TROMPA

TROMPA: Towards Richer Online Music Public-domain Archives

Deliverable 6.6 Working Prototype for Singers v1

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Leader	Emilia Gómez (UPF)
Contact Person	Emilia Gómez (emilia.gomez@upf.edu)
Authors	Aggelos Gkiokas (UPF), Emilia Gómez (UPF), Álvaro Sarasúa (VL), Jordi Janer (VL), Pilar Pascual (UPF)
Reviewers	Cynthia Liem (TUD)

Executive Summary

This deliverable is the 1st version of the demonstrator deliverable for the choir singers pilot submitted on M24 of the project. This deliverable is submitted concurrently with the other WP6 pilot deliverables that are the main deliverables related to **Milestone 3 - Working integrated prototypes ready v1.0**. Although these deliverables are demonstrators rather than detailed reports, their main purpose of this document is to present the functionalities of the pilot and a link to its actual implementation.

The deliverable contains three main sections. Section 2 presents the main functionalities of the pilot by providing screenshots, a URL where we can access the pilot software, a demo video of the pilot along with instructions on how to use the pilot. We present the user interface, its different options and the available functionalities, mainly selecting a musical piece from the available repertoire, selecting a voice, listening to a fragment, adjusting volumes and panning, recording a rehearsal, listening to the rehearsal and observing the automatic analysis of the rehearsal.

Section 3 is dedicated to the user evaluation of the pilot. It contains information about a virtual workshop that was organized with 19 choir singers for usability testing and pilot evaluation. Singers include a mix of different voices (Soprano: 42,1%; Alto: 31,6%; Tenor: 10,5%; and Bass: 15,8%) and musical expertises (Without musical training: 31,6%; Some musical training: 57,95; Experts: 10,5%, including choir conductors).

Participants agreed on a positive perception of the TROMPA Choir Singing Pilot to support the rehearsal, and positively evaluated all functionalities, providing usability feedback and suggestions for improvement. Our validation study has served to validate our approach and demonstrated the positive perception of the TROMPA Choir Singing Pilot. However, the evaluation also showed us some minor technical aspects that should be solved and ideas for improvements for the future iteration of the pilot.

Section 4 presents the future work including the pilot development planning and the strategy for engaging with the choir community locally and internationally. Section 5 mentions the integration of WP3 technologies to the pilot, the link with WP4 human-generated data gathering strategies, and the use of the Contributor Environment and WP5 components. We observe that these integrations area inline with TROMPA Deliverable 2.2 - Complete Requirements submitted on M18.

Finally Section 6 presents the conclusions of the deliverable in the context of the upcoming WP6 work. We focus in particular in views of the deliverable D6.8 - Mid Term Evaluation to be submitted 3 months later (M27).

Version Log		
#	Date	Description
v0.1	15 April 2020	First draft including the description of the pilot.
v0.2	24 April 2020	Version incorporating the results of the virtual workshop.
v1.0	28 May 2020	Final version incorporating reviewers comments

Table of Contents

1. Introduction

This deliverable is the 1st version of the demonstrator deliverable for the choir singers pilot submitted on M24 of the project. This deliverable is submitted concurrently with the other WP6 pilot deliverables (D6.3, D6.4, D6.5 and D6.7) that are the main deliverables related to **Milestone 3 - Working integrated prototypes ready v1.0**. Although these deliverables are **demonstrators** rather than detailed reports, their main purpose of this document is to present the functionalities of the pilot and a link to its actual implementation.

The structure of the deliverables is shared amongst all deliverables D6.3 - D6.7 and contains three main sections. Section 2 presents the main functionalities of the pilot by providing screenshots, a URL where we can access the pilot software, a demo video of the pilot along with instructions on how to use the pilot. Section 3 is dedicated to the user evaluation of the pilot. It contains information about a workshop that was organized for the usability testing as well evaluation of the pilot. This section is strongly related to **Deliverable 2.2 - Complete Requirements** submitted on M18 and the upcoming deliverable **D6.8 - Mid Term Evaluation** to be submitted 3 months later (M27). Section 4 include a description of the future outlook for the pilot, including the prototype development roadmap and user engagement strategies. Section 5 is related to the integration of WP3 technologies to the pilot as well as the integration of the pilot to WP5 components and Section 6 concludes the document.

2. Main functionalities of the prototype

2.1. Access information

- ❖ The **Pilot Prototype** is accessible in a temporary url[1] and will shortly be also accessible through the TROMPA subdomain[2].
- ❖ A **Demo video** showing the main functionalities of the pilot is reachable online[3] A **User Manual** in English, Spanish and Catalan is available [here](#).

2.2. Requirements

The pilot needs the following five requirements to be used:

1. A computer or tablet.
2. In the case of using an Android computer or tablet, [Chrome](#) browser with a recent version.
3. In the case of using iPad, iOS 11 or later.
4. Microphone (microphones integrated in laptops or tablets are enough).
5. Headphones (to avoid that the voices that sound when singing are mixed with the singer's voice).

2.3. Pilot Functionalities

The main functionalities of the application are:

- ❖ Select the piece to work from a set of pieces in a repertoire.
- ❖ Visualize the pieces with two visualization modes: score and *piano-roll.*
- ❖ Listen to the piece (or a fragment) with synthetic voices, controlling the volume and panning of each of the voices. The visualisation (score or *piano-roll*) follows the music.
- ❖ Select one of the voices in the score. This highlights the selected voice on the visualisation.
- ❖ Rehearse the piece (or a fragment), singing along with the other voices at the desired volume and panning.
- ❖ Display an automatic analysis indicative of the intonation of the sung fragment (currently only available in *piano roll* mode*)*

2.3.1. The interface

At the user interface, we can identify 8 available controls which are represented in Figure 2.1 and explained as follows.

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[1] https://trompa.netlify.app/
[2] https://choirs.trompamusic.eu
[3] https://www.youtube.com/watch?v=6pRt09pELnw

Figure 2.1. TROMPA choir singers pilot interface.

1. Voice selection and control. Clicking this button opens the menu for selecting the current voice and setting the volumes and panning of the voices in the score.
2. Selection of start and ending bars. The numbers in "Start bar" and "End bar" delimit the measures that will be heard when clicking on "Listen", or those that will be rehearsed when clicking on "Practice".
3. Listen button. By clicking, the selected measures are played with the volumes and panning set in the "Voices" menu.
4. Practice button. Clicking on this button, the application will start recording the user's voice while playing the synthetic voices at the volumes and pan settings set in the "Voices" menu. The beginning of the recording will be preceded by a count of one measure at the tempo of the piece.
5. Metronome on / off. When active, a metronome sounds along with synthetic voices when listening or rehearsing.
6. Display mode change. In the capture, the button displays a piano to switch to the *piano roll* view. When the active mode is *piano roll*, the button displays a staff to switch to score mode.
7. Repertoire menu. It allows changing the piece to another of the available ones.
8. Score navigation. It allows browsing the pages of the score (the number of pages and their content is adjusted according to the resolution of the device).

2.3.2. The *piano-roll* view

This view is meant to be used by singers who do not have a background in music theory and cannot read sheet music. The way this display represents the piece is widely used in music production software as well as other entertainment or singing game applications (such as the *SingStar* series). In this visualization, each note is represented by a "rectangle". The horizontal axis represents time: the notes sound in order from left to right, and longer notes correspond to "longer" rectangles. The vertical axis corresponds to the musical notes, with the highest notes located above and the lowest notes below.
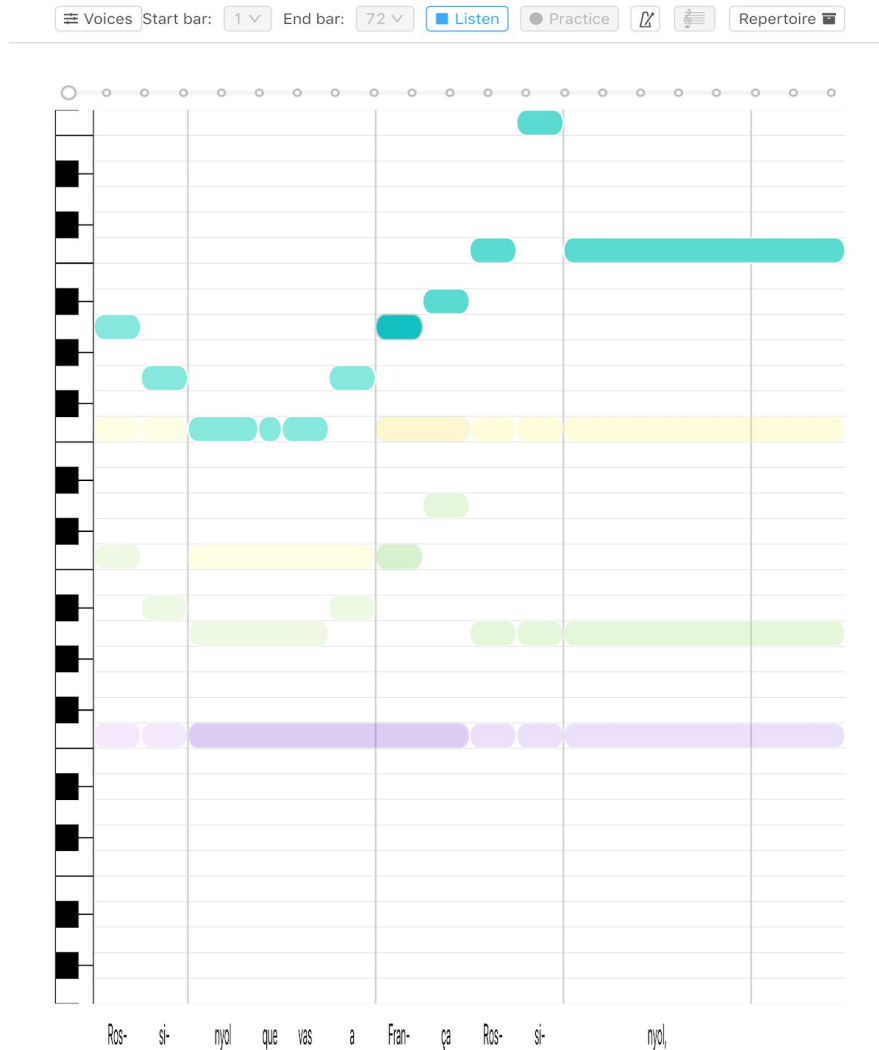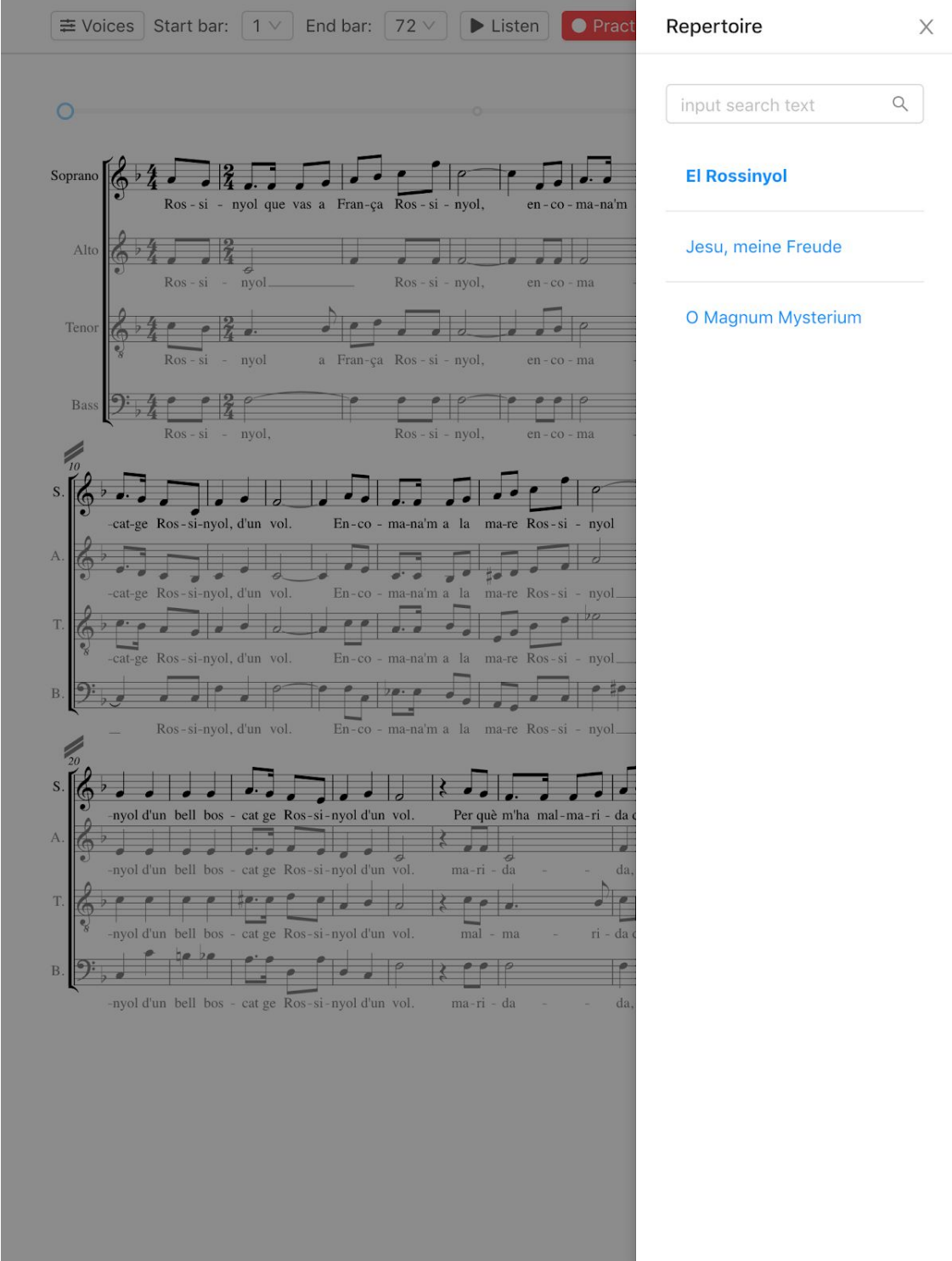
Figure 2.2. Piano roll view.

2.4 Using the Choir Singers Pilot

The main objective of the application is to be able to practice choir pieces individually. What are the necessary steps to do so?

2.4.1 Selecting a musical piece

To select a piece, simply open the repertoire menu (button (7): "Repertoire") and click on one of the available pieces. In the current trial version, the repertoire is limited to three trial pieces. In later versions, it will be possible to browse the TROMPA catalog and add new parts.

Figure 2.3. TROMPA choir singers pilot interface and piece selection control.

2.4.2. Selecting a voice

It is important to select the voice we want to rehearse (*soprano, alto...*). This can be done in the voice control menu (button (1): "Voices") or, in score display mode, by directly clicking on the name of the voice on the score. For example, the labels "Cantus", "Altus". "Tenor" and "Bassus" in the following screenshot allows to select the voice by clicking on them. The selected voice will be highlighted in the visualisation.
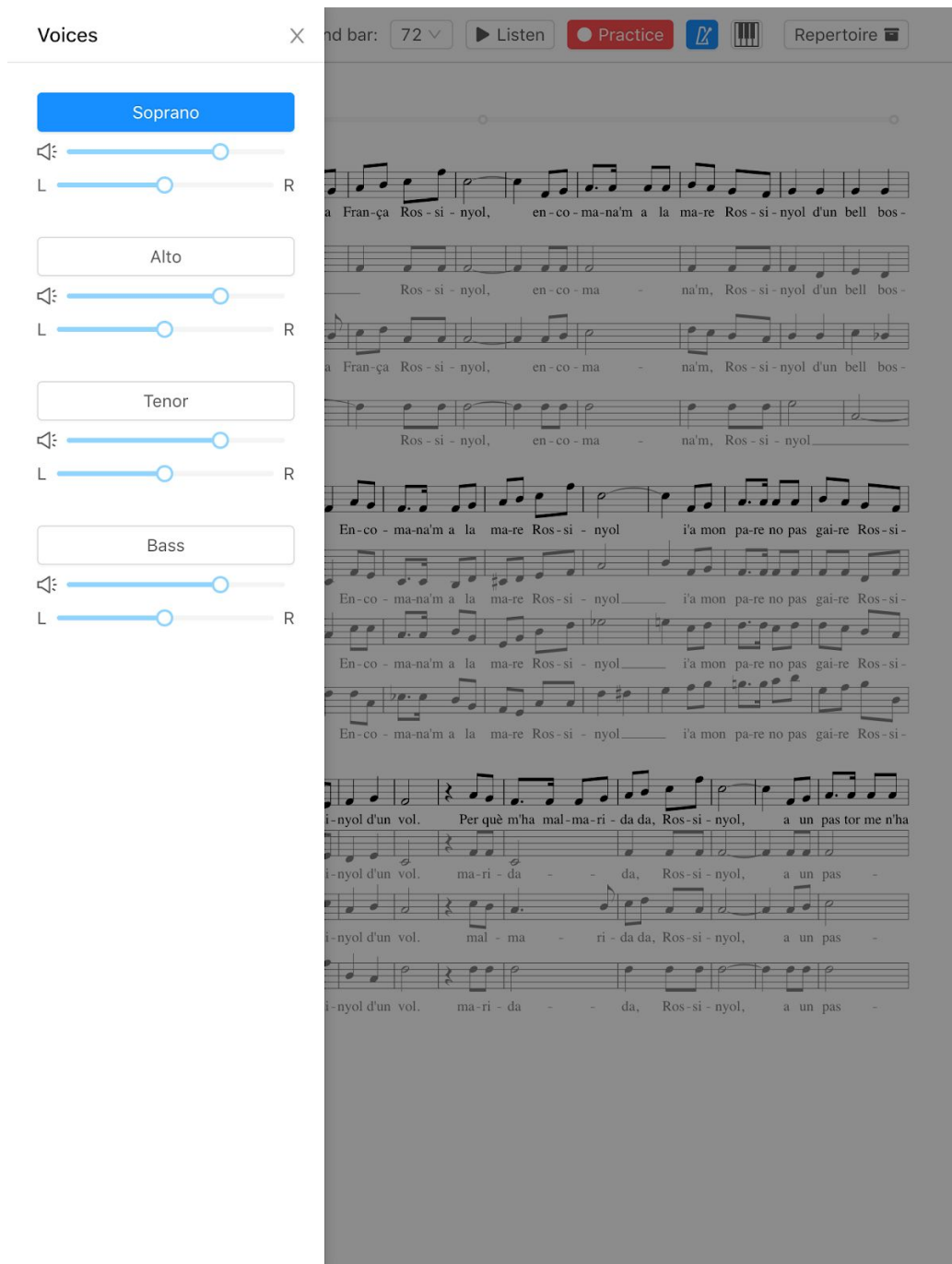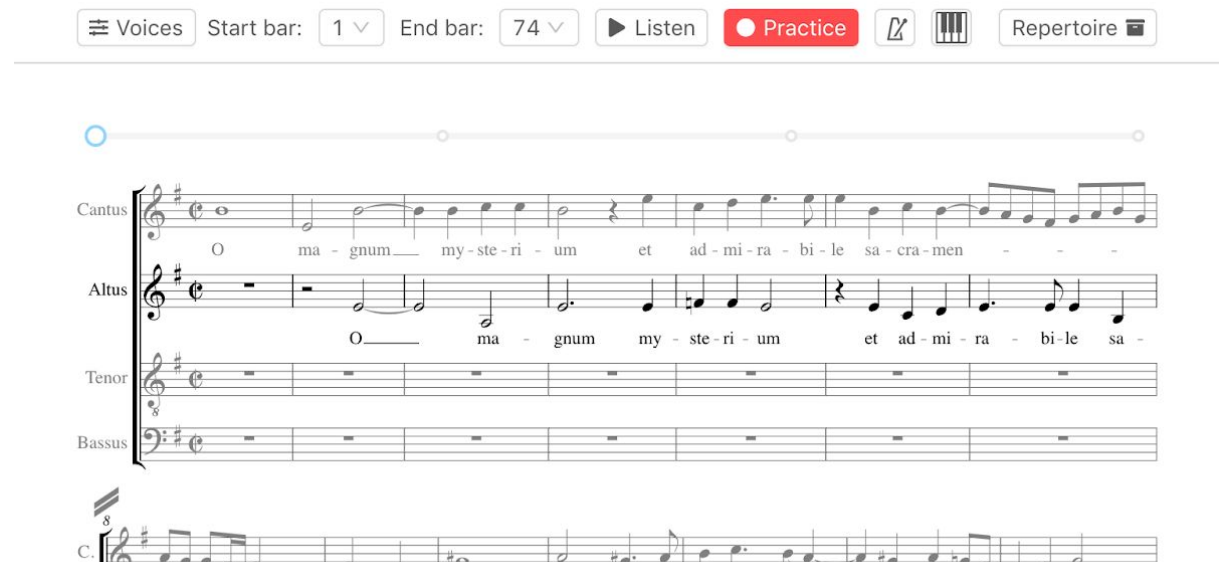

Figure 2.4. TROMPA choir singers pilot interface and voice selection control.

2.4.3. Listening to a fragment

A good first step to rehearse a fragment is to start by listening to it. To do this, simply indicate the start and end bars (drop-down (2): "Start bar", "End bar"). To listen to it, we click on the "Listen" button (3).

Figure 2.5. Fragment visualization.

2.4.4. Adjusting Volumes and Panning

By default, all voices sound at the same volume and centered (same volume on left and right channel). However, the singer may prefer not to hear some of the voices, change the relative volumes, or place some voices more to the right or left. All these parameters can be controlled in the "Voices" menu (1). Each voice has a volume and panning control. These controls can be modified while playback is active to facilitate selection of the desired parameters.

2.4.5. Recording a rehearsal

Once we have selected a fragment and adjusted the volumes and panning as we wish, we can begin to practice. To do this, we click on the (4) "Practice" button. Immediately, a one bar count will start from which we can sing while listening to the rest of the voices. This can be done with the metronome (button (6)) on or off.

2.4.6. Listen to the last rehearsal

Recording ends when the measure selected in "End bar" ends. From then on, the "Voices" menu (1) will include a new voice: "Your voice". If at this time we click on "Listen" (3), the recorded voice will sound along with the rest of the voices, and from the "Voices" menu we can control its volume and panning in an analogous way to the rest of voices.

2.4.7. Observe the analysis of the last rehearsal

In addition to listening to our voice, the application allows us to visualize an automatic analysis of our intonation. This analysis is currently only available in the *piano roll* view, so we must switch to this mode (button 6) if we are in the score view. As shown in the capture, the red line represents the intonation obtained automatically by analyzing the recording, superimposed on the *piano roll*. This allows us, in a visual way, to identify those notes where we have more or less intonation problems.

2.5 Connection to requirements

The functional requirements for the pilot were described in Deliverable 2.2 from the perspective of 2 types of users: conductors and singers. In the current version, we have focused on the functionality for **singers**. The main reason for this is that this functionality is the hardest to implement (given its real-time performance requirements, complex visualisations...), as well as the one that needs more testing. The features for conductors are more related to management tasks such as repertoire creation and statistics visualization, and will be addressed in the upcoming months. Moreover, the development of the functionality for conductors can directly benefit from having singers data available.

The current prototype covers **all** the functional requirements for **singers** described in **Deliverable 2.2 - Complete Requirements**[4] (pending some details described above). Singers can:
   ❖ Select different pieces from a repertoire.
   ❖ Get animated visualisations of the score in sheet music and piano roll formats.
   ❖ Listen to synthesized versions of the pieces in several languages (Latin, Spanish, Catalan, German and English).
   ❖ Control the volume and panning of the different voices during playback (pitch and tempo control are pending).
   ❖ Get a visualisation of an automatic performance analysis after singing.

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[4] This deliverable is confidential to the consortium only

3. User evaluations

3.1. Initial target audience & recruitment strategies

The initial planning of target audience and recruitment strategies had been as following:

- ❖ **Mockups Testing**: A workshop was organized (January 2019, M9) where 15 participants were asked to test and evaluate a mockup of the choir singer pilot. The participants were mainly professional choir singers and two conductors. This mock-up did not include synthesis functionality and was mostly focused on evaluating the intuitiveness of the interface in terms of navigation and score visualization. The outcomes of this evaluation were considered in the design of the current version of the pilot. Details of the organization and outcomes of the project are given in Deliverable **D6.1 - Final Mockups Testing**[5]**.**
- ❖ **Initial Pilot Evaluation:** A workshop of around 20 participants was organized for March 2020 (M23) in order to evaluate the 1st version of the pilot. The workshop was targeting a balanced audience between professional and amateur choir singers. In the workshop setting, the participants would have been asked to test various aspects of the pilot by singing along the pilot and evaluating the quality of the synthetic voice accompaniment. For this we had booked 10 translation booth rooms for testing the pilot and a class room for presentation and briefing.
- ❖ **Large Scale Evaluation**: After the release of the first version of the pilot we planned to have a larger scale evaluation of the pilot by approaching mostly local amateur choirs around the Barcelona area where UPF and VL partners with strong links with the Catalan Federation Choirs (FCEC) located and the associated partner ESMUC (Higher School of Music of Catalonia).

3.3. Impact of COVID-19 crisis and adjusted target audience & recruitment strategies.

Spain has been one of the countries with the largest effects of the COVID-19 Crisis. Since the 15th March Spain has been into a high emergency state where all activities involving people have been cancelled. As a consequence, the initial pilot evaluation described in the previous section has been cancelled and our recruitment strategies have been changed: we immediately focused our efforts to move to virtual pilot evaluation that we conducted as described as follows. Our target audience was about 15-20 of singers belonging to an active choir or choral group with a variety of musical expertise and training, with the aim of, on the one hand, be representative of the reality of many amateur choirs which is the potential audience of TROMPA and, on the other, obtain different feedback on their behaviour when addressing the proposed tasks.

The variety of musical expertise/knowledge of the members of a choir largely conditions the use of tools to support group rehearsals. With the aim of working musical aspects on group rehearsals beyond score reading or repertoire learning, it is already common for chorus to promote among

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[5] This deliverable is confidential to the consortium only

their members that they carry out an individual score reading/study of the repertoire using some digital media, in order to take advantage of group rehearsal for more advanced musical practice.

For this purpose, choirs exploit digital formats such as MIDI, audio (mp3) files, which already exist or are created on purpose by choirs. They also take advantage of performances available in different digital music platforms, with or without express recommendations from the choir conductor.

To achieve the required target audience for our pilot evaluation, we contacted various choral groups matching the sought profile, who showed interest in the TROMPA project to apply the pilot in their rehearsal work. These contacts will also serve in the future for the next phase of the community engagement strategy. Some of the identified choral groups have been selected by proximity or interest, and, seeing that they responded to the diversity of users that was sought, we addressed them for this small evaluation. We used a registration form for individual registration to the pilot evaluation.

Once registered, an email was sent to each participant with the materials and the assigned tasks, together with the necessary documents to participate in it (user manual, project information documents, conditions, consent forms, etc.). We also created an email address and whatsapp group to access support for the Pilot and for sharing perspectives before, during and after the test.

3.4. User evaluation outcomes

3.4.1 Evaluation study protocol

The objective of this study was to evaluate the functionality and usability of the TROMPA Choir Singers Pilot - Pilot for Choir Singers, determine the effectiveness of the incentives created within the platform and evaluate compliance with the design requirements. All the responses gathered were handled confidentially, and there were no right or wrong answers.

Participants worked individually from home to complete different assigned tasks. The duration of the study was approximately two hours distributed over several days, and the content of the material was made available in Spanish, Catalan and English. The activity took place virtually and was designed as a relaxed and informal activity. Participation was rewarded with 20 euros.

TASKS: our goal was to identify improvement margins and detect possible errors in the current version of the application. To do this, we asked participants to perform the following tasks that, in total, should not take more than 2 hours to be performed. We provided the users the following instructions:

1. ***Documentation reading and access***
   - *Please read this document and the application manual carefully, and watch the 5-minute video that explains how the application works.*
   - *Access the application. On the initial screen, enter the same email you put in the registration form.*

2. ***Visualization***
   - *Load the piece from the Repertoire menu.*
   - *Visualize the score and its piano roll representation, navigating through the pages and trying to identify if there is any visualization error.*

- ○ *At the piano roll visualization, check that the vertical automatic zoom levels are working as expected.*

3. **Listening**
   - ○ *Listen to the piece with the synthetic voices and check that the volume and panning controls work as expected.*

4. **Recording your voice**
   - ○ *Select your voice.*
   - ○ *Select a fragment that you want to practice.*
   - ○ *Make a recording of your rehearsal for the selected fragment.*
   - ○ *Check that you can listen to the recorded voice.*
   - ○ *Please check with and without metronome, checking that this works as expected.*

5. **Voice analysis**
   - ○ *Check, on the piano roll visualization, that there is a visualization including an analysis of the recorded voice. Identify any error in the visualization.*

6. **Free test.** *Feel free to explore the pilot during these days and make sure you carry out at least one all the tasks for each of the 3 available pieces in the repertoire.*

7. **Evaluation**
   - ○ *Please fill up an online questionnaire (version in Spanish available here) rating your experience in the different tasks, including errors and comments for improvement.*

3.4.2 Results

We present here some results of the evaluation exercise. We gathered a total of 19 participants with the following demographics: 72,7% female, 84,2% were using a computer vs iPad/Tablet, and the age range was 18-30 (5,3%), 31-45 (15,8%), 46-60 (47,4%) and >60 (31,6%). All participants have at least 3 years of experience singing in a choir. The distribution of participants between voice types was Soprano (42,1%), Alto (31,6%), Tenor (10,5%) and Bass (15,8%).

In terms of musical expertise, 31,6% of the participants don't have any musical training, while 57,9% participants have some musical training and 10,5% consider themselves as experts, including two choir conductors. 10,5% of the participants don't know how to read a musical score, while only 15,8% of them can read a score and sing at the same time.

We asked participants to score the different facilities of the pilot, as follows. Figure 6 and 7 includes their rating on the **visualization** facilities of the pilot. We observe that choir singers are highly satisfied with both visualizations, with a slight preference for the score visualization. We hypothesize it is due to their familiarity with score presentation in their daily practice.
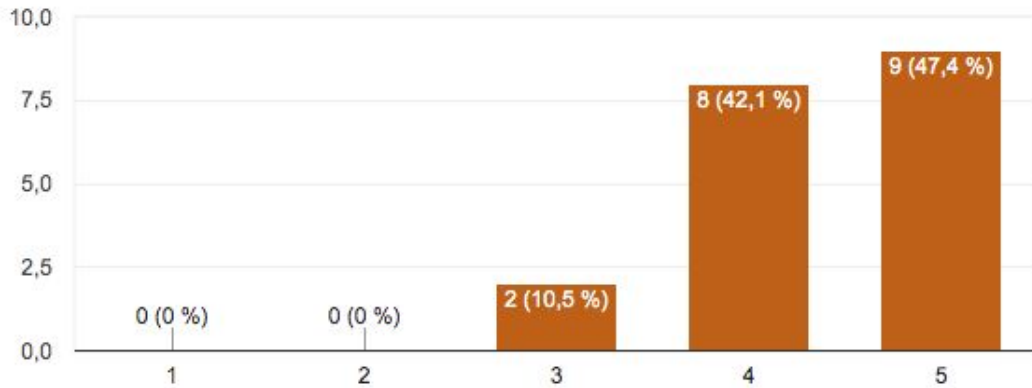
Figure 3.1. User rating of score visualization facility of the Pilot. (1) Poor - (5) Excellent.
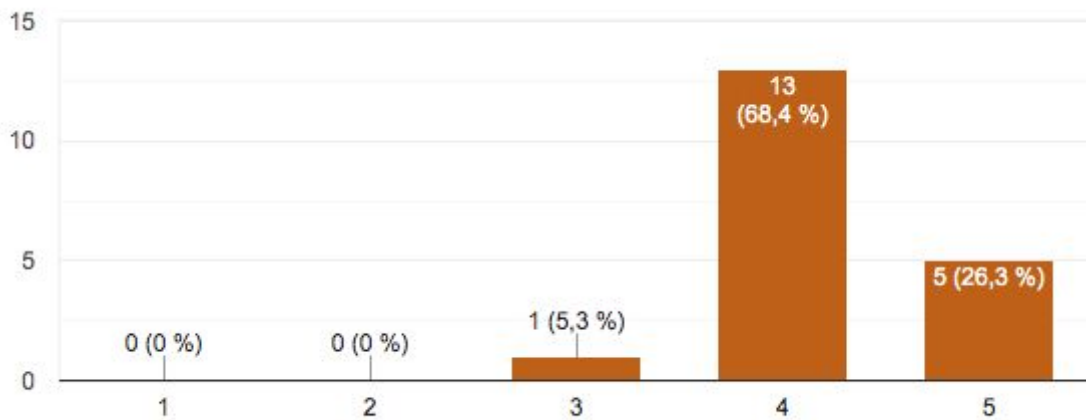

Figure 3.2. User rating of piano roll visualization facility of the Pilot. (1) Poor - (5) Excellent.

In terms of visualization, the participants had the following comments and suggestions for improvement. We outline here the most relevant ones:

❖ Difficulty in locating themselves in the piano roll visualization, and suggestion to improve the contrast and the colors used for the piano roll.
❖ A temporal delay between the synthesized voices and the recorded one.
❖ Suggestion to change the speed (tempo) of reading and pitch for difficult passages and to improve the change of paces.
❖ Suggestion to turn pages a bit before to make a good link when recording and other usability comments regarding the pilot.

In terms of **synthetic voices**, Figure 3.3 summarizes participant´s scoring on the synthetic voices. We observe that participants have positively evaluated the quality of synthetic voices. Some feedback received include some problems with the text in long notes, some tuning issues in the attacks and note transitions, and some pronunciation problems that need to be addressed in future developments of the synthesis engine.
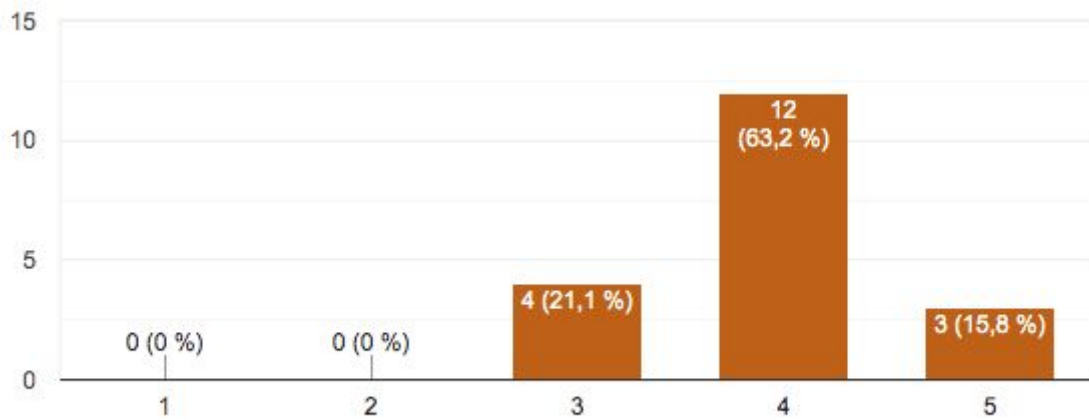
Figure 3.3. User rating of synthetic voices. (1) Poor - (5) Excellent

Figure 3.4 illustrates the participant perception on the voice recording and analysis functionality. We observe that participants are also satisfied with this functionality.
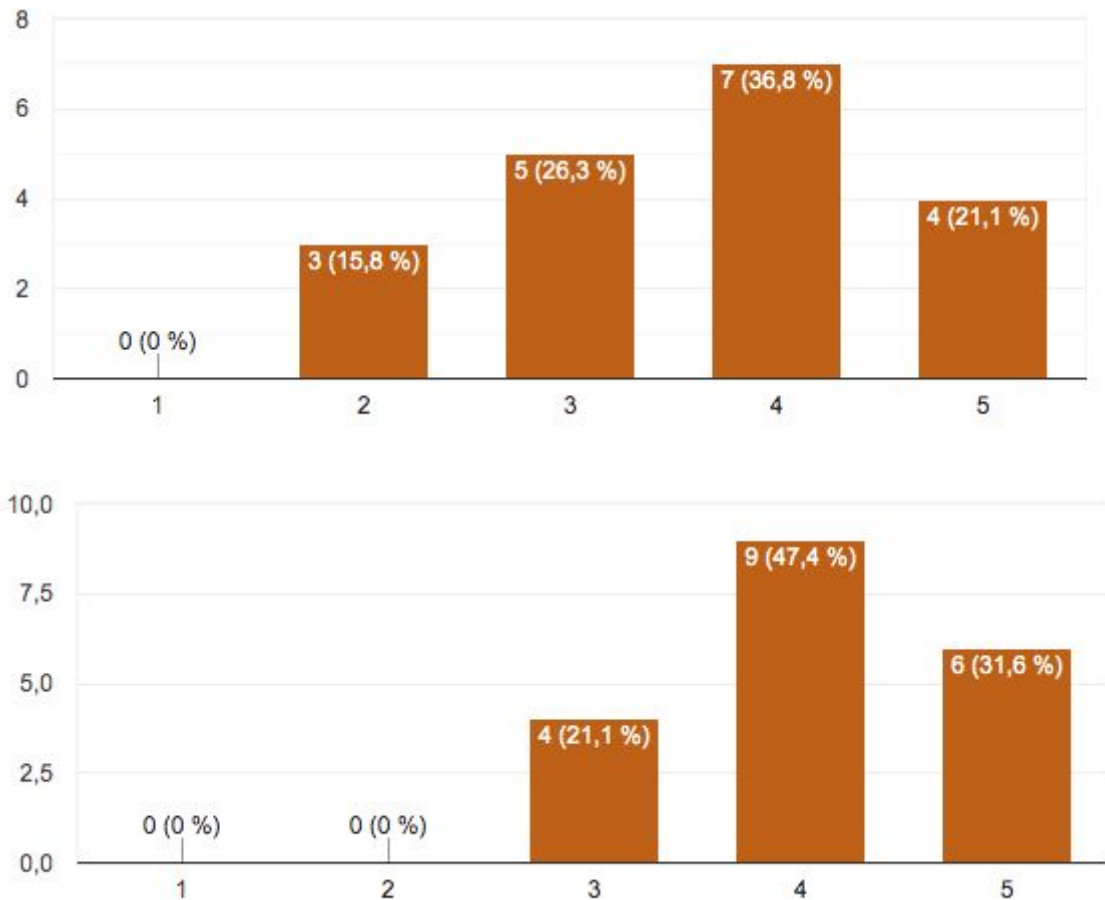
Figure 3.4. User rating on voice recording (top) and analysis (bottom) functionality. (1) Poor - (5) Excellent

In terms of suggestions, the participants propose to solve some issues related to temporal delays between the synthetic and the recorded voices. They also propose the possibility of storing different versions of their voice in order to compare several rehearsals. Some participants commented on the

need to have a more general rating of the performance in addition to the pitch visualization functionality which is planned in future developments of the pilot. Finally, Figure 3.5 includes their overall perception of the Pilot, and we observe the overall rating is very positive.
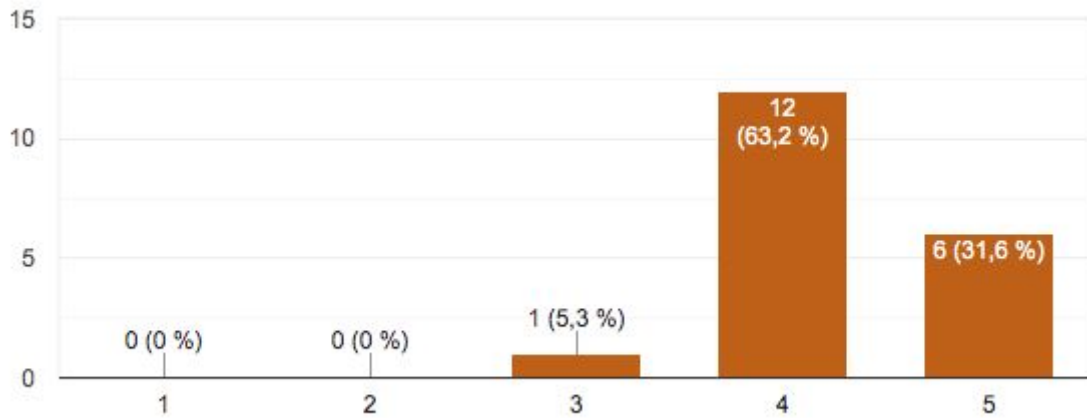
Figure 3.5. User overall rating on the Choir Singing PIlot. (1) Poor - (5) Excellent

Participants commented that the application is interesting to support the rehearsal, and they gave some detailed suggestions for improvement as mentioned below. Our validation study has served to validate the approach and demonstrated the positive perception of the TROMPA Choir Singing Pilot. However, the evaluation also showed us some technical aspects that should be solved and ideas for improvements for the future iteration of the pilot. These suggestions are incorporated in the future planning of the pilot, as introduced in the next section.

4. Future outlook

We present in this section the future plans for the pilot development, including the development roadmap and the plans for the engagement with the choir singing community.

4.1. Prototype development roadmap

The following figure summarizes the development timeline for the TROMPA Choir Singers Pilot in Months 24-34. "Full singers functionality" refers to a version with all the functional requirements for singers satisfied fully, although more features such as recommendation based on difficulty will be added afterwards.
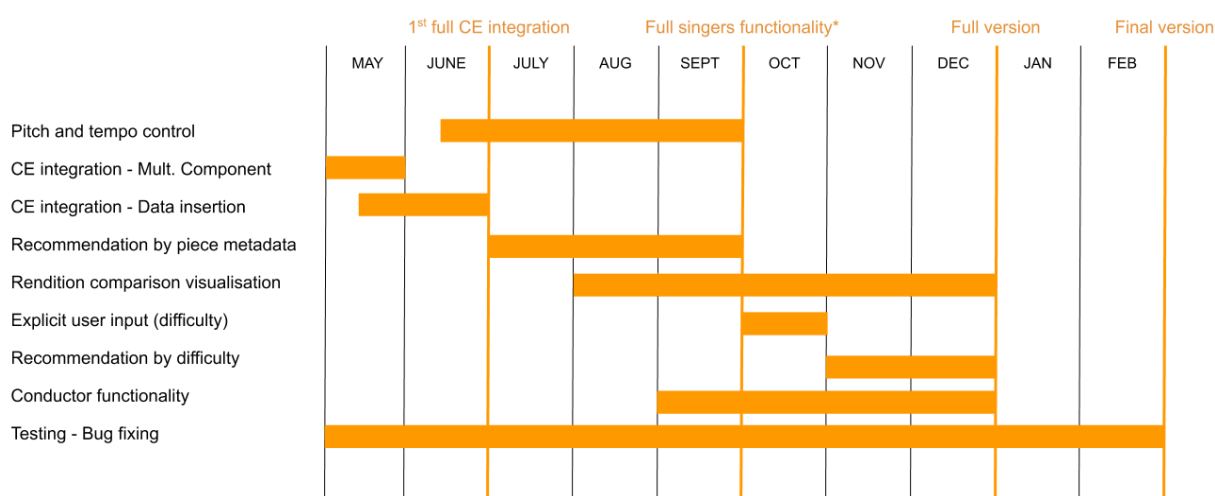
Figure 4.1. Development timeline for the TROMPA Choir Singers Pilot in Months 24-34.

The plan for the following months is to further develop the pilot to meet 4 milestones:

- ❖ **1st full CE integration.** For this version, we will integrate the Multimodal Component to browse scores in the CE. In addition, we will insert data generated by the pilot (e.g. audios and analyses of performances) into it.
- ❖ **Full singers functionality.** In this version, we will integrate pitch and tempo control (i.e. ability to practice at different tempi and to change the key), meeting all the functional requirements for singers described in Deliverable 2.2. In addition, by using the Multimodal Component, this version will offer basic recommendations based on metadata of the piece available in the CE (e.g. pieces by the same composer, in the same language…).
- ❖ **Full version**. Here we will add the functionality for conductors, which requires visualisation of multiple renditions by different singers of the ensemble. Moreover, we will integrate recommendation by piece difficulty, based on explicit difficulty ratings provided by users of the application.
- ❖ **Final version**. Fixing any issues identified during the testing of the previous versions.

4.2. User engagement strategies

Given the cancellation for weeks (or months) of physical choir rehearsals and concerts due to the COVID-19 crisis, the TROMPA consortium discussed how to take this as an opportunity to engage largely with the community in a virtual scenario.

From the **coming months** until deliverable D6.8 - Mid Term Evaluation (to be submitted in M27), we will provide a larger-scale evaluation of the Pilot with a focus on (1) improving usability of the Pilot; (2) enlarge the current Repertoire; and (3) enforce large-scale use of pieces. In order to do that, we propose to start by setting up a **user study centred around a single piece rehearsed by a large number of singers**. We plan to select a well-known choral piece from one of the public domain repositories. In order to reach a larger audience, we will plan a communication action to reach a wide community at local, European and international level.

The requirements for the selected piece was to have a mid-level of difficulty, to be a known historical piece, and to be in Latin to avoid the language bias. We asked the conductor of a professional choir in Barcelona (Cor Francesc Valls) to help us in the selection and, as a temptative piece, we are considering *Sicut Cervus* by G. Palestrina. As for Month 24, we are preparing the rendering of the synthetic version, as well as the integration into the Pilot to start the outreach action during May 2020.

The outcomes of this action will be on the one hand, to create awareness of the Pilot by choir members at international scale. On the other hand, it opens the technical possibility to reuse the performances recorded by the participants to build a virtual choir recording. Although it is still to be defined its technical implementation, the virtual choir result could be a powerful promoting material for the TROMPA project. With the aim of expanding the use and dissemination of the pilot, we plan to resume previous contacts made before the emergence of COVID-19, on the one hand, various choirs from the territory of Catalonia and Spain, as well as choir federations that bring them together, and finally initiatives of various kinds that can open doors for us to reach more audiences.

Beyond that, we will exploit in the next year the synergies with TROMPA partners and the European Choral Association to enforce the dissemination of the pilot on an international scale, as described as follows.

Phase 1: Local Choir Community in Barcelona/Catalonia
In Catalonia there is a great variety of choirs (approximately 1,000) in most towns, and many of them are associated within a set of federations that bring them together and offer them some basic services (insurance, courses, participation in musical cycles and various acts, archive of scores, etc). TROMPA is in touch with the Catalan Federation of Choral Entities[6], an autonomous entity, with legal personality. It has been created to improve and coordinate the choral activities, collective actions of the federated entities. As a complementary aim it has also been created to give advice and guidance to these groups and to promote new choirs. Member of the European Federation of Young Choirs (EUROPA CANTAT) and of the International Federation for Choral Music (IFCM). More than **500 choirs** are now members of the FCEC.
We will also reach Moviment Coral Català[7], the confederation that since 1995 brings together various choral federations in Catalonia, representing more than 700 entities and 30,000 singers disseminated throughout the Catalan territory. Other local contacts in the choir community include:

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6 https://www.fcec.cat
7 https://mcc.cat

❖ Associació Messies Participatiu[8] is a cultural entity that organizes activities and musical events, from which it is possible to establish contacts of the participants to arrive at the group choirs, as most of the singers belong from all over Catalonia.
❖ Centrecoral[9] is a mailing list on the subject of choral singing, in the style of those that work in many other countries, but in catalan, with a huge number of subscribers that will allow us to disseminate the project through its portal.

Based on the established contacts, we will define an action plan structured by geographical areas. We will define the choirs that can be prescribers of the use of the pilot by areas of influence and by the way they are organized, with the aim that they host workshops to present the pilot at the territorial level. These prescribing choirs may be by:
❖ Interest in the project.
❖ Ability to call nearby, known or associated corals.
❖ Capacity and structure to host presentations (physical or virtual).

From our plannings, we intend to run between 6 and 10 workshops in Catalonia for choir communities, depending on the local restrictions for physical workshops. Otherwise, we will consider evirtual events.

Participation and presentations at international events and festivals:
Every year, FCEC organizes an international choir singing festival in Barcelona, where we plan to make a more global dissemination of the initiative.

Communication and dissemination
Once contact is established with the choirs and groups, communication actions will be activated to publicize the project, such as:
❖ Provision of periodic content/newsletter on the project website to feed the associated mailing list and spread it on known portals.
❖ Contact with the specialized media to present, write or explain the project, locally - when the workshops are held - and nationally.
❖ Dissemination of the project activity on social networks (facebook, twitter and instagram), such as calls, news, presentations, etc.
❖ Advertising clips or "teaser" videos for new audiences.

The intention is that the same calls and the workshops themselves provide content for the dissemination of the project, and expand the public as they are carried out.

Phase 2: Scaling at the European level

The intention is to expand the universe of corals that can be users of the project at national and European level.
❖ First, we will explore choral communities in the partner countries, thanks to the link with TROMPA consortium, including The Netherlands, Austria and UK. In each of these countries

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[8] www.messiesparticipatiu.cat
[9] http://www.centrecoral.org

we will create dissemination material and reach similar structures of federations and associations to replicate workshops, when possible, attend fairs or festivals. We will take advantage of the liaison and the links within the TROMPA consortium.

❖ Second, we will take advantage of the synergies that the Catalan federations already have at European level to access contacts, including events where the project can be presented.

❖ Finally, we will take advantage of having Europa Cantat as a TROMPA associated partner. It is a network of organizations, choirs and individuals in the field of collective singing in Europe. They represent more than 2,5 million singers, conductors, composers and managers in over 40 European countries. We will contact this association through FCEC.

Our user engagement strategy will be restricted by the evolution of the health emergency, so a focus on activating local communities located next to TROMPA partners would be the most suited one for a mobility restriction scenario.

5. Integration with other TROMPA WPs

This section summarizes the integration of the prototype with the components and technologies developed in other WPs, including WP3 (automatic description), WP4 (crowd-sourcing and human computation technologies) and WP5 (contributor environment and core components).

5.1. Relation with TROMPA WP3

WP3 tasks	Currently integrated	To be integrated in next version
Music description	The pilot currently performs automatic voice analysis using the Voiceful Cloud platform and painting a pitch analysis curve on top of the piano roll visualisation.	Enhance pitch visualization and incorporate automatic assessment of performance with respect to intonation.
Audio processing[10]	Synthetic voices in the current version already use the voice models generated for TROMPA.	Current work in Deliverable 3.3 is dealing with supporting a wide variety of musical notations in MusicXML.
Visual analysis of scores	n/a	n/a
Alignment of musical resources	n/a	n/a
Multimodal cross-linking	n/a	In the next months, we will integrate the Multimodal Component in order to offer an enriched score browsing experience (e.g. recommending scores from the same composer, style…)

5.2. Relation with TROMPA WP4

WP4 tasks	Currently integrated	To be integrated in next version
Crowd-powered improvement	Currently we are storing recordings and metadata from users which can be useful not only to build	We plan to add explicit user input for fragment and piece difficulty ratings. This will be used for recommending pieces with

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[10] This task is explained in detail Deliverable 3.3 - Audio Processing v2.

	additional features (e.g. comparative performance analysis of previous renditions) but also for other tasks such as research on automatic difficulty rating.	difficulty appropriate for the user skills.
Annotators	n/a	n/a
Incentivisation of TROMPA crowds	The current version includes a manual in 3 languages (English, Spanish and Catalan) which includes the video linked at the beginning of this document. This version also integrates Google Analytics to facilitate analysis of user's actions using the pilot. For every voice analysis performed in the Voiceful Cloud, the pilot stores metadata with information about the piece, fragment and user.	Recommendation: by integrating the multimodal component, the pilot will offer pieces recommendations based on different similarity criteria (composer, epoch, style…). We also plan to add recommendations based on difficulty, for which we will retrieve difficulty ratings from users of the pilot.
Campaign design	n/a	n/a

5.3. Relation with TROMPA WP5

The Pilot is yet not integrated with the TROMPA Contributor Environment (CE), but this integration is precisely the next step for development and is already planned in detail. First, we will integrate the Multimodal Component (MC) in order to be able to browse scores; the requirements of the pilot for the integration of the MC are documented in its GitHub repository and will be implemented in its next development iteration. Second, we will insert data generated by the pilot (e.g. performances and their analyses) into the CE. This is pending some details currently under discussion by the consortium regarding the modeling, i.e. which fields must be filled in the CE nodes and which relationships must be defined between nodes. As soon as this is completely defined, this integration will be immediate.

WP5 components	Currently integrated	To be integrated in next version
Score edition component	n/a	Some of the features already implemented in the score edition component might be useful for the pilot for new functionalities (e.g. ability to select regions by dragging, associate annotations to a specific selected region). Although none of this is a functional requirement of the pilot, we will consider integrating the Score Edition component for additional features
Processing library	The new voice models have been deployed to the *Voiceful Cloud* service, and the API has been updated to support choral pieces. However, the current pilot version uses synthetic audios generated offline, not through the CE. We already created a script to act as an *interface* between the CE and the Cloud service. Making the synthesis ready to be called from the CE is pending some decisions on authentication to avoid fraudulent use. Similarly, the analysis on *Voiceful Cloud* is accessed directly from the application, not through the CE.	In parallel to the development of the functionality for conductors, we will integrate the synthesis in the CE so that users uploading a new piece can also generate the synthetic voices, automatically generating new nodes and relationships in the CE.
Multimodal integration	The pilot still does not integrate the Multimodal Component, since it still does not satisfy the minimum requirements to browse scores together with their synthetic audios. However, these requirements have been reported in detail to the relevant partners and are part of the current development plans	As soon as the Multimodal Component satisfies the minimum requirements for the pilot, it will be integrated. First, it will allow users to browse scores in the CE. Then, we will use it for recommendation, as explained in 4.2.
Performance assessment	The *Voiceful Cloud* analysis is already integrated as described in D5.5, Music Performance Assessment Mechanisms.	Voiceful Cloud features will be combined to other music descriptors from WP3 in order to facilitate a) choir singing analysis in terms of intonation, timing and pitch accuracy and b) rating/evaluating synthetic choir voices.

Annotation tools	n/a	n/a

6. Conclusion

In this deliverable we have presented the status, in M24 of the TROMPA project, of the Pilot Prototype for Choir Singers. The Pilot is already online, and the current version already satisfies the functional requirements for singers defined in WP2, pending some details such as pitch and tempo control. The requirements for conductors will be developed in the upcoming months, taking advantage of the data that the Pilot can already generate through testing. The available pieces have already been synthesized with the new voice models developed in WP3. Regarding WP4, the current version includes a manual in 3 languages (Spanish, Catalan, English) and it stores information about its usage on Google Analytics and storing metadata associated with all analyses. In upcoming versions, the pilot will provide recommendations for new pieces by integrating the WP5 Multimodal Component (e.g. recommending pieces by the same composer) and by using explicit and implicit data generated by users (e.g. recommending pieces of similar difficulty). WP5 Performance Assessment has already been integrated through the *Voiceful Cloud* service, and specific choir singing analysis developed in WP3 will be integrated in upcoming versions.

In addition, we have provided some usability evaluation with 19 choir singers with different musical expertise, who provided usability feedback and comments on the user interface and technologies of the pilot. This evaluation will allow the Consortium to shape a fully usable Prototype that will serve as the basis for the next evaluation exercise to be reflected on **D6.8 - Mid Term Evaluation** to be submitted in M27.