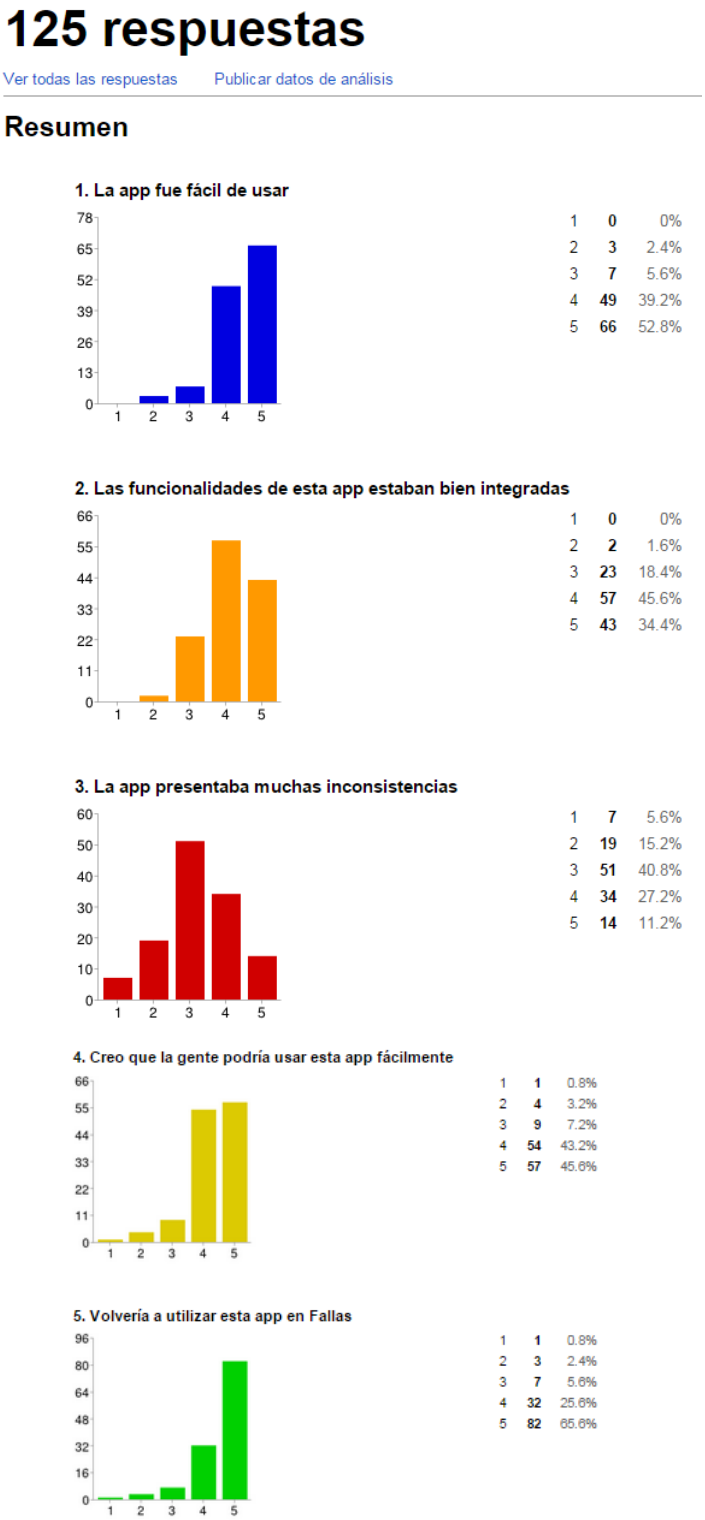


Figure 52. Fallas app. User survey results

The analysis of the results is very positive:

- 92% of the surveyed users think that the App was easy to use (4-5 rating).

- 80% of the surveyed users think that the functionalities had been well integrated (4-5 rating).
- 89% of the surveyed users think that the people could easily use this app (4-5 rating).
- 91% of the surveyed users think that they would use again this App during Fallas (4-5 rating).
- Only 38% of the surveyed users think that the App showed inconsistences (4-5 rating).

2.3.7.5 - *Awards*

On March 7th, 2015 the awards related to the Live Fallas competition were given. All registered users that filled the feedback survey were invited to come to the UPVLC's Grade Hall to share briefly with them the results of the app and give them a small gift: a USB battery charger that were left over from the Experiment in Rennes (Transmusicales).

Figure 53. Information poster and Prof Palau explaining Fallas results

The first three users that make more check-ins during the Fallas were given an iPad Air2 as gift, who were:

- Joseabelrodriguez21@gmail.com
- ssamuel@hotmail.com
- fuenmaria@yahoo.es.

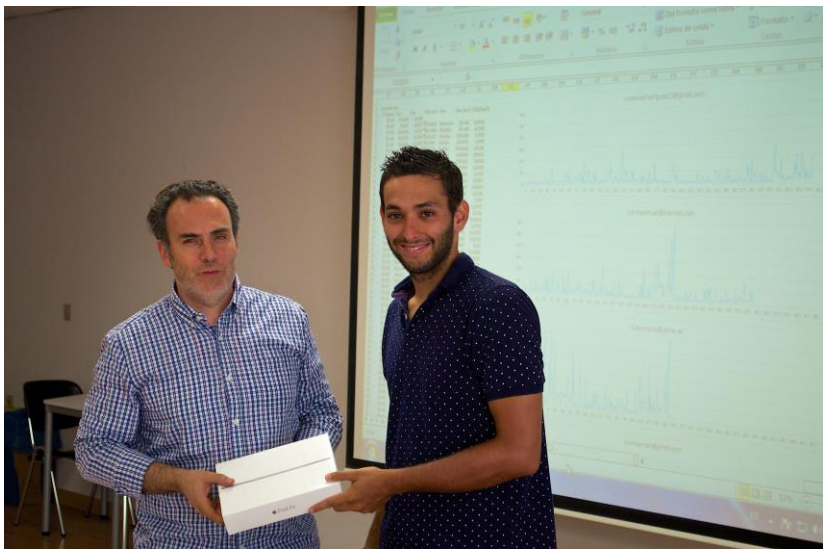


Figure 54. Prof Palau giving the iPad Air 2 to one winner

We took the opportunity to speak with them informally to get more feedback about the app. Most of them were quite happy; they have used it a lot and also wanted to show gratitude for building large scale experiments in research projects that are usable by normal citizens.

Figure 55. Common photo with all attendants

2.3.8 - Traffic observed during the experiment

In order to track the usage of the application, we used a web analytics platform named Piwik. Similar to Google Analytics, it provides different tools and options to analyse the traffic and generate different statistics.

2.3.8.1 - Total traffic observed each day

The number of visits received each day is calculated taking into account the duration of a session; when the user ends the session, this counts as a single visit. A session is considered to be ended when the user stops interacting with the application for 30 minutes or more.

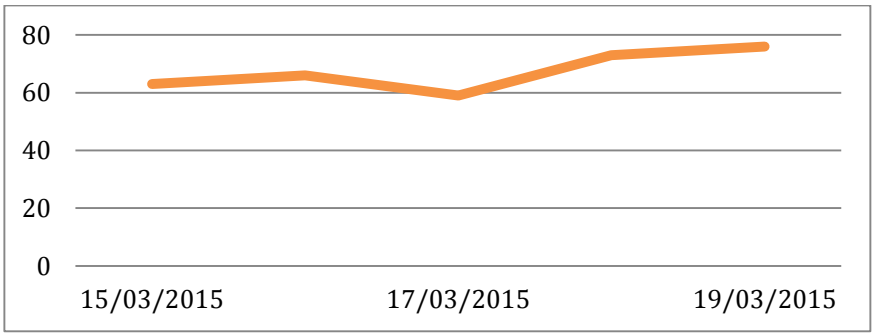


Figure 56. Visits per day

Piwik can be configured to track specific actions such as clicking a button, following a link, navigating through different sections and so on. Figure 57 shows the average actions performed each day by the users during an application session.

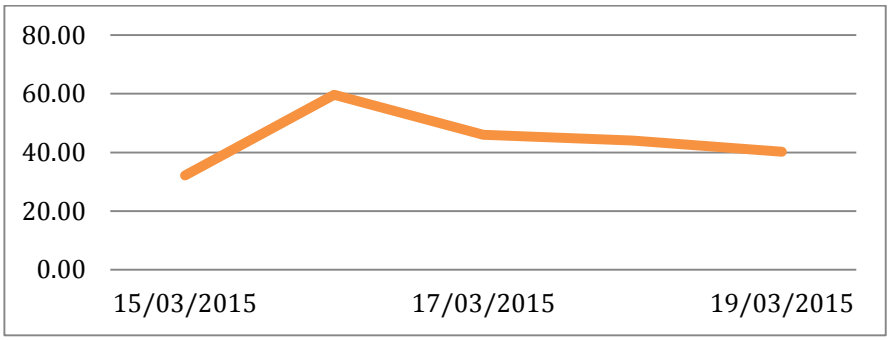


Figure 57. Average actions per visit

Although the number of visits each day provides useful information to track how many times the application is opened and used, the most relevant value refers to the time that users spent using the application. Figure 57 and Figure 59 show the total time spent in the application by all users each day, and the average duration of a visit. This information might be useful for advertisement and marketing companies (not the case here).

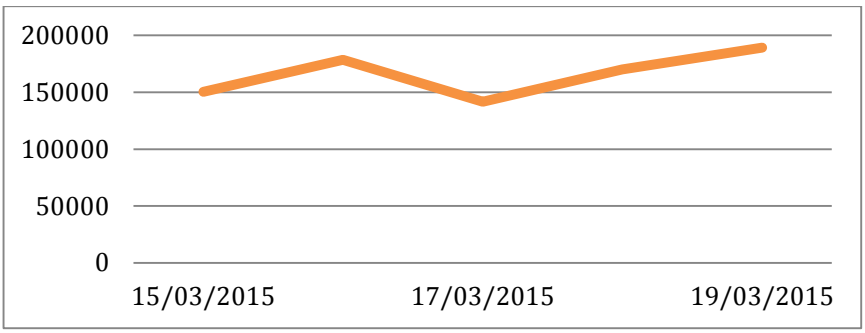


Figure 58. Total time spent by visitors (in s)

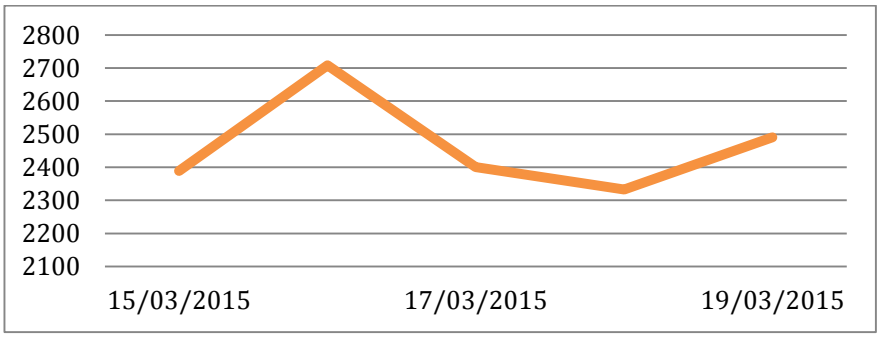


Figure 59. Average duration of a visit

2.3.8.2 - Mean traffic observed per hour

Piwik also provides statistics that show the mean usage every hour. The following graphs show the average number of visits and total time spent during a day. It appears that from 12:00-20:00 people are most active, which is in line with normal behaviour and events during the Fallas Festival.

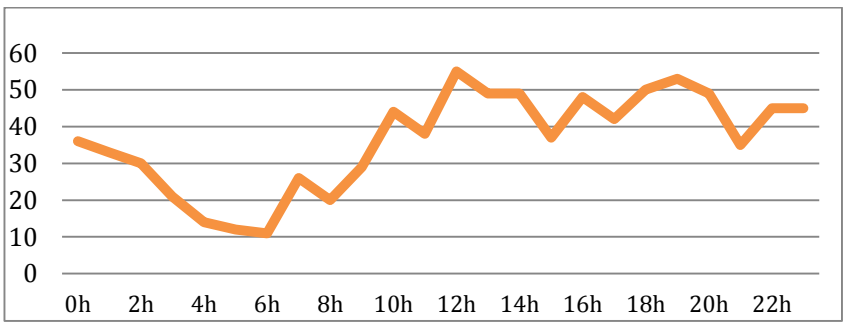


Figure 60. Average number of visits per hour

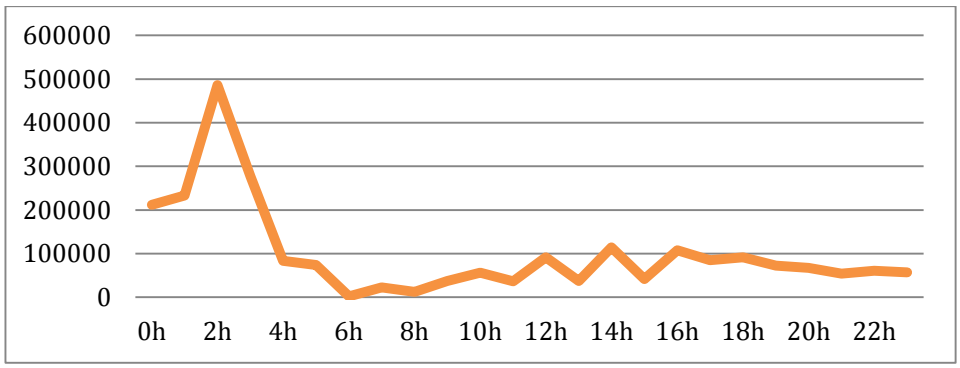


Figure 61. Total time spent by visitors

2.3.8.3 - Observed user interaction

We tracked specific sections of the application in order to know how interesting the different functionalities were for the users. The following graphs show the number of visits (visits are tracked in a 30 min window) received each section and the total events (number of times the users clicked to show the section). It is clear that people were mostly interested in getting details for each Falla, though they have used intermediate pages to get (Falla-Menu-filter) to it. Events (Agenda-List) also seemed to be interested for users.

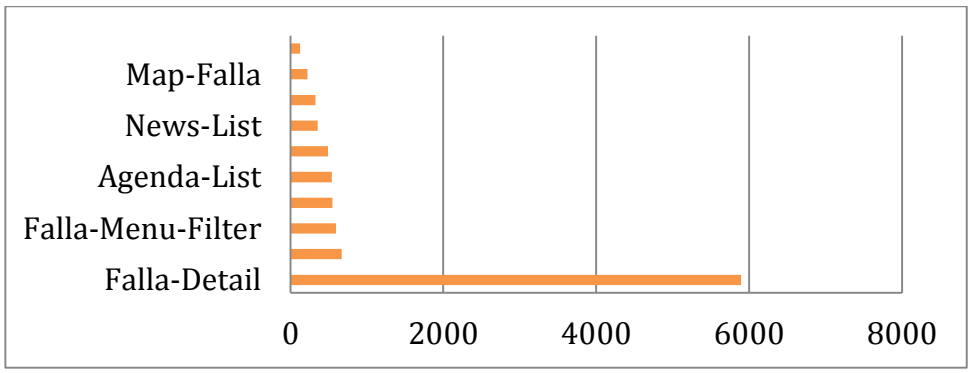


Figure 62. Visits per main app pages

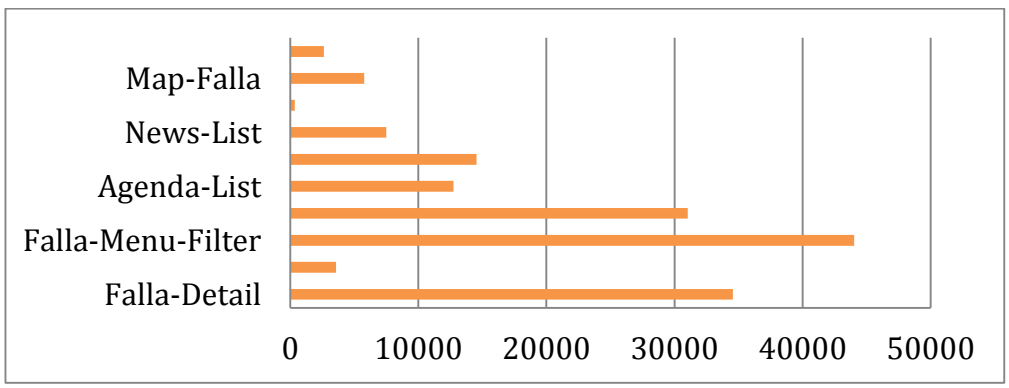


Figure 63. Total events

2.3.9 - Summary of findings and evaluation

The Fallas experiment has been a great success. It engaged more than 8000 users and it was on the top places at both Android and IOS marketplaces. The general assessment of the Live Fallas app is really good, and most users who provided feedback were really happy with the app.
However, the provided functionalities of the app can be enhanced for the upcoming years.

Function "Fallas"
This is the most used functionality in the app, and most users (both registered and unregistered) used it to get Fallas details about particular Fallas.

Suggested improvements:

- By tracking the user position it could be possible to know whether the requested information about a particular Falla resulted in the visit to this Falla in the next hours;
- Show more information about the awards given to « Fallas infantiles », as some Fallas compete to awards under different categories;
- Add official photos from past years.

Function "Events"
This function just presented in an easy way all official events related to Fallas, which can be easily read and located.

Suggested improvements:

- Include another section related to non-official (local) events, such as small concerts.

Function "News"
This function presented all news that related to a particular Falla. The interface was easy to use, and all local RSS feeds where analysed.

Suggested improvements:

- Improve the RSS analyser to better match news with Fallas;
- Engage 'casales' to provide local news about their own Falla in order to attract people.

Function "Activity maps"
This functionality is probably the most innovative one as it allows to make interesting analysis with geolocated social network information, building real- time heat maps in order to know the most/least activity areas in whole city of Valencia. As we tracked the whole day, we could also establish the transitions from one zone to another, and correlate it with special events, either related to Fallas or not (e.g. football match).

Suggested improvements:

- Improve the social network inspector to better differentiate between social items related to Fallas.

It is important to stress that the success of the app was not only assessed by the FiContent2 partners, but for the city council and other entities. In fact, we were invited to present the Fallas app as a successful story in two local events at the Universitat Politecnica de Valencia:

- FIWARE hack4Good: academic presentation for students and researches (April 17-19);
- Valencia smart City: official presentation for politicians and researchers (April 16).

2.4 - Scenario 2: "Tenerife Transit Experience" (May to September 2015)

2.4.1 - Scenario description

MTSA it is a rail transport operator on the island of Tenerife and its app VIA-MOVIL has been a major technological step in the public transport.

One platform scenario (see deliverable D3.1) has been considered in the experiment:

- Transit Experience Scenario.

Two SE has been integrated:

- FUSION ENGINE from UPVLC (FE SE);
- POI-PROXI from PRODEVELOP (POIProxy SE).

And one GE from FI Catalogue has been also used to improve POIs features:

- POI DATA PROVIDER GE (POI-DP).

In the base of that experiment there is a new beacons network based in BLE technology which allows bringing new geo-localized services. The mobile application collects the BLE beacons data and sends them to the central platform. The server side selects the user experience to send back to the mobile according to the user profile and the beacon detected.

The experiences received combine geo-localized dynamic data (stops, tram, line and direction) and transit service information (offers, incidences in the line, transfers between lines, POIs in the city, special events, etc.).

An important target group of this experiment is visually impaired people. The system will be able to send a message when it detects the arrival to a stop, reporting the stop name and the next tram arrival time. Even the system can propose him/her to validate the trip if is detected inside a tram.

Also, the system can provide useful information of fraud estimation and transport demand (by origin-destination) for internal management of the operator and the relevant public office.

The architecture is depicted in figure 64 where the different enablers are in green:

- The FE SE is able to fusion data from multiple data sources and generates one single POI repository;
- POIProxy SE obtains data from social networks and local RSS news;
- The POI-DP GE is able to provide storage information related to our locations, serve queries by location and other criteria;
- The SDK for Bluetooth 4.0 allows to detect the beacons installed in each stop and inside the vehicles;
- VIA-MOVIL and Experience Servers will handle all the new experiences and services integrated with VIA-MOVIL features.

The different enablers are integrated following the next diagram:

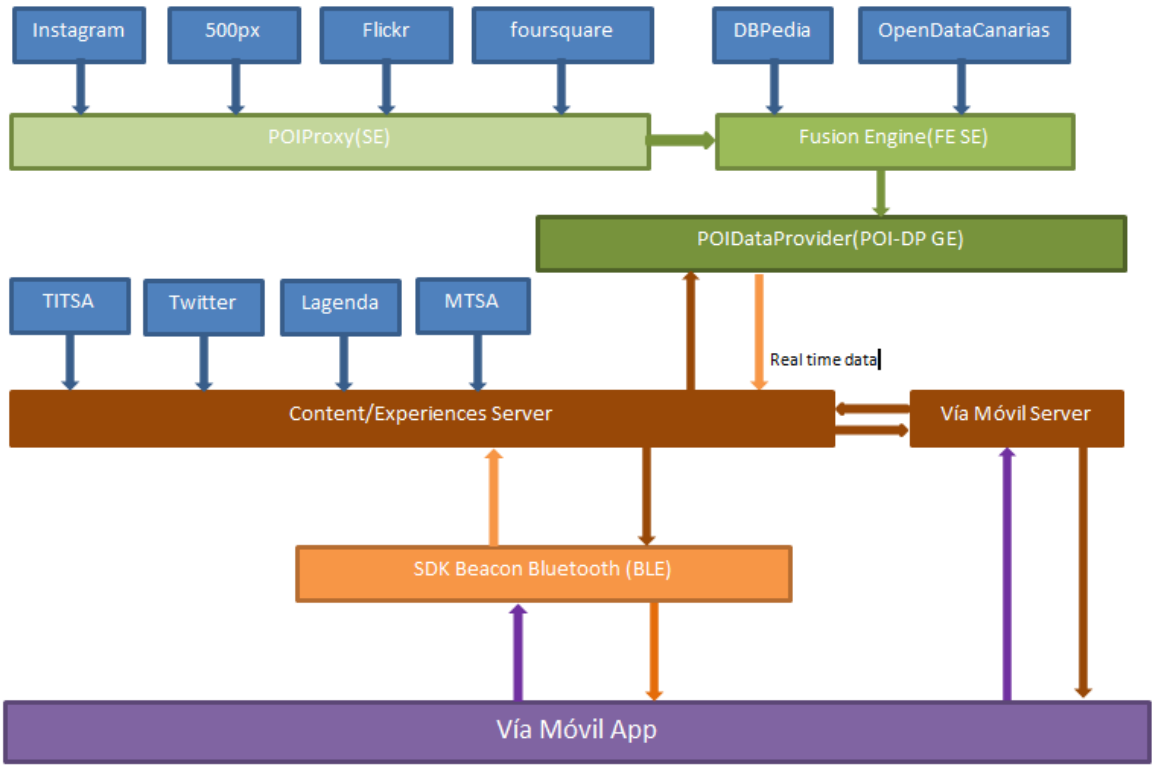


Figure 64. Transit Experience general architecture

The new services have been published to users through subscriptions to different info channels. The user who wants these new services has to be registered (subscribed) in these channels, and the others still use the app as always.

The information from the different POIs collected and registered through the SEs and GE will be presented in a channel called 'Close to Me'. If the user subscribes to this channel, the POIs that will be displayed at each moment in the app depends on the tram stop where it has been localized by the BLE beacon and the SDK running in the app. In this way, as user move forward in the line, the showed POI info is automatically updated.

The others channels work in a similar way. The information from events, transport or tram service should be accessed through a channel subscription.

2.4.2 - Test objectives and expected outcomes

The purposes of this experiment are:

- Show the viability of a network of BLE beacons that will serve, in addition to integrate them with the Via-Movil MTSA ticketing system, as support for an initial portfolio of services;
- Evaluate the operation of a POI service integrated by POI-and FE SE features and how it fits in a real transport environment;

- Evaluate a way to provide dynamic information (audio, vibrations) for the visually impaired to facilitate their access to the transport service (location of fundamental elements, adapted sales system, special announcements, etc.);

- Improve the app relaying on the feedback of real users. This includes new releases (updates) of the app in marketplaces;

- Evaluate the information on transport demand (by origin-destination) for internal management of the operator and the relevant public office.

The expected outcome was an informed understanding of how the features worked fine in practice and feedback on how they could be improved in the future.

2.4.3 - Description of tested application

During the experimentation, the mobile app included the following services:

- Info Channels: specific information channels that user needs to subscribe to receive information. These are the channels:
    - ***Close to me*** (Cerca de Mi): information from POIs detected during the trip. The app detects in which stop is the user in every moment and show the POIs around it;
    - ***Free Time*** (Ocio): information about events and happenings to take place in the next days;
    - ***Family Time*** (Familiar): information about events addressed to children and families;
    - ***+Accessible*** (+Accesible): information from tram service addressed to blind or reduced mobility people. For example: what is the name of this stop?, when does the next tram arrive?, Is there any incident in the line?, where does this tram go?
    - ***Transport*** (Transporte): information during the trip regarding correspondences and available transfers with bus lines or next departures.

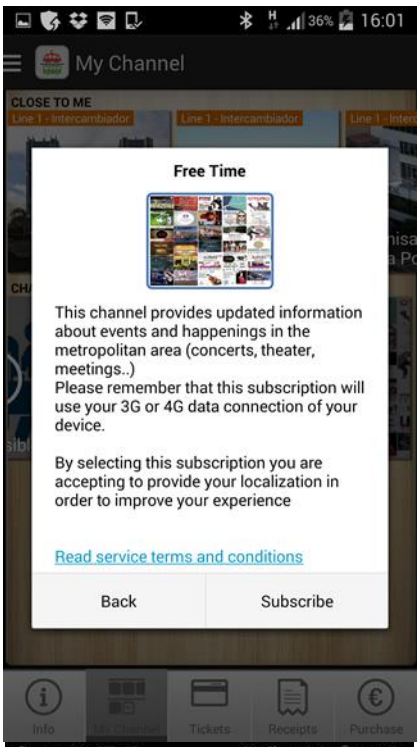
- Exclusively for visually impaired people, disabled, or with limited mobility, it is possible to validate the trip without reading the QR sticker. Users who want this option should apply for it in advance and MTSA will study each case and activate it just for them.

- For all users (it is not necessary a subscription), it is possible to send an alert message informing about delays or incidents in the line.

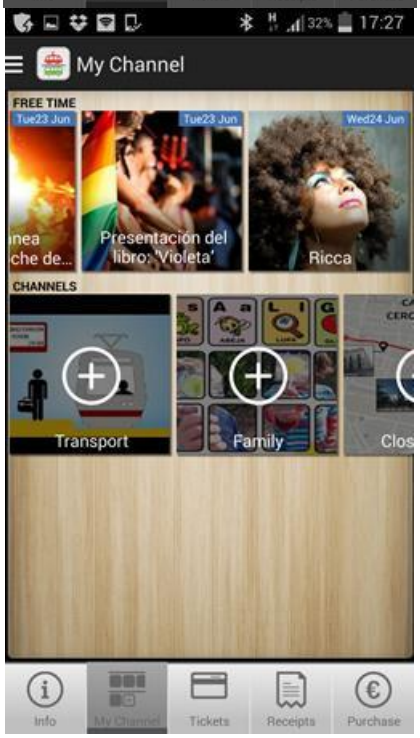
Some useful screenshots are displayed below for a better understanding:

Subscription to channels from SLIDE Menu

Subscription to channels from MY CHANNEL Menu. Pressing (+) the subscription is selected



Example of Subscription to 'Free Time' channel



List of events ordered by date in Free Time Channel

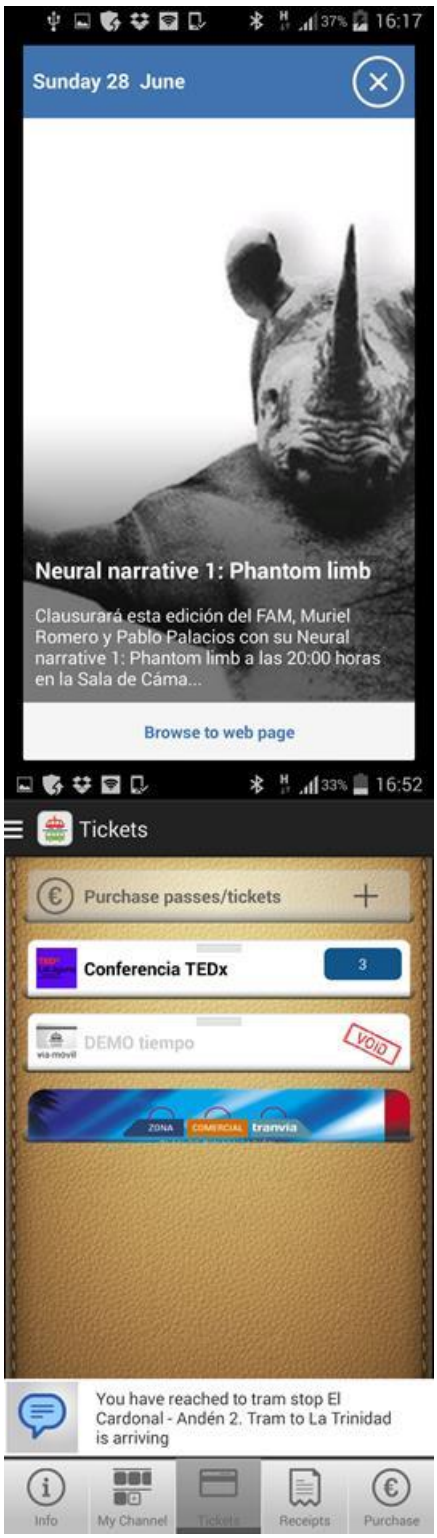
List of POIs between stops 'INTERCAMBIADOR' and 'FUNDACIÓN' in Line 1

After the trip validation in a certain stop, POIs that belong to this stop are displayed automatically in the channel interface.

Pressing (-) in the channel the subscription is unselected

Detail of a family event

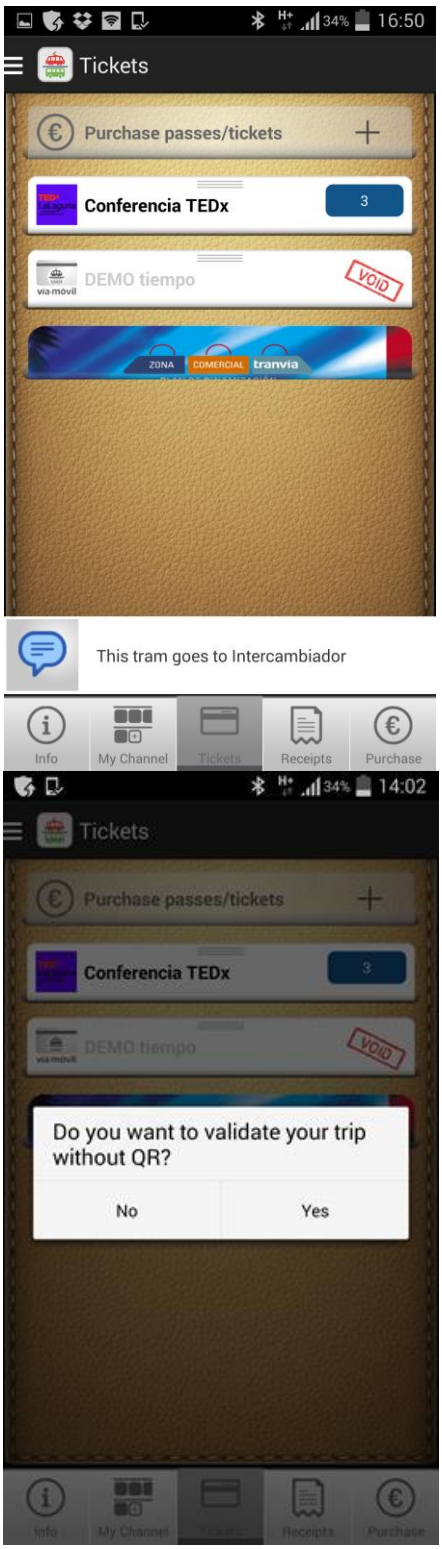
The user can reach the source page to get further information and leave VIA-MOVIL app by pressing 'Browse to web page'



Detail of a Free Time event

The user can reach the source page to get further information and leave VIA-MOVIL app by pressing 'Browse to web page'

Sample message of an arrival to a stop and when next tram will arrive. The message comes up automatically when the user is subscribed to the +Accessible channel



Sample message when the user is in a tram. The message comes up automatically when the user is subscribed to the +Accessible channel

Message inviting to validate the trip without reading a QR code. This message will be displayed after select the pass and pressing 'TRAVEL'.

This feature will be only available for a group of users previously selected by MTSA

Sample of transport message displaying transfers available on bus operator (TITSA) and tram in a certain stop
The message comes up automatically when the user is subscribed to the Transport channel

Alert message sent to all users detected close to a stop or inside a tram

Figure 65. New features included in Tenerife mobile app

The summarized list of functionalities available through the app is the following:

- Select the channel to subscribe (showing some information regarding to the channel);
- Display the POIs around a stop and browse among them. During the trip the user can check the POIS of next stop;
- Display the events and browse among them. Permits retrieve more external info from the source;
- Display the bus stops around the user and show correspondences, available transfers and next departures;
- Display service messages regarding to the stop where the user is waiting or regarding the tram is arriving;
- Play these service messages;
- Allow trip validation without reading QR sticker.

2.4.4 - Application of user centric methods and evaluation tools

From early stages of the project, MTSA has been searching for contents sources to be included in the info channels. Several collaborations have been set up:

- Collaboration with Open Data Canarias Portal for accessing POIs and transport information;
- Collaboration with Open Data Santa Cruz de Tenerife Portal for accessing POIs and transport information;
- Collaboration with the Tenerife Island Government Tourism Portal;
- Collaboration with LAGENDA Portal to retrieve events information;
- Collaboration with TITSA (bus operator) to get online data traffic data;
- Collaboration with ONCE (National Organization of Spanish Blind) in order to have testers to experiment the new features addressed to this group.

Before starting the development, MTSA and the different collaborator entities had some technical meetings in order to agree the final format and synchronization processes.

It is important to understand that Via-Movil is already a widely used app, so the new features should be compatible with the actual purposes and should be framed in the real use, that is, a transport app which allows trips purchase and validate. For this objective, many internal meetings took place with Commercial and Marketing departments in order to get the best integration without change the main handling and usability; and to plan how to make public these new services.

Several internal versions were developed and tested before producing the official update at the beginning of May. This allowed testing not only the new features but how it fit into the app. Various methods have been used:

- Direct information from Via-Movil Server: we know exactly how many users have been subscribed to each channel (and unsubscribe) and how many synchronizations (uses) have been produced to each source;
- Internal review: Several MTSA employees and ‘friendly’ users were asked to test the app and give their opinion, in order to catch fast feedback;
- An online questionnaire was submitted to users through experimentation period to collect user feedback. This questionnaire integrates questions to evaluate the user experience in term of usability; attractiveness and appearance;
- As some of the new experiences are addressed for visually impaired people, two people from this group have been chosen to provide this specific feedback;
- Social Networks;
- Android Platform: Users can send their opinion through Google Play, they also send us debug reports in case of an app unsolicited exit. Another way is by Google Groups, where they can start new themes or comment previously created ones.

User's feedback results are shown at point 2.4.10 of this document.

2.4.5 - Planning and running the trial

The experimentation takes place from May 25th and is still running. During experimentation, only selected users were invited to update the app and use it in the tram, but if these new services are well received MTSA will open them to all users in the next months (fall 2015).

2.4.6 - Recruitment: number of experimenters, targeted end users, criteria

User recruitment was done following the next criteria:

- Last Via-Movil version installed;
- Frequent Via-Movil users (at least four trips per week in the last month);
- Device compatible with Bluetooth 4.0 (Via-Movil already registers the smartphone type).

As mentioned, two blind people were directly selected to test specific visually impaired features.

As the new features are included in a Via-Movil update, the new one was published in May 6th in order to have enough time to get a wide deployment:

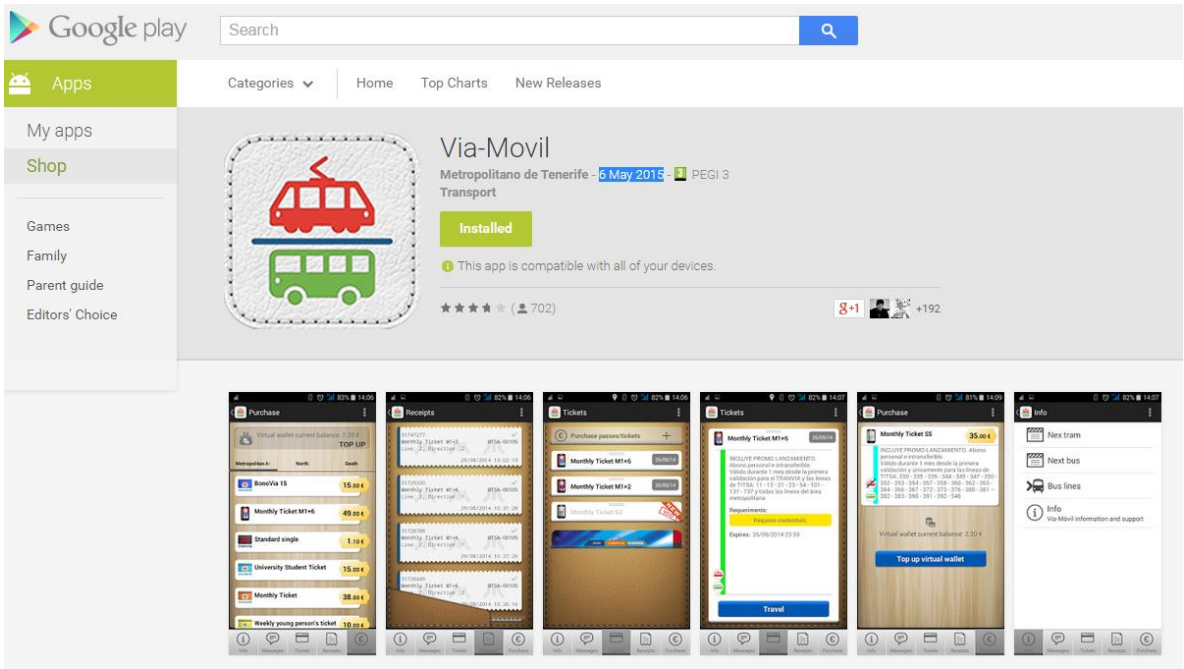


Figure 66. Google Play Market (Via-Movil)

All the new features were initially disabled, and they will be only activated for selected users from the start date (May 25th).

As it can see in the next figure, the deployment of this new version (15050403) was very fast:

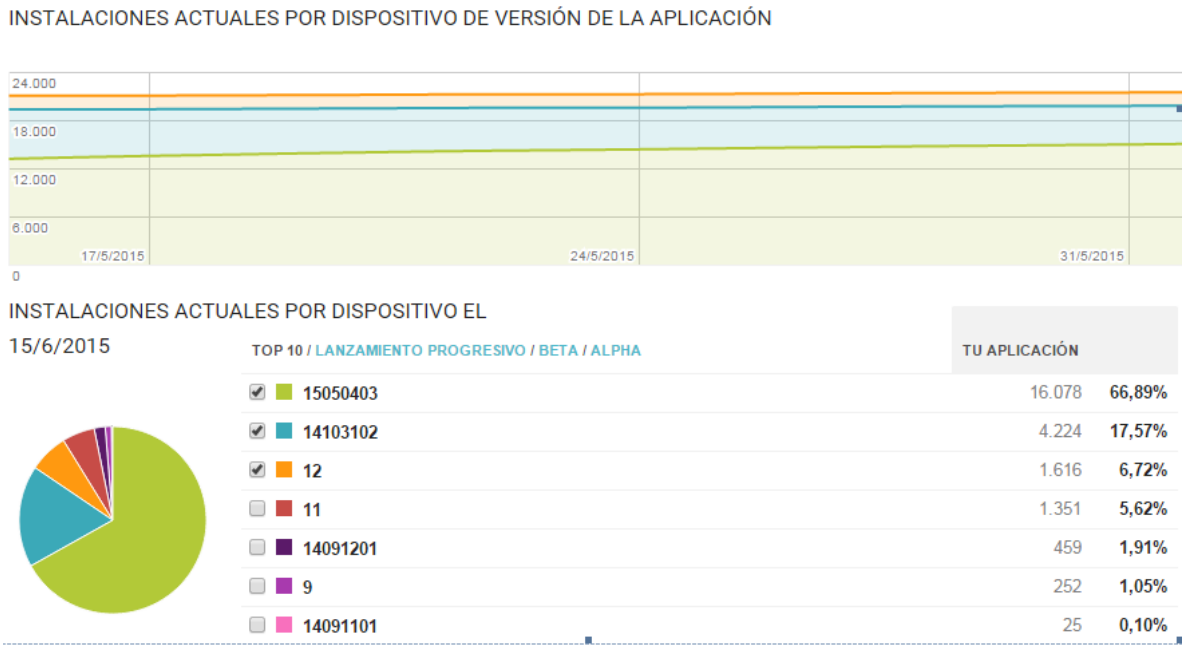


Figure 67. New version deployment

Once the new version was liberated, MTSA started the user selection according to the mentioned criteria:

1. Last version installed till May 25th: **16.078 users;**
2. Frequent Via-Movil unique users: **5.034 users;**
3. Device Bluetooth 4.0 compatible (main marks as Samsung galaxy S4, S3, Note 3 and Sony Xperia Z1): **6.136 users.**

Merging these three criteria, **3.025 single users** were candidates to be invited to use the new Via-Movil version. This invitation was performed through Google Groups functionality.

In order to maintain a controlled test environment the invitation was sent to 100 of selected users every week, with the objective of reach 150 users using the new functionalities.

Taking into account that only 40% (estimate) of the invitation were accepted and the user finally used the features, we have sent the following invitations with these major results:

Week	Users invited	Users that have accepted	Users subscribed to one or more new channels
May 25th	100	55	31
June 1st	100	64	35
June 8th	100	71	44
June 15th	100	66	47
TOTAL	**400**	**256**	**157**

Table 3 Users recruitment at the Tenerife Experimentation

Down below there is an example of email submitted, inviting to become part of the experiment:

Bienvenido al grupo de Beta Testers de Vía-Móvil Inbox x

informatica@metrotenerife.com via googlegroups.com 10:57 (46 minutes ago)
to tranvia-testers Unsubscribe

Spanish › English Translate message Turn off for: Spanish ×

vía-móvil Tenerife

Estimado usuario de Vía-Móvil,

Disculpa que te molestemos, te hemos incluido en el grupo de Beta Testers de Vía-Móvil para que puedas probar la nueva versión que vamos a lanzar en unos meses. Esta nueva versión incluye muchas mejoras como:

- Se mejora la comunicación con el usuario pudiendo recibir información casi inmediata sobre incidencias
- Nuevos canales de información que te podrán ser muy útiles durante tu viaje: un canal de transporte con información online sobre transbordos con TITSA en función de la parada en la que estás, un canal de ocio para que estés enterado de los próximos eventos y puedas planificar tu tiempo libre, y otro de sitios de interés alrededor de nuestra línea que te permitirán localizar y llegar a cualquier sitio fácilmente.

Hemos querido probarla primero con un grupo reducido de usuarios. Te hemos elegido porque usas la aplicación con cierta frecuencia y tu teléfono soporta la versión de Android adecuada.

El siguiente link te llevará hasta Google Play donde podrás aceptar ser Beta Tester de Vía-Móvil y, a continuación, te ofrecerá un link para que descargues la actualización de la aplicación:

https://play.google.com/apps/testing/com.metrotenerife.viamovil

Recuerda que es una versión de prueba, bastante avanzada y casi definitiva, pero puede tener algún error. Nos gustaría que nos comentaras qué te parece y si cambiarías algo. Después de usarla, te enviaremos una encuesta para que nos digas qué te ha parecido, si nos respondes entrarás en **el sorteo de un iPad Air 2**.

Si no quieres participar, puedes darte de baja como miembro del grupo de Beta Testers de Vía-Móvil en el link al pie de este correo.

Saludos,

El equipo de desarrollo de Vía-Móvil

Figure 68. Email sent to the target group

Traduction into English:

Dear Vía-Móvil user,

We have included you in Via-Movil Beta Testers group so you can preview and test the new version that will be launched in a few months. This new version includes many enhancements such as:

- ***Improved communication** so you can receive almost immediate information on incidents and issues;*
- *New **information channels** that may be very useful during your trip: a transport channel with online information on TITSA transshipments depending on the stop where you are, an entertainment channel to keep you aware of upcoming events allowing you to plan your free time, and other sites of interest around our tram lines that allow you to locate and reach any place easily.*

We wanted to test it first with a small users group. We've chosen because you use the application frequently and your phone supports the proper Android version.

The following link will take you to Google Play where you can accept being Beta Tester Via-Movil and then is provided a link for downloading the application update:

https://play.google.com/apps/testing/com.metrotenerife.viamovil

*Remember it is a trial version, quite advanced almost final, but may have issues. Any comments will be welcome: your experience, what you think and if you would change something. After use, we'll send you a survey about your experience using the app, answering you can participate in **a draw for an iPad Air 2**.*

https://play.google.com/apps/testing/com.metrotenerife.viamovil

If you do not want to participate, you can unsubscribe as a member Via-Movil Beta Testers group in the link at the bottom of this email.

Greetings,

The Via-Movil development team

Web page

The main Web page included was modified for those willing to get more information about the new features. It was placed on: www.metrotenerife.com and www.via-movil.es

Figure 69. Web page and banner to invite to the experimentation

Additionally, the following internal marketing activities were performed to reach the maximum number of users:

Inapp message

Several messages were sent to the target group through the app (Via-Movil has an internal messaging service). Of course for those who wanted to become a tester were included in the experiment.

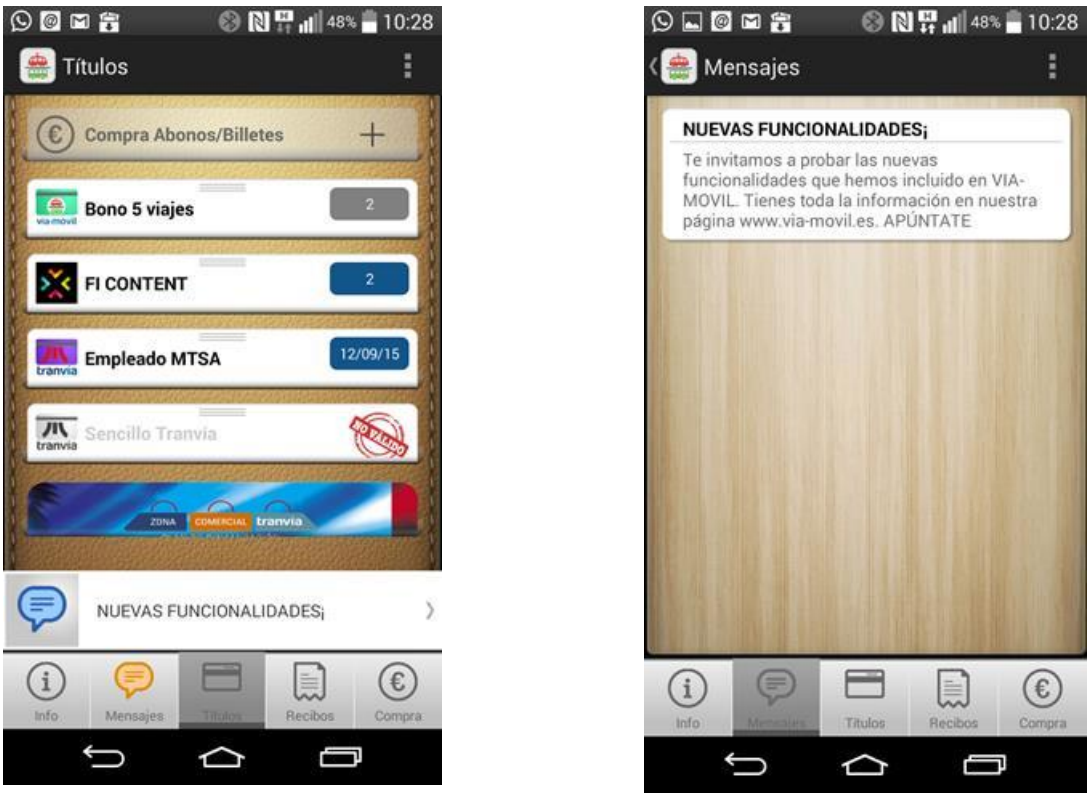


Figure 70. Example of VIA-MOVIL message to invite to the experimentation

Traduction into English:

NEW FEATURES¡
We invite you to test the new services we have put in place in the new VIA-MOVIL version. You can check all info in our website: www-via-movil.es. SIGN UP.

Inapp advertisement

Also, a campaign of several advertisements was performed to the target group. This ad appears when the user proceed to validate the trip (Via-Movil also has a campaign functionality).
This campaign was also shared with the testers to remember them to use the different channels.

Figure 71. Example of VIA-MOVIL ad campaing

Dissemination through Facebook and Twitter

Using our Facebook and twitter profiles, MTSA has announced the new services in order to get new testers.

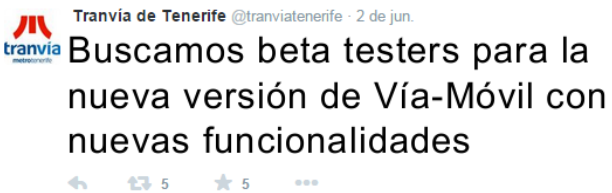


Figure 72. Example of twits and post

Advertisement on trams and stops

An advertisement campaign was performed during these months. Actually the campaign is not related with the new services (because the experimentation is closed to the tester group), but only Via-Movil. Anyway, this is a manner to get more users that could become a tester during next weeks.

Figure 73. Ads in tram and stop

2.4.7 - Devices and SIMs cards, network

Regarding the technical infrastructure used for the Tenerife Experiment, MTSA have mainly used the infrastructure already in use for provide VIA-MOVIL system. Those servers are hosted in MTSA Data Center and run on VMWare infrastructure. POI-PROXY SE and FE SE was also support from UPVLC site, and POI-DP GE was installed in a virtual machine hosted in MTSA Data Center.

The test users have used their own devices and data connection.

The different infrastructures to run the experiment are depicted below:

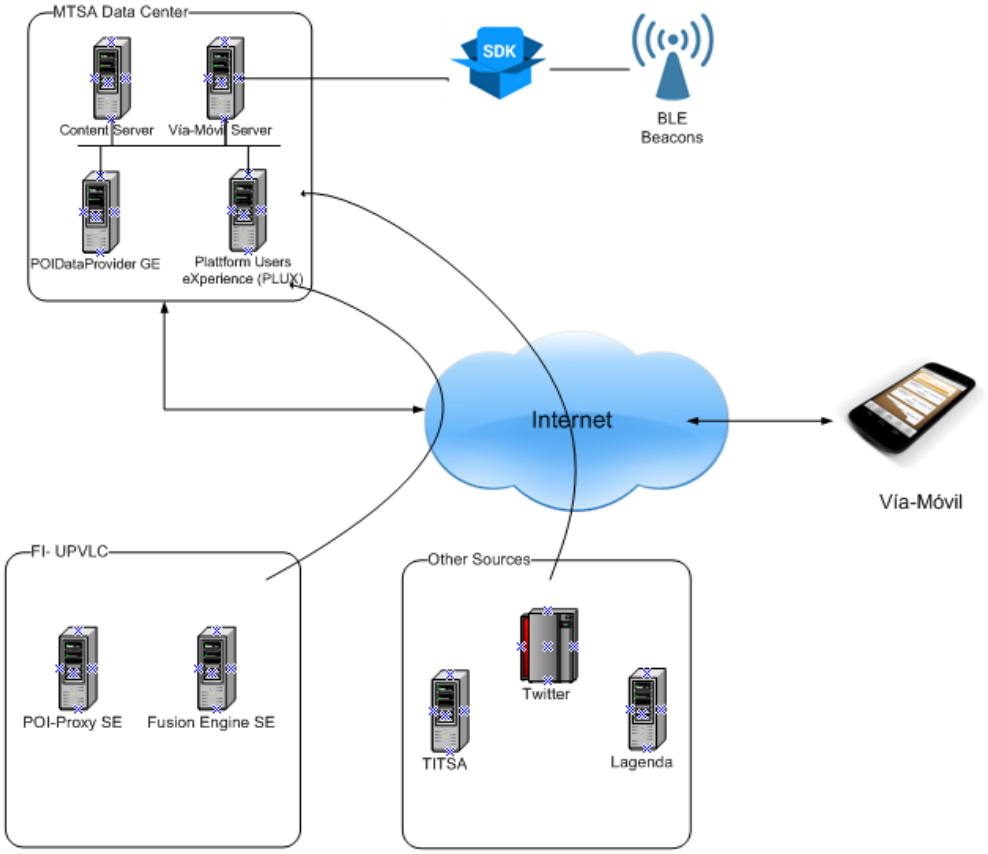


Figure 74. Technical infrastructure for the Tenerife Experiment

A very important part of the infrastructure for this experiment is the BLE beacons network. MTSA has installed:

- Two BLE beacons in each stop,
- Three BLE beacons in each vehicle.

A total of 128 beacons are installed and ready to be detected by the SDK running in the app.

The BLE beacon technical specs can be found in this link: http://wiki.aprbrother.com/wiki/ZeroBeacon301

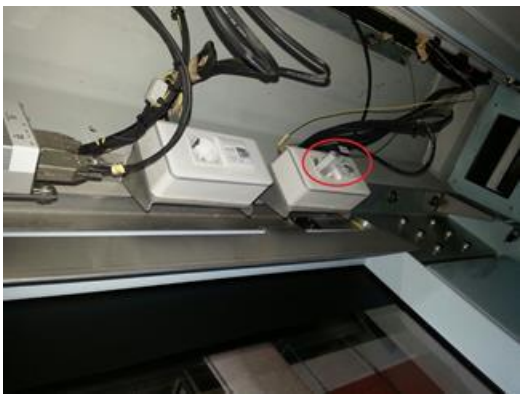


Figure 75. Examples of beacons installation in trams (inside the cover) and stops (in the stop rack)

2.4.8 - Data collection and ethical issues

Test users are already registered users, so at the time of registration they have to accept the terms and conditions and privacy issues according to Spanish laws (http://www.via-movil.es/en/ option LEGAL ADVICE).

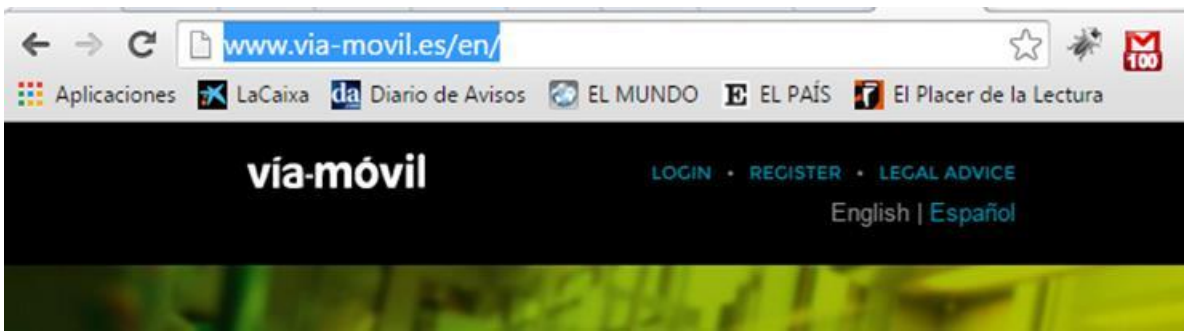


Figure 76. Link for Terms and Conditions in Via-Movil web site

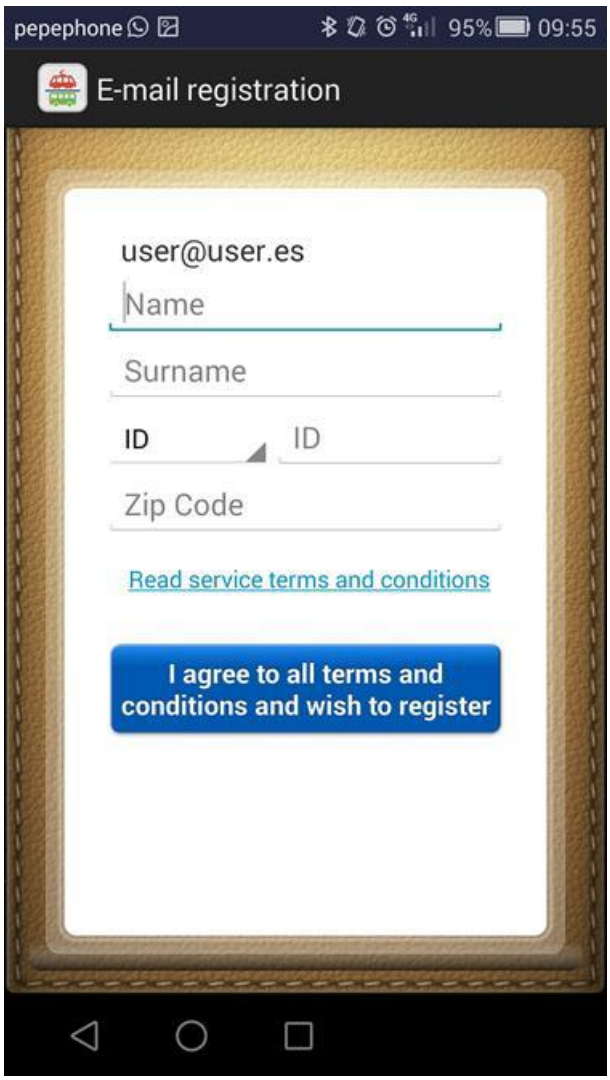


Figure 77. Registration's step in which the user should accept Term and Conditions

All the personal information provided and collected was kept in a secure file according to the applicable data protection regulations.

The questionnaire responses will be given just with email in order to make the final draw and for informing about the winners.

2.4.9 - Empirical findings and evaluation

Final number of test users

After the invitation mail and the others campaigns already described, the number of test users raised to 175 (**figures of June 17th**). Two of them are visually impaired collaborators.

App evaluation

The integration of new these features did not disturb at all the normal transport usage.

A new menu option was included to show the new information channels allowing their management (subscribe and unsubscribe).

The integration of new features did not disturb at all transport usage.

Service evaluation

We don't have experienced any problem during experimentation period.

The next figure shows the CPU load for Platform Users eXperience server (PLUX). As expected, there are some peaks at certain remarkable dates, like Friday night, and a fall down when the tram service is not working.

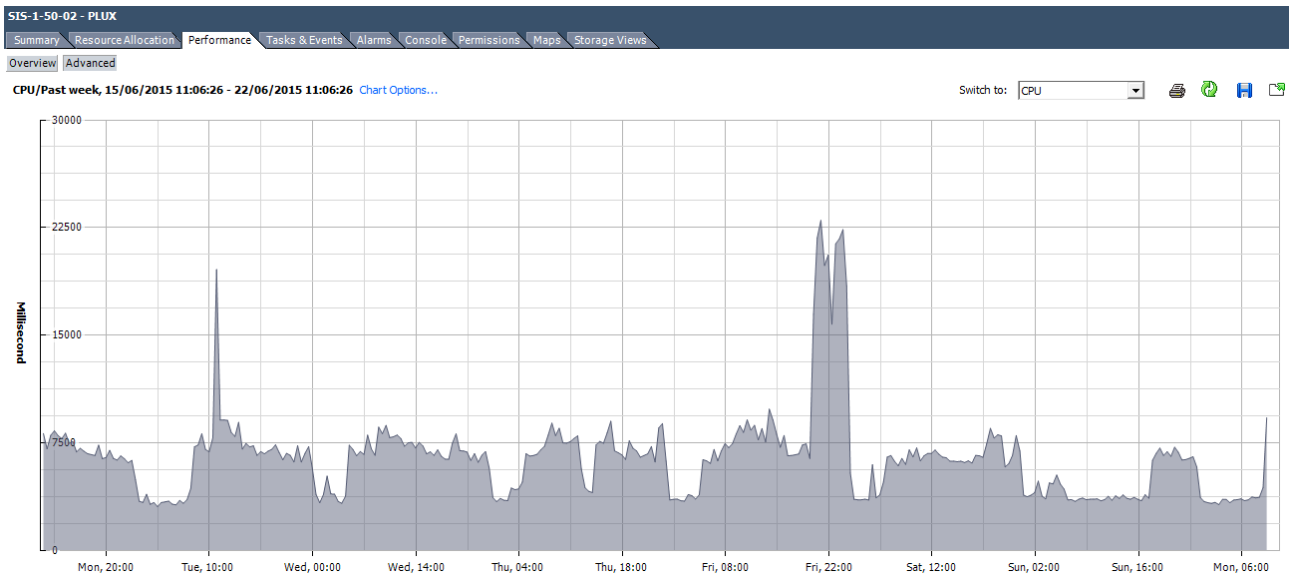


Figure 78. CPU monitor of Server Experiences

User experience and evaluation

The evaluation will do it from two points of view *(see Users feedback point at 2.4.10)*:

- Via-Movil user records: channels subscription, experiences performed and others related statistics;
- Feedback questionnaire.

VIA-MOVIL tracks the user behavior so we can take out interesting results:

Channel	Subscribed Users
Transport	158
FreeTime/Family	149
CloseToMe (POIs)	70
+Accessible	37

Table 4 Channels subscription

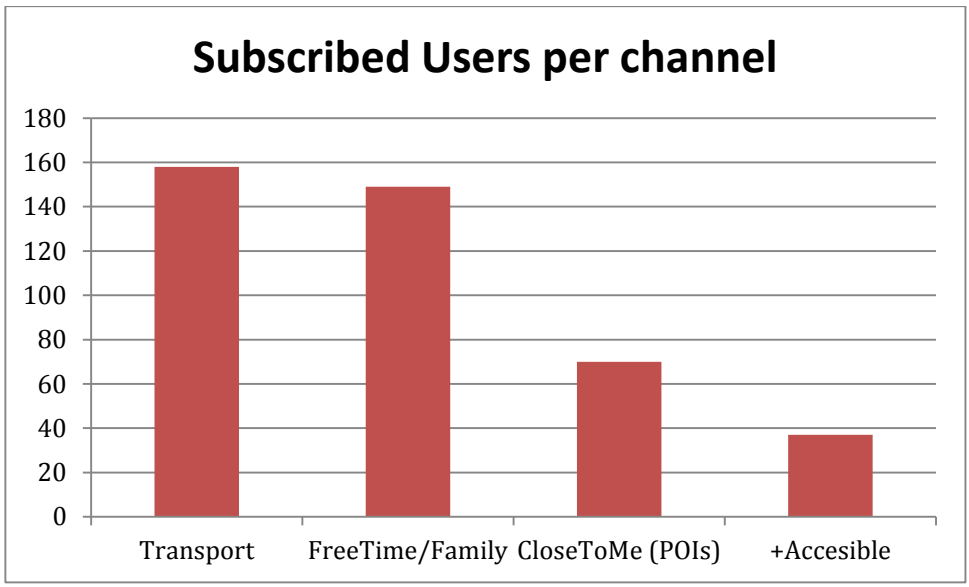


Figure 79. Channels subscription

It could be seen that the most popular channel is 'Transport'. It's normal because the app environment is the tram, and regular users often need transfers with buses. Additionally line 1 goes through two important bus exchangers in the metropolitan area so this channel provides useful information.

Another highly demanded channel is the event and happenings channel. Our user profile is a student and this kind of information is also relevant.

The third channel is the 'Close To me' information channel; and finally the channel which provide dynamic information (audio, vibrations) for the visually impaired to facilitate their access to the transport service. It could be seen that this channel has been selected by other users (not only visually impaired or limited mobility people). In fact, this is the channel with more subscribe/unsubscribe events, which means that many users has only tried it.

On the other hand, the channel subscription implies to have some experiences. It is important to measure them because they provide statistics about the real use of each channel. Below, the numbers of experiences registered in the period are shown:

+Accessible	What is the name of this stop?	772
	When does the next tram arrive?	2316
	Which one is this tram?	772
	Where is this tram going?	772
	Validate my trip without reading the QR code?	24
CloseToMe	Which Points of Interest are during my trip?	1470
	Which Points of Interest are in the next stop?	1470
FreeTime	Is there any interesting event this week?	3124

Transport	Which transfers with the bus do I have in this stop?	3308

Table 5 Experiences per channel

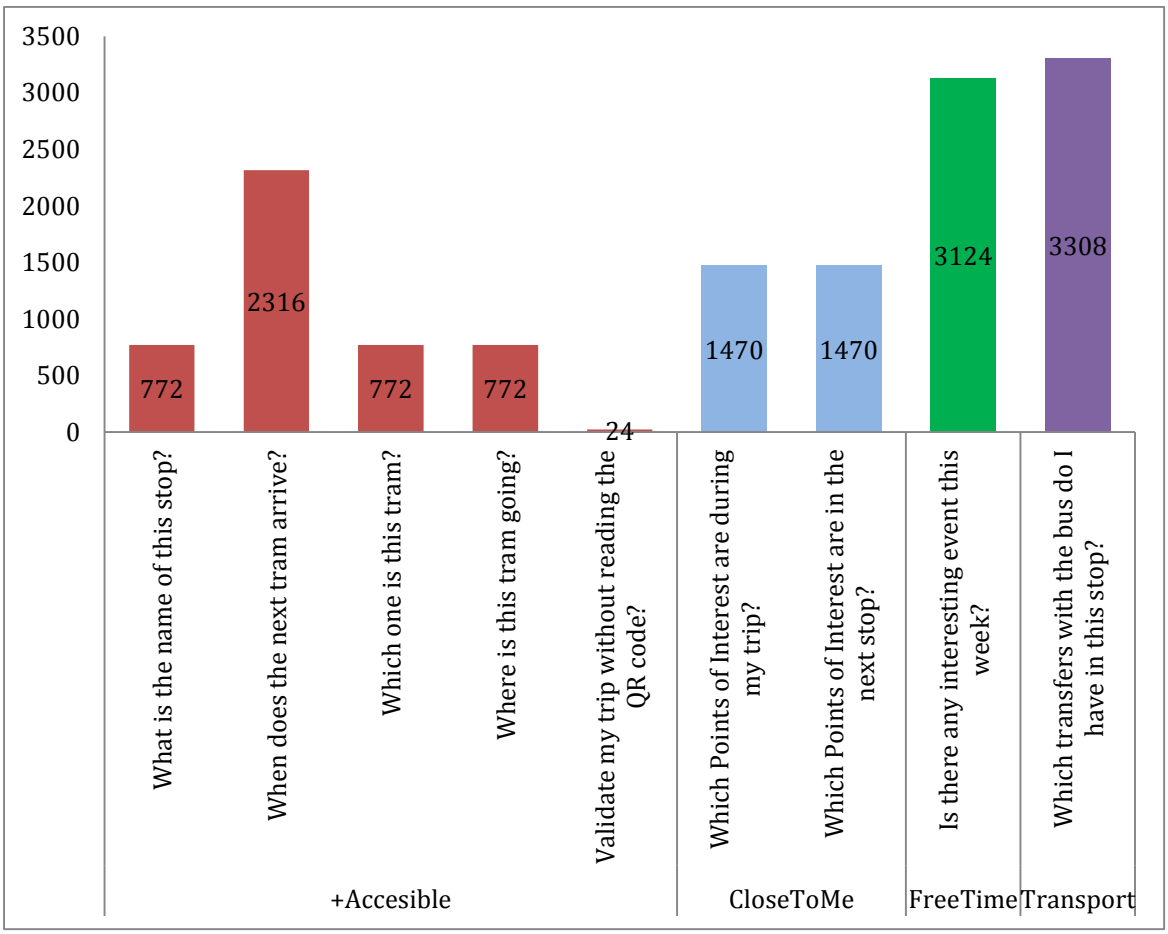


Figure 80. Experiences per channel

'+Accessible' channel implies several experiences that come up automatically when an event is confirmed using the BLE beacon and the SDK (arrive to a tram stop, get on a tram..). Only the two visually impaired collaborators can validate the trip without reading the QR. The previous figures show that there have been 24 trip validations using this method.

'Close to Me' channel also has got a big number of experiences. These experiences have been registered in the stops near most popular sites and venues: Santa Cruz center and La Laguna (World Heritage Site).

Events channel has been very used and many synchronization processes have been registered in the system.

Another interesting data is that most of the performed experiences took place during the trip and just after the validation (we know it because we can retrieve the moment of getting on the tram and the trip validation). That means that the new info channels increase the time that the user accesses the app for other purposes.

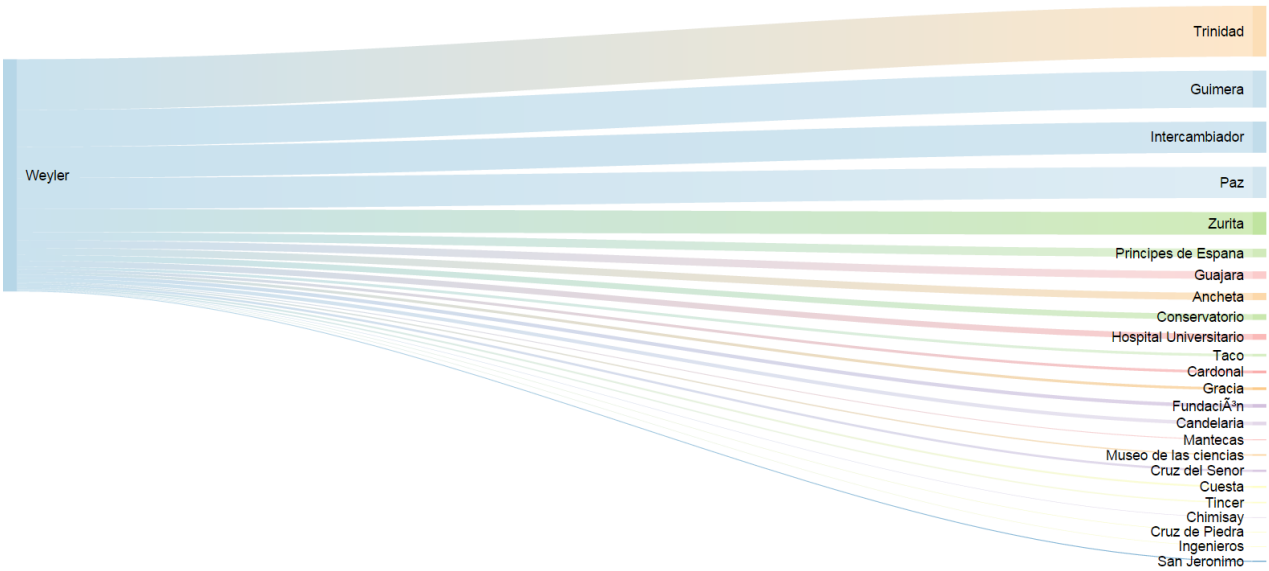
Finally, the transport channel appears with highest number of experiences. That is normal because of the number of subscribed users and because the experiences don't need of the user action. It comes up when the system detects the user has got off the tram and show a notification about bus transfers and next departures around this stop.

On the other hand, two types of experiences were also registered although they are not related with any channel:

- Incidents in line: 3 notification about delays in the tram service were sent to test users while they were detected near a stop or inside a tram;

- Fraud estimated: just for internal purposes, the user event of "*get on a tram and do not register the corresponding Via-Movil trip validation*" were marked as a suspicious behaviour. During the evaluation period 11 anomalies of this type were detected.

To conclude this analysis and show the viability of the BLE beacons and the improvement for a transport operator management, then next pictures displays part of the origin-destination matrix retrieved from the events (get on and get off the tram) detected through the BLE beacons network.



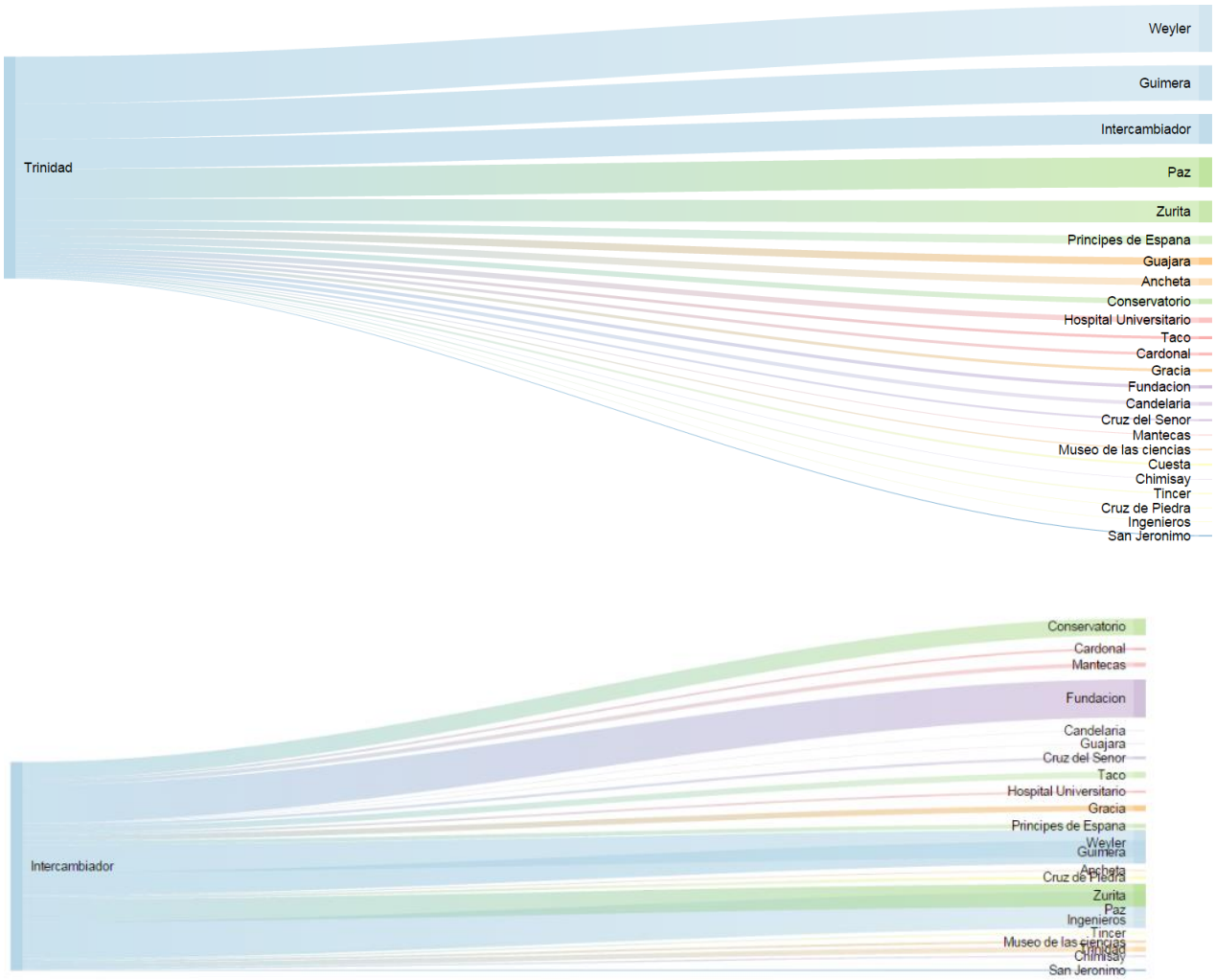
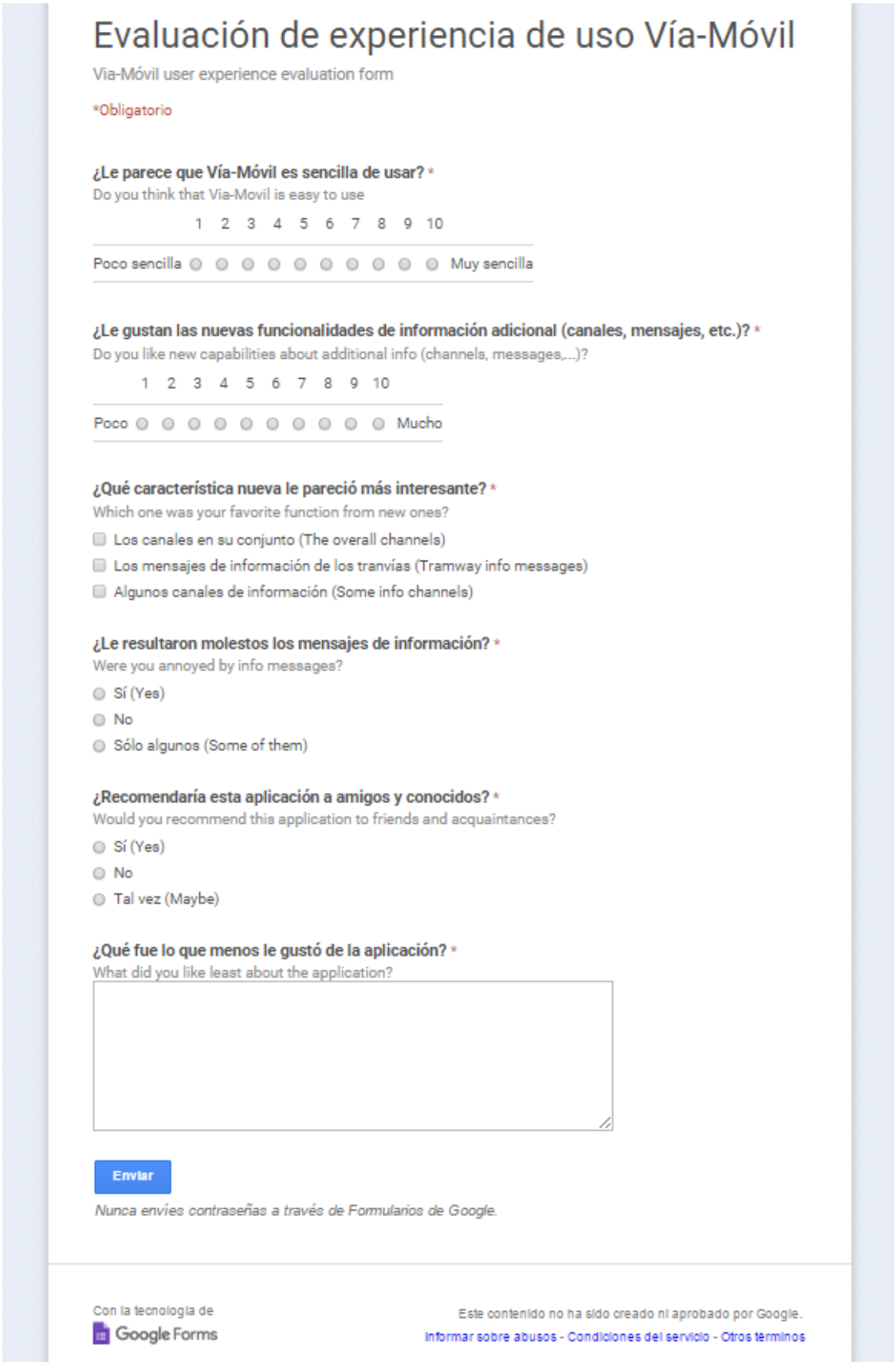


Figure 81. Examples from Origin-Destination information

2.4.10 - Users feedback

2.4.10.1 - *Evaluation form*

We have sent to all testers an email to complain a feedback evaluation form created with Google Docs at URL: http://goo.gl/forms/stUpFvO57J



Evaluación de experiencia de uso Vía-Móvil

Via-Móvil user experience evaluation form

*Obligatorio

¿Le parece que Vía-Móvil es sencilla de usar? *
Do you think that Via-Movil is easy to use

1 2 3 4 5 6 7 8 9 10

Poco sencilla ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ Muy sencilla

¿Le gustan las nuevas funcionalidades de información adicional (canales, mensajes, etc.)? *
Do you like new capabilities about additional info (channels, messages,...)?

1 2 3 4 5 6 7 8 9 10

Poco ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ Mucho

¿Qué característica nueva le pareció más interesante? *
Which one was your favorite function from new ones?

- ☐ Los canales en su conjunto (The overall channels)
- ☐ Los mensajes de información de los tranvías (Tramway info messages)
- ☐ Algunos canales de información (Some info channels)

¿Le resultaron molestos los mensajes de información? *
Were you annoyed by info messages?

- ○ Sí (Yes)
- ○ No
- ○ Sólo algunos (Some of them)

¿Recomendaría esta aplicación a amigos y conocidos? *
Would you recommend this application to friends and acquaintances?

- ○ Sí (Yes)
- ○ No
- ○ Tal vez (Maybe)

¿Qué fue lo que menos le gustó de la aplicación? *
What did you like least about the application?

Enviar

Nunca envíes contraseñas a través de Formularios de Google.

Con la tecnología de Google Forms

Este contenido no ha sido creado ni aprobado por Google.
Informar sobre abusos - Condiciones del servicio - Otros términos

Figure 82. User experience evaluation form

Results from evaluation form are shown below:

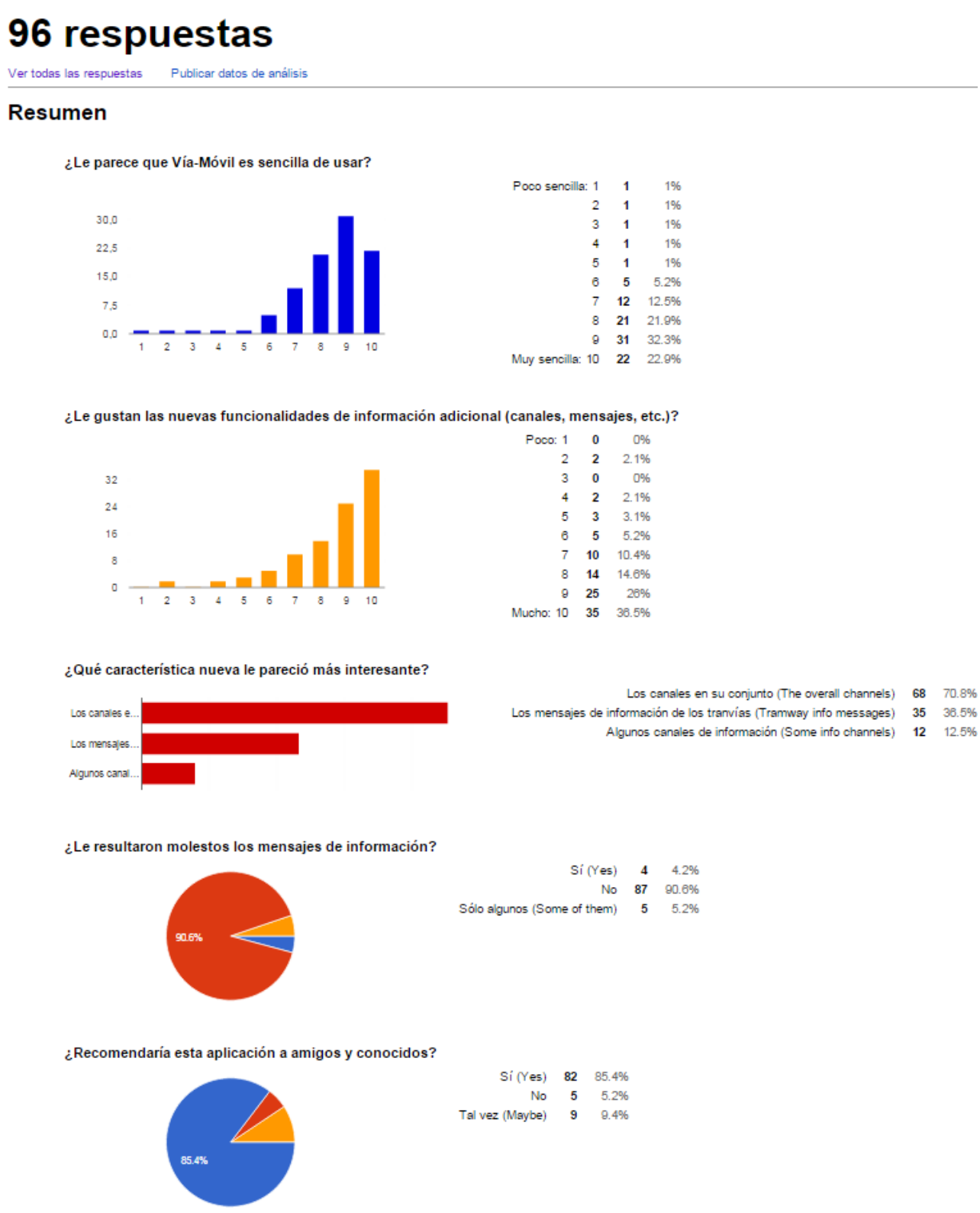


Figure 83. Results from user experience evaluation form

We obtained 96 answers to the evaluation form from a total amount of 256 users (see Table 3: User recruitment).

Over 90% of users think that information messages sent by MTSA servers and received at their smartphones were useful and non-invasive. It was one of our critical points because it is very important that users feel comfortable with the amount of messages sent and each one's quality should be improved to avoid user app rejection or invasive feeling.

A 90% is a great value because users feel comfortable with the number and the content of messages sent by the application.

More than 85% would recommend Vía-Móvil to other users, 9% maybe and only 5% wouldn't recommend it.

The new information channels were interesting for more than 75%, with a punctuation equal and over 8. A great goal for our purposes because people really like the content served by channels subscription. Less than 7% disliked information channels, punctuating those under 5 points and more than 50% punctuated the channels over 9 points.

Close to 90% thanked than it is an "easy to use" application, rating it between 7 and 10 points, and only 5% ranked it under 5 points.

The next figure is the email sent to testers asking them to complete the questionnaire. We offered an iPad Air 2 draw for everyone who completed the form.

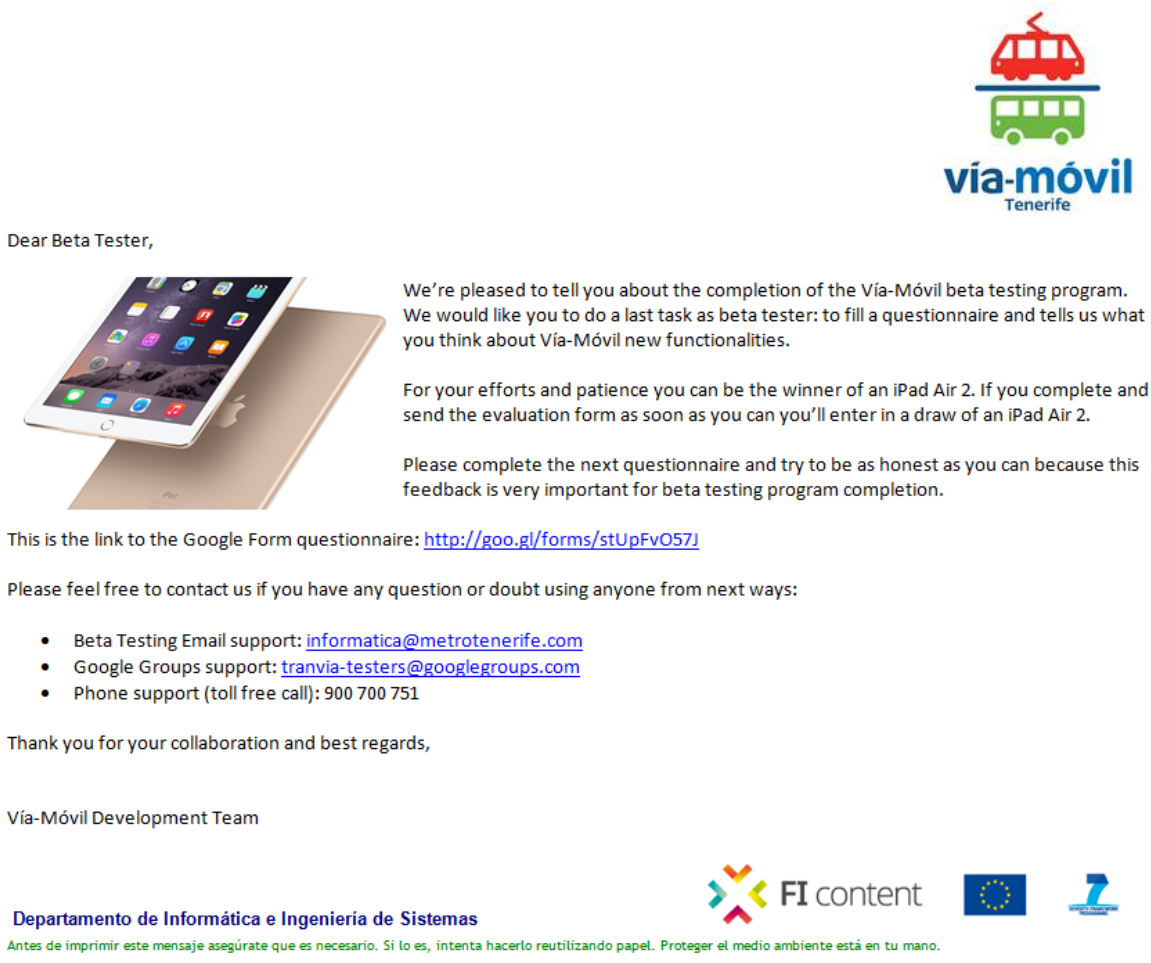


Figure 84. Beta testers email sent for users feedback form complete

2.4.10.2 - *Social media campaign*

There are some examples about the end of the campaign through messages using more important social networks that we sent using our official profiles.

In this tweets and Facebook comments we are thanking beta-tester users for their contribution to the development of a Smart City and revealing all users (only a little bit) the new look of the application.

We have used some screenshots to show the new capabilities in the new version we are going to launch in few weeks.

Figure 85. Some social networks examples

2.4.10.3 - *In-app messages*

We sent using internal messaging system specific messages to users suggesting them to complete the Google Form sent them by email.

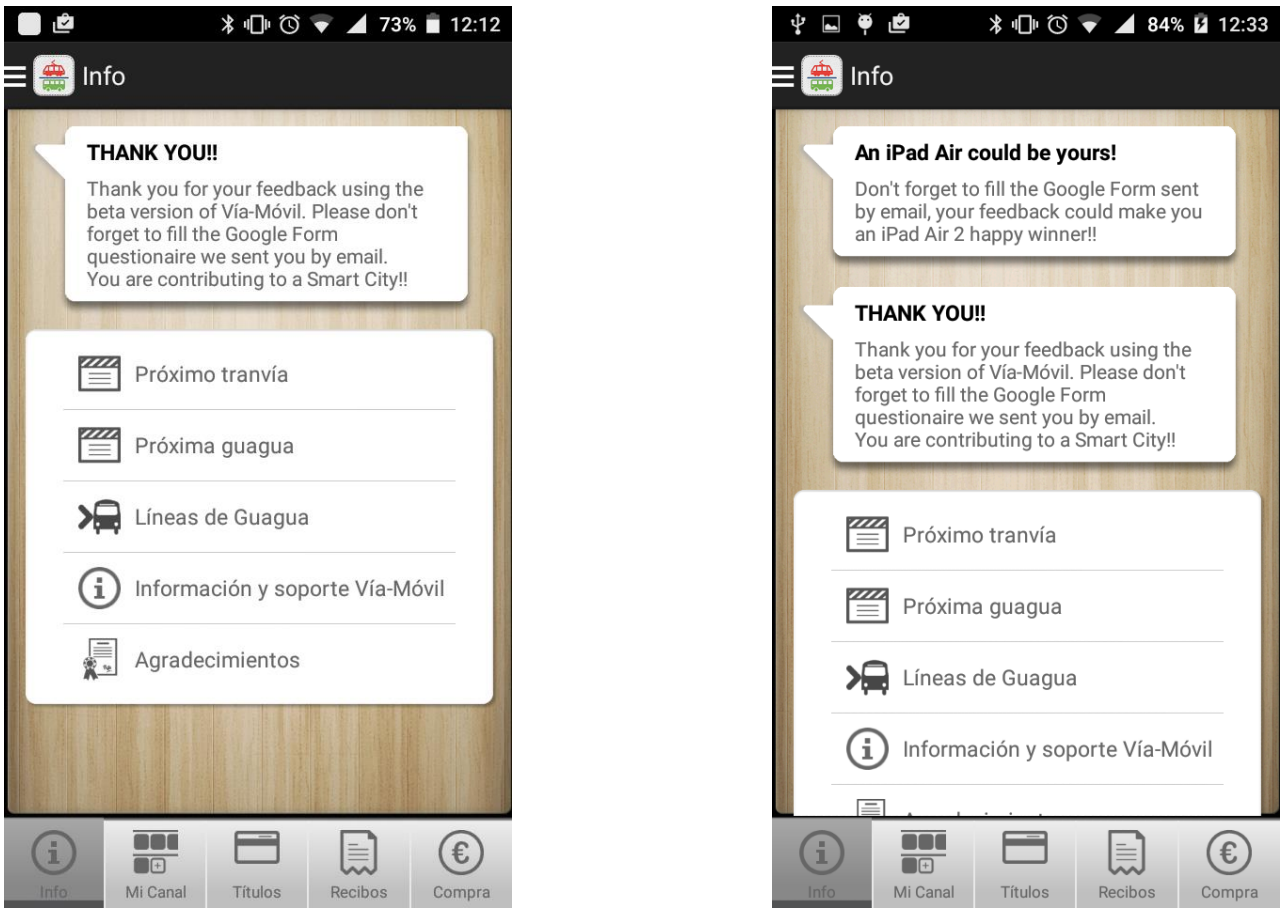


Figure 86. In-app messages sent to testers

Figure 87. Pablo Martin presented the iPad Air to the beta tester winner at MTSA

2.4.10.4 - *Google Play statistics*

We have used a new function included in Google Play called GCM (Google Cloud Messaging system) with the total amount of messages sent by day. In the next two figures are shown the number of messages by date.

It is remarkable that between July and September there is a fall because the main application users are students and they are on holidays, but at the end of September the number is recovered again as soon as students come back to school again.

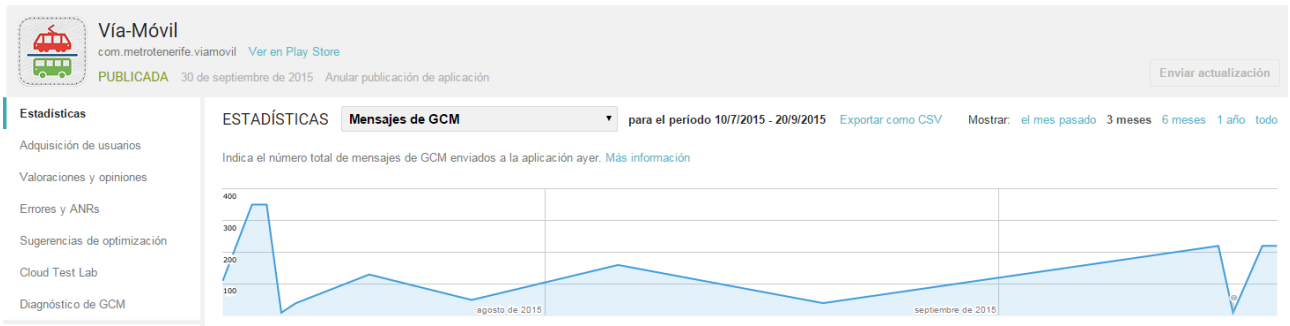


Figure 88. Google Cloud Messaging overall system stats

Figure 89. Number of messages sent on July and August through Google Cloud Messaging

Another valuable tool from Google Play used for code debugging was the “Errors and ARNs” reporting tool, where users send to Google Play (through Android error reporting system) their issues with the app by a clean and easy way and forgetting complex feedback form for error collecting.

The next figure is an example of a Java error report sent by a lot of users, it can be shown the smartphone model, the Android version and the app version. This is a really fine error collecting tool for developing purposes.

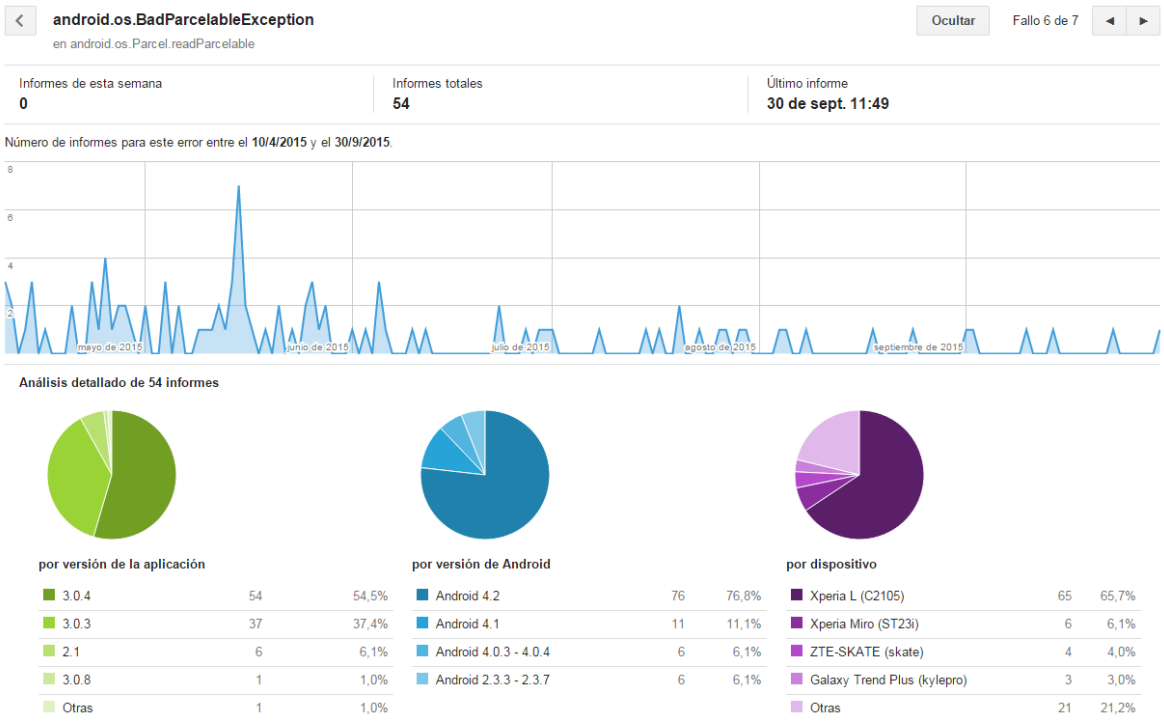


Figure 90. Example of reported error through Google Play

2.4.10.5 - *Google Groups feedback*

Other way used for users feedback collecting was by mean of Google Groups, a place where they can explain their problems with the app and read the problems and solutions for other users also.

The beta tester users only had to send an email to a Google Group, explaining with screenshots, photos or any other kind of file, which problem they had. Some of them gave us really nice and valuable information for code development.

Other users gave us ideas about what they expected and what not, so we could improve information channels only with required messages and when needed. This feedback process is still running and is also very important for us.

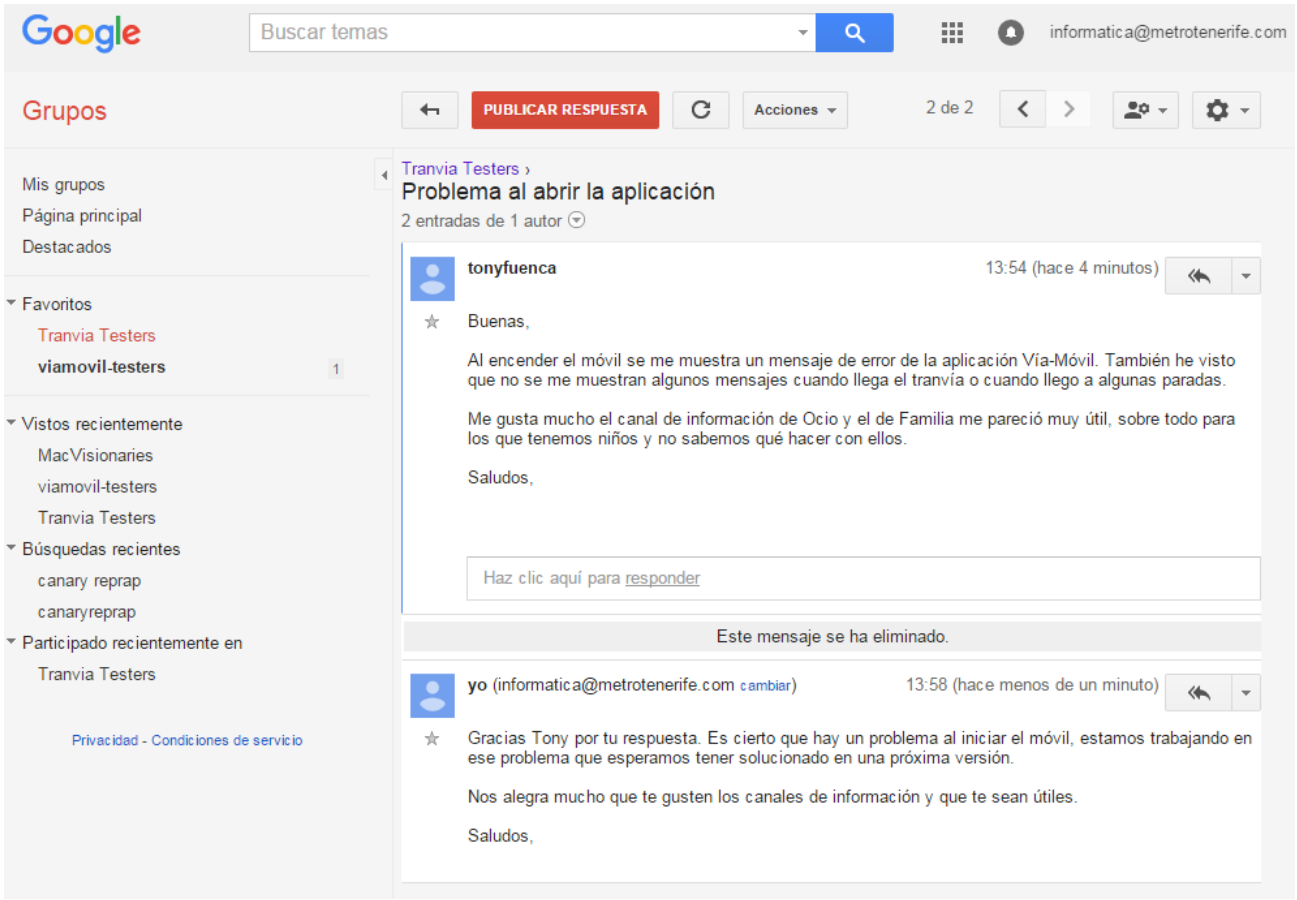


Figure 91. An example of user feedback by Google Groups

2.4.10.6 - *Final app version*

As user feedback result, we needed to update Vía-Móvil version to beta testers using Google Play beta testing APK deployment service. In the next figure are shown the different APKs uploaded through Google Play.

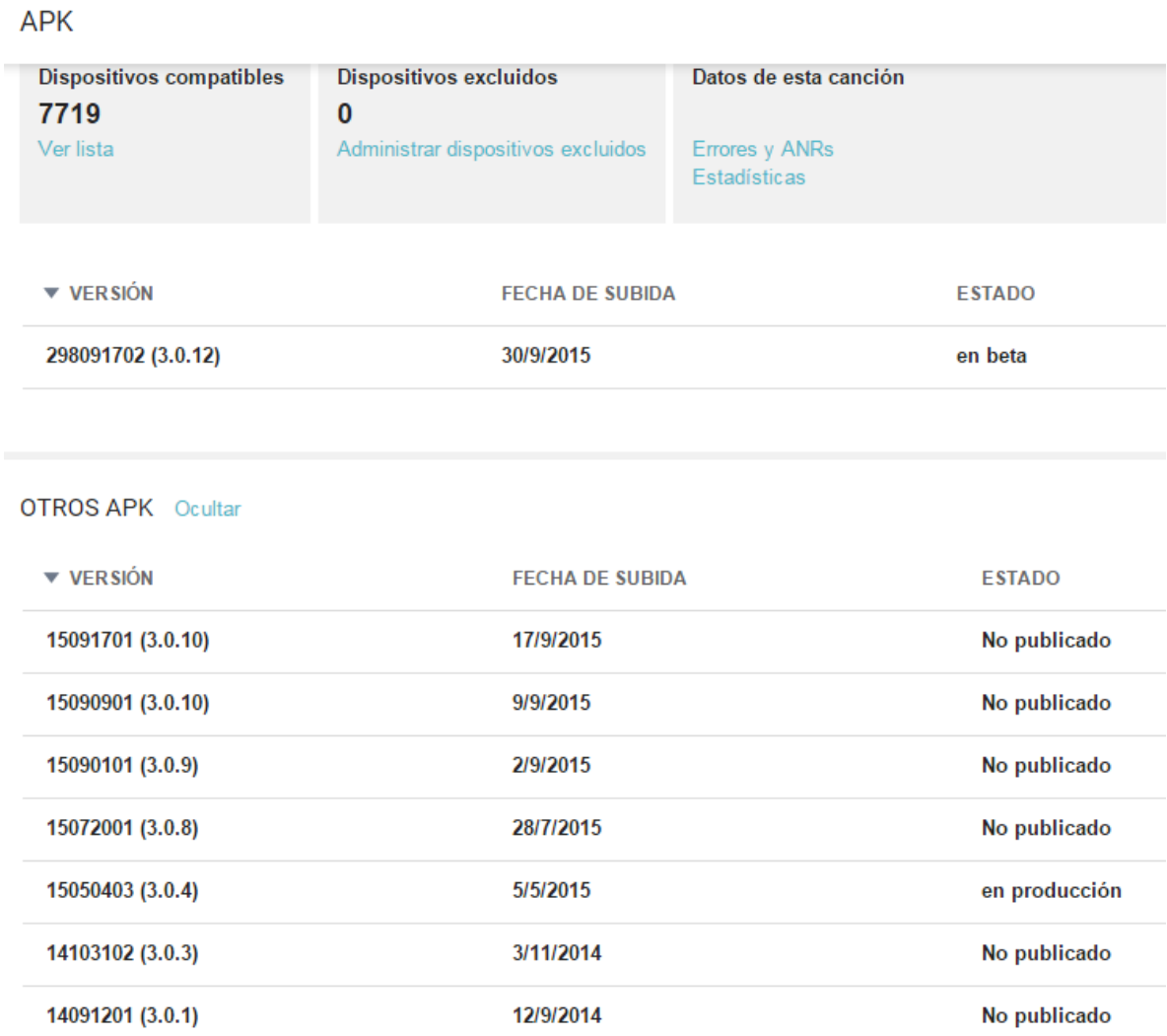


Figure 92. Beta APKs deployed using Google Play

We had to do a major update ending July and minor updates in September due to graphical issues on specific smartphones.

2.4.10.7 - *Via-Móvil final empirical results*

As explained in point 2.4.9, these are the results for Vía-Móvil backoffice user statistics. The next table reflects the number of channel subscribers from testers:

Channel	Subscribed Users
Transport	183
FreeTime/Family	164
CloseToMe (POIs)	85
+Accesible	102

Table 6 Channels subscription

Next graph shows same data but in a graphical way:

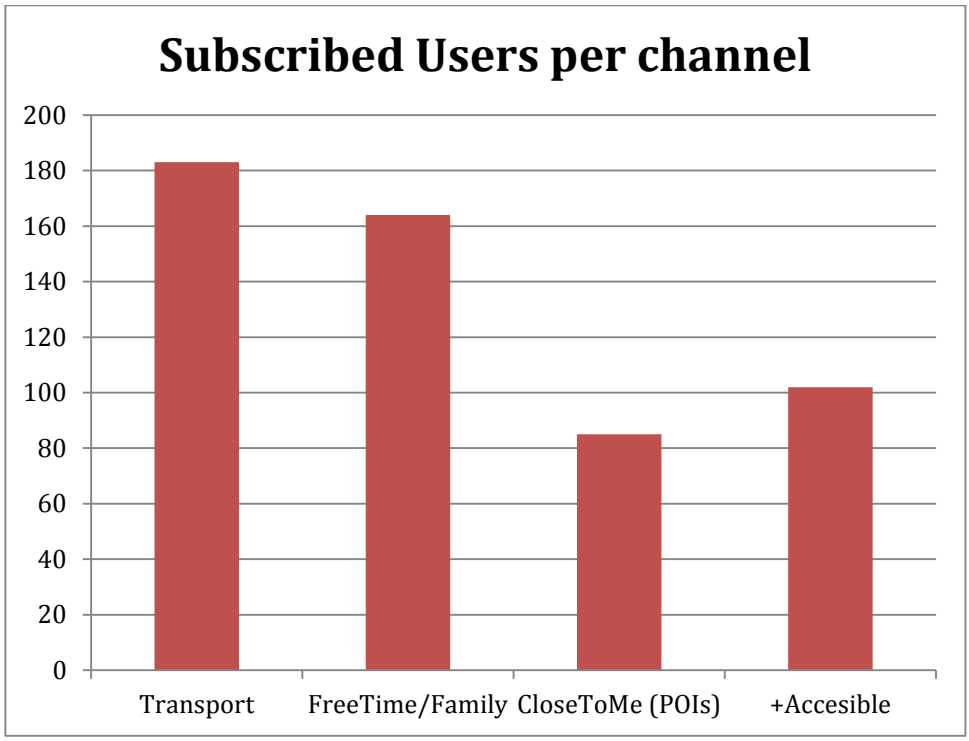


Figure 93. Channels subscription

The next table shows the number of experiences registered by users grouped by channel kind:

+Accesible	What is the name of this stop?	13911
	When does the next tram arrive?	41733
	Which one is this tram?	13911
	Where is this tram going?	13911
	Validate my trip without reading the QR code?	136
CloseToMe	Which Points of Interest are during my trip?	11549
	Which Points of Interest are in the next stop?	11549
FreeTime	Is there any interesting event this week?	23886
Transport	Which transfers with the bus do I have in this stop?	24936

Table 7 Channels experiences grouped by channels

The figure below represents the data in the upper table in a graphical point of view:

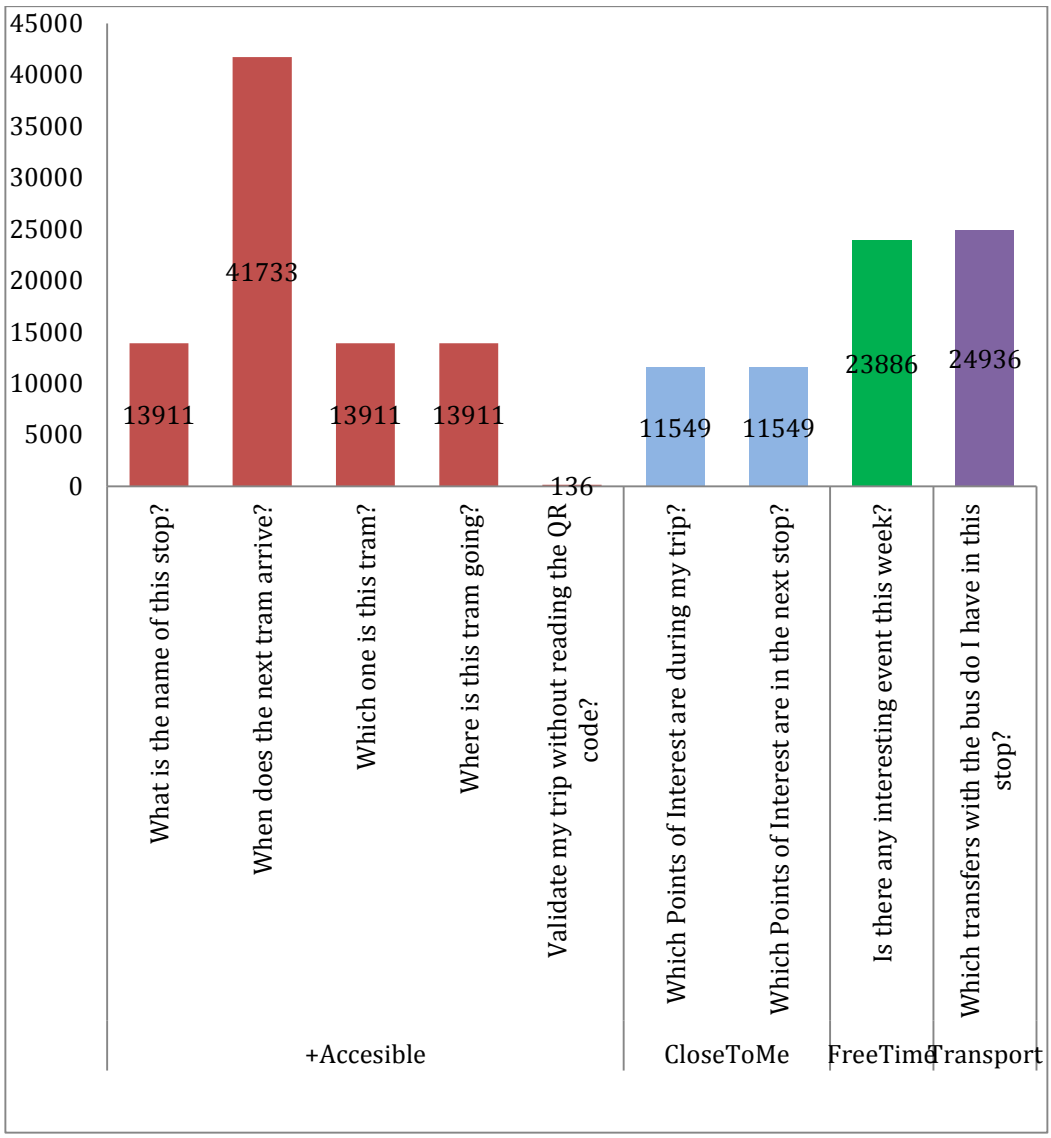


Figure 94. Channel experiences distribution

3 - SUMMARY AND CONCLUSION

3.1 - Scenario: On-Site Visit

The on-site visit scenarios were very user-oriented. We got very technical tests in Berlin in a lab-test and also tested the scenario with non-technical participants in Berlin and Barcelona in field trails. Mostly we got between 5 and 19 testers. The results we collected were documented in questionnaires and bug-tracking systems. It was also a very close work between the two experimentation sites. For this scenario we tested three enablers:

1. Open City Database SE,
2. Content Enrichment SE,
3. Object Storage GE.

The two SEs were deployed at a Fraunhofer Fokus Server in Berlin. The Object Storage was deployed at the Xifi Node Berlin. For our testing the Object Storage worked well, but it was a lot of work to integrate it in our scenario. We only used the Object Storage GE to push there uploaded media files. In this case other web solutions may be more comfortable and easier to use.

3.2 - Scenario: Festival

The experiment carried out during the Transmusicales festival has shown how easy it was to develop applications very quickly in the area of festivals with FIWARE generic enablers and FIContent Specific Enablers.
The tests conducted with users during this large-scale experiment highlighted the strengths and weaknesses of the application both technically and in terms of usages. The results of the experimentation are briefly summarized as follows:

- Users mostly perceived the functionalities as innovative (specially the 3D map) and very useful, but some of them got difficulties to run these functionalities properly due to technical limitations of their smartphones.

- For companies who would use the enablers, the recommendations are:
  - to associate users to the early phases of development to be sure that the developed product meets expectations of users;
  - as far as you are developing apps for smartphones, it is important to find the right compromise between new technologies and performance provided by a heterogeneous fleet of smartphones;
  - to ensure compatibility of enablers with smartphones and to be precise on the minimum system requirements.

After taking into account corrections and changes proposed by the users during the experimentation, eBIZ plans to make of evenTribe a marketable product dedicated to all festival organizers.

3.3 - Scenario: Live Fallas

The experiment in the city of Valencia (Live Fallas app) was able to integrate various Specific Enablers developed during the second experimentation cycle for the Smart City Platform. Any citizen and tourist in Valencia was able to download a mobile app from the Android or iOS marketplace and start using it during the Fallas Festival. The results are summarized as follows:

- More than 8500 users downloaded the mobile app and used it during the festival. Users could even register and participate in a competition (voluntarily) in order to do check-ins, comments, ratings and photo uploads. More than 500 participated as registered users, which gave us more feedback;
- Users were quite happy with the app as stated in the feedback questionnaires, and they found the provided functionalities in the app as useful and innovative, such as the real time social network heatmap;
- The city council of Valencia were also happy with the results of the app, and it was presented as a successful story during a FIWARE official presentation for the Valencia Smart City platform. The app was also presented in another academic presentation before a FIWARE hack4good event. Besides, the Live Fallas app has been described in a paper that has been accepted for a conference in ICME 2015 (http://www.icme2015.ieee-icme.org/).

3.4 - Scenario: Tenerife Transit Experience

The Transit Experiment performed in Tenerife (linked to Cologne) has been made using a real app already highly spread in the public transport users of the island (Via-Movil). This has provided a very real analysis of the improvement of introducing new smart city services in a transport environment.

The experiment begun at May 25th and it is still running. The number of testers has increased to 256 users (**figures of September 15th**). During this period, only selected users were invited to participate and use it in the tram, but, if these new services are well received, MTSA will open them to all users in the next months (fall 2015).

Several info channels have been set up to provide different information. One of those channels (Close to me) makes use of the SE FE and POIProxy and the GE POI-DP integrating different data sources in a simple record. This channel has been well received by the tester group showing a high number of subscriptions and experiences.

An important targeted group of this experiment is visually impaired people. A specific channel for this collective has been defined and two collaborators from this group which are also tram users are highly using these new features. The system will be able to send a message when it detects the arrival to a stop, informing the stop name and the next tram arrival time. Even the system can propose him/her to validate the trip if he is detected inside a tram.

Also, the system can provide useful information of fraud estimation and transport demand (by origin-destination) for internal management of the operator and the relevant public office.