



D7.6 Final periodic activity and management report

January 29th, 2020

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CHANGELOG

Version	Date	Description of change	Responsible
V0.1	01/11/2020	First draft	Daniel Molina
V0.5	11/11/2020	First round of contributions from work packages	Daniel Molina
V0.6	18/11/2020	Second round of contributions from all partners	Daniel Molina
V0.8	24/11/2020	Version for peer-review	Daniel Molina
V0.9	04/12/2020	Version incorporating comments from peer-review	Daniel Molina
V1.0	29/01/2021	Final version	Daniel Molina

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1 Executive Summary

This deliverable includes a public summary of the activity performed by H2020 project FuturePulse (Grant Agreement Number: 761634) throughout its third and final year of execution.

Section 2 describes the aims and objectives of the project and its use cases. Section 3 includes a list with the main results of the project. Section 4 depicts a summary of the activity performed during the period. Section 5 presents the work carried out within the period by every Work Package of the project and Section 6 summarises the updates of the Data Management Plan.

2 FuturePulse

2.1 Rationale

Music is one of the **fastest evolving media industries**, currently undergoing a **transformation** at the nexus of **music streaming, social media and convergence technologies**. As a result, the **music industry** has become a **mixed economy of diverse consumer channels and revenue streams**, as well as **disruptive innovations** based on **new services** and content **distribution models**. In this setting, music companies encounter daunting challenges in dealing successfully with the transition to the new field that is shaped by streaming music, social media and media convergence. The availability of huge music catalogues and choices has rendered the problems of recommendation and discovery as key in the competition for audience, while the continuous access to multiple sources of music consumption has resulted in a dynamic audience, characterised by a highly diverse set of tastes and volatility in preferences which also depend on the context of music consumption.

The project **helps music companies** leverage a variety of music data and content, ranging from broadcasters (TV, radio) and music streaming data, to sales statistics and streams of music-focused social media discussions, interactions and content, through sophisticated analytics and predictive modelling services **to make highly informed business decisions, to better understand their audience and the music trends of the future**, and ultimately **to make music distribution more effective and profitable**. **FuturePulse** will offer these capabilities over a **user-friendly, highly intuitive and visual web solution** that will enable the immersion of music professionals in the realm of music data, and will support them to make highly informed and effective business decisions (e.g., artist/venue to book, marketing budget).

2.2 Partnership

The **FuturePulse** partnership consists of eight partners: three pilot partners (PLAYGROUND, Soundtrack Your Brand -SYB- and Advanced Music -SÓNAR-), each of them coming to the project with unique business cases with high innovation potential. These are supported by two leading EU research Organisations (CERTH, IRCAM), and three IT, technology and data providers (BMAT, ATC and MUSIMAP) to ensure that a market-ready system and a set of cutting edge services will be delivered after being thoroughly evaluated in real-world business settings.

The pilot partner BASS NATION terminated their participation due to force majeure in FuturePulse on July 20th, 2019, being substituted by SÓNAR as the pilot leader for the Live Music use case and BMAT for the leadership of WP5 (Pilot Management).

2.3 Use Cases and Business Scenarios

To serve the increasingly complex needs of the music ecosystem, **FuturePulse** has **developed and pilot test a novel, close to market music platform** in three high-impact use cases:

- Record Label use case:** FuturePulse platform helps music professionals grasp how all the different signals (music streaming, music play in radio/TV, social media sharing) translate to future music sales and revenues (digital sales/streaming/ads), and what are the best strategies to optimise them.
- Live Music use case:** FuturePulse platform collects and analyses data from multiple sources around artists in order to help predict the ticket sales that an artist would bring for a particular venue, the audience demographics (e.g., age composition), discover and recommend artists that will be a good match for a venue, and support the end-users on the task of pricing the artists for live events. FuturePulse makes the results of this analysis accessible to the main live music stakeholders: a) venues, b) promoters and c) festival organisers.
- Music Platform use case:** FuturePulse provides a platform for joint analysis of music play data coming from the background music provider and data coming from the client business where music is played (e.g., sales data). This allows the end-user to uncover valuable correlations and recommend music to stream to optimise business goals.

2.4 Scope and Objectives

In response to the industrial needs of the music industry the **FuturePulse** project has identified the following six specific technological and innovation objectives:

- Objective 1:** Deliver a single tool for collecting and accessing music data from a diverse set of sources.
- Objective 2:** Deliver a set of data-driven services for estimating the current and future popularity of songs, artists and genres.
- Objective 3:** Deliver a set of services for enhanced audience analysis and management.
- Objective 4:** Integrate music data collection, mining, and visualisation in a scalable Software-as-a-Service (SaaS) platform.
- Objective 5:** Perform large-scale pilots on three clearly defined music segments.
- Objective 6:** Develop and execute a comprehensive dissemination and exploitation plan and pave a clear path to market.

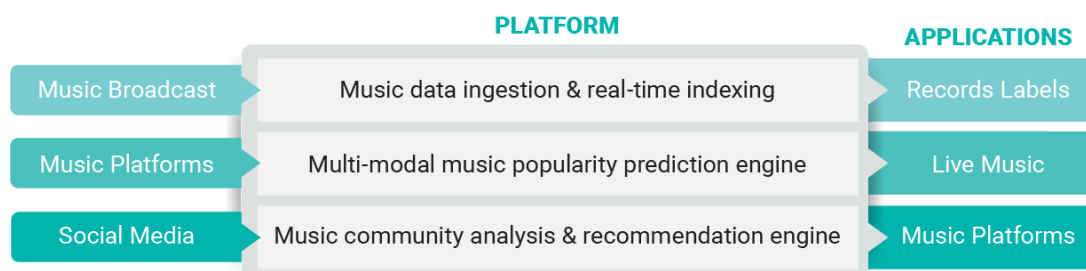


Figure 1: FuturePulse Platform and Applications

The project has delivered a number of high-quality outcomes that will form the basis for

the exploitation plan of the project. These are illustrated in the figure above and include the following:

- A robust and extensible multi-source music data ingestion and real-time indexing framework.
- A multi-modal music popularity prediction engine: This will produce short- and long-term predictions for popularity indices about specific artists, albums, songs, styles and genres, given a variety of incoming signals.
- An online music community analysis framework and a music recommendation engine.
- An integrated scalable cloud-based platform offering the full spectrum of FuturePulse services.
- Three market-driven applications serving the needs of record labels, event organisers and music platform operators.

3 Summary of the main results and outputs of FuturePulse

Technical outputs

- [FuturePulse open platform available](#)
- [FuturePulse API and documentation published](#)
- Data collection (broadcasting, online music statistics, social media and open data), which helps the development and evaluation of the predictive analysis and recommendations of artists and tracks
- High-level music content analysis developed and improved
- Aggregation, estimation and prediction algorithms, a non-linear composite artist popularity score, genre association analysis, listening behaviour and audience and brand profiling
- Artist discovery
- New user-friendly and intuitive User Interface
- New functionalities according to pilots' requirements
- Performance improvements; partial migration to AWS
- Support of Medium and Large Scale pilots

Pilots

- Requirements for the pilots refined and included in the Action Plan Year 3
- Medium Scale and Large Scale pilots performed
- Feedback and insights provided to the other WPs of the project, including additional feedback mechanisms (questionnaires, backend user action data)

Dissemination, Exploitation and Liaisons

- Events, Workshops and project showcases
 - Sónar+D CCCB online event – FuturePulse panel 'Forecasting success in the music industry'
 - Sónar+D Innovation Challenge presented by FuturePulse
 - Project showcases: FuturePulse Open webinar, Primavera Pro online conference, C/O POP Convention

- Participation in: Waves Music Conference, SEUIT Architecture Summit, Sweden Live, Linecheck Music Meeting and Festival
- Dissemination
 - Total of 9 scientific publications to journals and conferences
- Communication
 - FuturePulse website updated and public deliverables published
 - Audience engagement through social media
 - FuturePulse promotional video for our participation to Primavera Pro online conference
 - Three electronic Newsletters
- Press & Media
 - Article in Music Business Worldwide magazine
 - Dagens Nyheter newspaper
 - Interview in 808 Radio CMM
 - Article in Austrian Music Export
 - Podcast “Predicting Hits ... Before They Hit”
 - Article in Musikindustrin.se
 - Podcast “The power of audio + science + AI”
- Exploitation
 - Updated Market research and IPR analysis
 - Exploitation plan
- Liaisons
 - Partners in We Are Europe project participating in Live Music pilot
 - API shared with H2020 projects HRadio, Marconi and Bloomen

Data

- Management of third-party data availability
- Data Management Plan monitored
- New updates to Zenodo
- Public deliverables available in FuturePulse website

Others

- Feedback from the FuturePulse External Advisory Board (EAB) formed by 8 External experts from the music industry

4 Summary of activity during M25-M39

4.1 Gantt chart

	Start	End	Y1				Y2				Y3				Y4
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
WP1 Open Innovation, User Requirements and Design	1	15	D1.1/5	D1.2			D1.3/6/4								
T1.1 Technology and market innovation analysis	1	15													
T1.2 FuturePulse co-design process	1	15													
WP2 Music Data Collection, Analysis and Indexing	2	27			D2.1	D2.2/5			D2.3		D2.4				
T2.1 Collection of broadcast data	2	21													
T2.2 Collection of online music platform data	2	21													
T2.3 Collection of social media and open data	2	21													
T2.4 Music analysis and indexing	2	27													
WP3 Predictive Analytics and Recommendations	1	30				D3.1				D3.2/4		D3.3			
T3.1 Popularity estimation and prediction	1	24													
T3.2 Audience profiling and recommendation	7	30													
T3.3 Business-driven music mining & recommendation	10	30													
WP4 Platform Integration and Application Development	1	36		D4.1/8		D4.2/9	D4.3	D4.4		D4.5		D4.6		D4.7	
T4.1 System architecture	1	18													
T4.2 Visualization and user interaction	4	24													
T4.3 FuturePulse platform development and component integration	4	36													
T4.4 FuturePulse application development	10	36													
WP5 Pilots and Evaluation	4	36			D5.1/9										D5.8/16
T5.1 Record label pilot	4	36								D5.2/10					D5.5/13
T5.2 Live music pilot	4	36								D5.3/11					D5.6/14
T5.3 Music platform pilot	4	36								D5.4/12					D5.7/15
T5.4 Pilot coordination and management	4	36													
WP6 Innovation Management, Dissemination and Exploitation	1	36	D6.1	D6.2			D6.3/7			D6.4/8					D6.5/9
T6.1 Development of engagement and communication strategy	1	12													
T6.2 Creation of FuturePulse website and dissemination material	1	36													
T6.3 Dissemination activities	7	36													D6.5/9
T6.4 Exploitation activities	7	36													D6.6/10
WP7 Project Management	1	36	D7.1	D7.2		D7.3/7				D7.4/5/8					D7.6/9
T7.1 Project coordination, resource monitoring & financial control	1	36													
T7.2 Project quality planning and monitoring	1	36													
T7.3 Data management	1	24													

Table 1: FuturePulse Gantt chart

4.2 Deliverables

The following table includes the deliverables submitted to the Funding & Tenders portal during the period M25-M39, as included in the Description of Action (DoA). All submissions were performed in due time except pilot reports (M38), which needed extra time to include conclusions from the Large Scale Pilots.

Month	#	Title	Lead beneficiary	Type	Dissemination level
M25	D5.2	Record Label pilot report v1	Playground	Report	Public
M25	D5.10	Record Label pilot report v1 (D5.2 Confidential)	Playground	Report	Confidential
M25	D5.3	Live Music pilot report v1	BMAT	Report	Public
M25	D5.11	Live Music pilot report v1 (D5.3 Confidential)	BMAT	Report	Confidential
M25	D5.4	Music Platform pilot report v1	SYB	Report	Public
M25	D5.12	Music Platform pilot report v1 (D5.4 Confidential)	SYB	Report	Confidential
M27	D2.4	High-level music content analysis	IRCAM	Demonstrator	Public

		framework v2			
M27	D2.6	High-level music content analysis framework v2 (D2.4 Confidential)	IRCAM	Demonstrator	Confidential
M30	D3.3	Predictive analytics and recommendation framework v3	CERTH	Report	Public
M30	D4.6	FuturePulse use case applications v3	ATC	Demonstrator	Public
M38	D5.5	Record Label pilot report v2	Playground	Report	Public
M38	D5.13	Record Label pilot report v2 (D5.5 Confidential)	Playground	Report	Confidential
M38	D5.6	Live Music pilot report v2	Sónar	Report	Public
M38	D5.14	Live Music pilot report v2 (D5.6 Confidential)	Sónar	Report	Confidential
M38	D5.7	Music Platform pilot report v2	SYB	Report	Public
M38	D5.15	Music Platform pilot report v2 (D5.7 Confidential)	SYB	Report	Confidential
M39	D4.7	Final FuturePulse platform and applications	ATC	Demonstrator	Public
M39	D5.8	Final pilot report	BMAT	Report	Public
M39	D5.16	Final pilot report (D5.8 Confidential)	BMAT	Report	Confidential
M39	D6.5	Communication & dissemination report v2	ATC	Report	Public
M39	D6.9	Communication & dissemination report v2 (D6.5 Confidential)	ATC	Report	Confidential
M39	D6.6	Exploitation report	BMAT	Report	Public
M39	D6.10	Exploitation report (D6.6 Confidential)	BMAT	Report	Confidential
M39	D7.6	Final periodic activity and management report	BMAT	Report	Public
M39	D7.9	Final periodic activity and management report (D7.6 Confidential)	BMAT	Report	Confidential

Table 2: Deliverables M25-M39

4.3 Milestones

The milestones covered during the M25-M39 period are:

Number	Title	Lead Beneficiary	Due date	Means of verification
MS4	R&D towards pilot v2 (medium-scale)	BMAT Packages involved: WP3, WP4, WP5	M30	<p>The project has completed the second annual reporting period. The intermediate release of the FuturePulse platform is demonstrated at the second review meeting. The data collection mechanisms are finalized.</p> <p>The second version of the predictive analytics and recommendation framework and of the FuturePulse use case applications are also ready. Medium-scale pilots have been carried out for all three use cases. The dissemination, exploitation and business planning has been revised, according to the latest market developments.</p>
MS5	R&D towards pilot v3 (large-scale) WP3, WP4, WP5	BMAT (substituting Bass Nation) Packages involved: WP3, WP4, WP5	M39	<p>The FuturePulse platform and the individual components have been evaluated from expert user groups, while ground truth evaluation of the components has been performed, using the final release of the platform, use case applications and predictive analytics and recommendation framework. Large-scale pilots have been carried out for all three use cases.</p>
MS6	Project result packaging and exploitation	BMAT Packages involved: WP6, WP7	M39	<p>The dissemination, exploitation and business planning has been finalized to facilitate the communication, exploitation and commercialisation tasks. The final exploitation strategy, including a business analysis for commercialising FuturePulse post project end, has been finalised, and an agreement has been reached among the consortium partners on the exploitation of the FuturePulse platform. The achievement of this milestone will be verified in the final project review meeting.</p>

Table 3: Milestones M25-M39

4.4 Events and Presentations

Date	Type	Event Name	Title of Presentation	Main Contributor/ attendee
27/09/2019	Conference	Waves Music Conference, Vienna	Presentation and Demo	Thomas Lidy (Musimap)
04-08/11/2019	Conference	International Society for Music Information Retrieval (ISMIR), Delft, The Netherlands	Data-driven song recognition estimation using collective memory dynamics models	Christos Koutlis (CERTH)
04-08/11/2019	Conference	International Society for Music Information Retrieval (ISMIR), Delft, The Netherlands	Deep-rhythm for tempo estimation and rhythm pattern recognition	Hadrien Foroughmand (IRCAM), and Geffroy Peeters
20/11/2019	Conference	SEUIT Architecture Summit 2019	Data Driven Decision Making in the Music Industry	Daniel Johansson (SYB)
20-21/11/2019	Conference	Mirac research conference in Sweden www.mirac.se	Live music and Statistical Analysis - FuturePulse	Daniel Johansson (SYB)
14/12/2019	Conference	International Conference on Complex Networks and Their Applications 2019	LinkAUC: Unsupervised Evaluation of Multiple Network Node Ranks Using Link Prediction	Manios Krasanakis (CERTH)
21/01/2020	Music industry conference	Sweden Live 2019	FuturePulse - Data Analysis for the Live Industry	Daniel Johansson (SYB), Saki Markovic (PGM)
17/06/2020	Online presentation	SAMI Svenska Artisters och Musikers Intresseorganisation	Data Science for Musicians and Artists	Daniel Johansson (SYB)

23/06/2020	Online presentation	Studieförbundet	Statistics and the music industry	Daniel Johansson (SYB)
21-24/07/2020	Online conference	Primavera Pro online conference	FuturePulse: Empowering the Music Industry with Predictive Analytics	Gonçal Calvo (BMAT)
19/09/2020	Conference	Sónar+D CCCB	FuturePulse: forecasting success in the music industry	Daniel Johansson (SYB), Saki Markovic (PGM), David Weiszfeld (Soundcharts), Sophie Brüggemann (Spinnin' Records)
09/10/2020	Online webinar	FuturePulse Open webinar	FuturePulse Presentation and platform demonstration	Sakis Dalianis (ATC), Daniel Molina (BMAT), Gonçal Calvo (BMAT), Daniel Johansson (SYB)
22/10/2020	Main conference	C/O POP Convention	Predicting the unpredictable	Saki Markovic (PGM), Gonçal Calvo (BMAT), Daniel Johansson (SYB)
22/10/2020	Online conference	Joint Conference on AI Music Creativity	Extending Deep Rhythm for Tempo and Genre Estimation Using Complex Convolutions, Multitask Learning and Multi-input Network	Hadrien Foughmand (IRCAM), and Geffroy Peeters
13/10-18/11/2020	Innovation Challenge / Datathon	Sónar+D Innovation Challenge	Predictive Analytics for the Music Industry	Gonçal Calvo (BMAT), Saki Markovic (PGM), Daniel Johansson (SYB), Thomas Lidy (Musimap), Manos Schinas (CERTH), Sónar
18/11/2020	Conference	Linecheck Festival / Milano Music Week	The end of magic: Algorithms and Analytics in A&R and Booking /	Saki Markovic (PGM)

			Networking: Meet Music Technology	
December 2020 or January 2021	Conference	2020 IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining	Stopping Personalized PageRank without an Error Tolerance Parameter	CERTH

Table 10: Events and presentations

4.5 Papers

- **“LinkAUC: Unsupervised Evaluation of Multiple Network Node Ranks Using Link Prediction”**, by Emmanouil Krasanakis, Symeon Papadopoulos, Yiannis Kompatsiaris. In: Cherifi H., Gaito S., Mendes J., Moro E., Rocha L. (eds) **Complex Networks and Their Applications VIII. COMPLEX NETWORKS 2019**. Studies in Computational Intelligence, vol 881. Springer, Cham. http://doi.org/10.1007/978-3-030-36687-2_1. Published 3 December 2019 ([Link to Zenodo](#))
- **“An Analysis of the Effect of Data Augmentation Methods: Experiments for a Musical Genre Classification Task”**, by Rémi Mignot, Geoffroy Peeters, **Transactions of the International Society for Music Information Retrieval**, 2(1), pp.97–110. December 2019. <http://doi.org/10.5334/tismir.26>. Published 18 December 2019 ([Link Zenodo](#))
- **“GAP: Geometric Aggregation of Popularity Metrics”**, by Christos Koutlis, Manos Schinas, Symeon Papadopoulos and Ioannis Kompatsiaris, **Information 2020**, 11(6), 323. <https://doi.org/10.3390/info11060323>. Published: 15 June 2020 ([Link to Zenodo](#))
- **“Unsupervised Evaluation of Multiple Node Ranks by Reconstructing Local Structures”**, by Emmanouil Krasanakis, Symeon Papadopoulos, Yiannis Kompatsiaris, **Applied Network Science** 5, 48 (2020). <https://doi.org/10.1007/s41109-020-00287-x>. Published 06 August 2020 ([Link to Zenodo](#))
- **“LAVARNET: Neural network modeling of causal variable relationships for multivariate time series forecasting”**, by Christos Koutlis, Symeon Papadopoulos, Manos Schinas, Ioannis Kompatsiaris, **Applied Soft Computing**, Volume 96, November 2020, 106685. <http://doi.org/10.1016/j.asoc.2020.106685>. Published 28 August 2020 ([Link to Zenodo](#))
- **“Extending Deep Rhythm for Tempo and Genre Estimation Using Complex Convolutions, Multitask Learning and Multi-input Network”**, by Hadrien Foroughmand, Geoffroy Peeters, **Joint (Virtual) Conference on AI Music Creativity**, Stockholm, Sweden, October 19-23, 2020. ([Link to Zenodo](#)).
- **“Stopping Personalized PageRank without an Error Tolerance Parameter”** Emmanouil Krasanakis, Symeon Papadopoulos, and Yiannis Kompatsiaris. To be presented at the **2020 IEEE/ACM International Conference on Advances**

in **Social Networks Analysis and Mining (ASONAM 2020)**, 7-10 December 2020, (Virtual).

4.6 Press & Media

- An article about FuturePulse has been published in **Music Business Worldwide** on 14 October 2020. Music Business Worldwide is the major news site for the global music industry with 55.000 subscribers ranging from music industry C-level executives to media professionals around the World. FuturePulse partner Daniel Johansson (SYB) talked to Dave Roberts about the project's goal and achievements as well as the planned dissemination activities (FuturePulse open webinar, webinar at c/o pop Convention and Sónar+D Innovation Challenge around predictive analytics). An individual newsletter about this article was sent to all 55.000 subscribers. The article is available [here](#).
- FuturePulse was mentioned in one of the largest newspapers in Sweden. FuturePulse partner Daniel Johansson (SYB) talked to Georg Cederskog and Hugo Lindkvist of **Dagens Nyheter** on 28 February 2020, about the coronavirus outbreak & on the possibility that the coronavirus could have disastrous consequences for the live industry. The full article is available [here](#).
- FuturePulse project Coordinator, Daniel Molina (BMAT), presented the project at **808 Radio CMM** on 10 October 2020. The interview is available [here](#) (from minute 24:30).
- FuturePulse participation at c/o pop Convention 2020 - xoxo Edition! was mentioned in a news article in **Austrian Music Export** on 15 October 2020. Austrian Music Export is a joint initiative of the Austrian Music Information Center mica – music austria and the Austrian Music Fund in close cooperation with the organizers of the Austrian booths at international music trade fairs. The article is available [here](#).
- FuturePulse partner, Daniel Johansson (SYB), presented the project during the Podcast "Predicting Hits ... Before They Hit" at "**Up Next Podcast**" with Gabriella Mirabelli on 5 November 2020. The podcast is available [here](#).
- An article about FuturePulse has been published in Musikindustrin.se on 26 October 2020. FuturePulse partner Daniel Johansson (SYB) talked to Lars Nylin about the project's goal and achievements. The full article is available [here](#).
- FuturePulse partner, Thomas Lidy (Musimap), gave an interview about his role in the FuturePulse project in the Podcast "The power of audio + science + AI" with Jasmine Moradi on 26 November 2020. The podcast will be available [here](#).
- FuturePulse has published 3 Newsletters ([Issue 1](#), [Issue 2](#) and [Issue 3](#)).

4.7 Updates of the project website

FuturePulse website has been continually maintained. Moreover:

- The video section of the homepage has been updated three times so that it is more appealing in order to accommodate i) the promotional video that has been created for [Primavera Pro online conference](#) and which presents the project

and the platform, ii) the video recording of the [FuturePulse Open webinar](#) and iii) the live streaming of the open online final event of this year's [Sónar+D Innovation Challenge](#) (SIC).

- The slider section of the homepage has been updated with images and catchy captions for:
 - The prelaunch notice for testing the FuturePulse platform with a link to <https://app.futurepulse.eu>.
 - The FuturePulse Open webinar that was organised on 9th of October 2020 with link to the relevant [blog post](#).
 - The Sónar+D Innovation Challenge Open Call that ran from 13th-23th of October 2020 with link to the relevant [blog post](#).
 - The Sónar+D Innovation Challenge final event with link to the [live streaming](#).
- New blog posts have been created with content from events we attended as well as from FuturePulse public deliverables and publications demonstrating the project's technical framework/methodology.

4.8 Coordination activities – cooperation with other projects/programmes

Project	Link	Expected areas of collaboration	Status
We Are Europe	https://weare-europe.eu/en/home/	Participation in Pilot activities	The partners were involved by Sónar in the Live Music pilot.
HRadio	https://www.hradio.eu	Exploitation and Dissemination	We shared our services API. Partners signed in the FuturePulse open platform and tested it.
MARCONI	https://www.projectmarconi.eu	Exploitation and Dissemination	We shared our services API. Partners signed in the FuturePulse open platform and tested it.
Bloomen	http://bloomen.io/	Exploitation and Dissemination	We updated them on project developments

			since both projects run in parallel with the participation of ATC and BMAT.
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Table 9: Cooperation with other projects

During the final period of the project, the main collaboration area with other H2020 projects has involved the participation of the partners in the We Are Europe project in the Live Music piloting activities. Furthermore, in the context of the Radio/Audio cluster, we continued informing HRadio and Marconi projects about our results and exchanging technical information. We shared updated documentation of our services API so they could test it and potentially leverage it for their activity. Members of HRadio and Marconi signed up to the FuturePulse open platform.

5 Work carried out by WP during M25-M39

In this section, we present the main activities and results during the third year of the project divided by work package.

5.1 WP1: Open innovation, User Requirements and Design

The objective of this Work Package is to position FuturePulse in the highly dynamic landscape of online music, to specify its unique and innovative characteristics and to deliver a set of concrete user requirements for FuturePulse.

This work package did not have activity within the period. The consortium kept continually monitoring the potential competition in the music industry. As a result, the Exploitation Report in WP6 complements the information delivered in the Music Industry Innovation Reports delivered within this WP1.

5.2 WP2: Music Data Collection, Analysis and Indexing

The main objective of this Work Package is to ensure that consortium partners have timely access to music data that is necessary for developing and testing the FuturePulse capabilities.

From the start of the third year, to the end of WP2, the work was dedicated to finalising the implementation of the data collection (broadcasting, online music statistics, social media and open data). Additionally, research works continued for the improvement of high-level content analysis.

The main activities and results of this WP during the M25-M39 period have been:

- Extension of the monitored sources by 100 additional radios channels, with an improvement of the geographical homogeneity of the panel.
- Extension of Spotify Playlists by tracking 27k playlists on a weekly basis (we started from 5k, we extended it to 15k and finally 27k entries identified to cover as many as possible playlists).
- Improvement of the audio-based mood recognition module (Deep Learning

model based).

- Addition of Spotify Charts and Spotify Analytics as data sources.
- Extension of the "Deep Rhythm" method for automatic estimation of tempo and musical genre.
- The deliverable D2.4/6 High-level music content analysis framework v2 was submitted.

5.3 WP3: Predictive Analytics and Recommendations

The main objective of this Work Package is to develop methods to leverage the large variety of collected music data (from WP2) for supporting decision making by various stakeholders (e.g., artists, labels, and brands).

Activities in Work Package 3 focused on improving the popularity estimation and prediction algorithms for tracks, artists, and genres. This is in part based on adding additional data sources, the other part being updates and improvements of the underlying machine learning algorithms. A large-scale test on the song recognition model has been performed. Furthermore, audio-based mood recognition has been significantly improved.

The main activities and results of this WP during the M25-M39 period have been:

- Popularity estimation and prediction algorithms for tracks, artists, and genres were improved.
- Additional data points and sources were added, tracking on country-level was introduced.
- The track recognition model was improved and tested with actual listeners.
- A non-linear composite artist popularity score and a comparison study among predictive models for the task of artist popularity online metrics' forecasting were developed.
- A genre association analysis was carried out and updates were made on the genre popularity estimation model.
- Audio-based mood recognition has been improved.
- Based on the collection of playlist data we developed a recommendation system to suggest relevant playlists given a new track, based on audio analysis of the track and audio profiling of the playlists under tracking.
- REST APIs for popularity estimation and prediction as well as finding top trending artists and tracks were improved and optimized.
- Initial steps were made towards developing a model where listening behaviour is transformed into an audience profile.
- Brand profiling and mapping target groups and audience profiles have been explored with SYB and other companies.
- The deliverable Predictive D3.3 analytics and recommendation framework v3 was submitted.

5.4 WP4: Platform Integration and Application Development

This Work Package is devoted to the definition of the FuturePulse platform architecture and the development of the actual platform and applications to be used by the pilot users throughout all pilot phases.

The focus of WP4 in the third year of the project was to proceed with the implementation of the final version of the FuturePulse platform. ATC, as WP leader, coordinated the activities of the WP4 as well as the communication between the technical and research partners through technical sessions during the plenary meetings, emails and bi-weekly calls. The work during the period was focused on the continuous development and improvement of the application's UI, with 19 incremental releases to support new functionalities, the improvement of the system performance, as well as the seamless integration of the system's services. Moreover, a technical evaluation of the system from the technical point of view has been performed in order to ensure that all mechanisms and services are functioning properly. During the reporting period the tasks T4.1, T4.2, T4.3 & T4.4 were active. The related progress and outcomes are presented in brief as follows.

The main activities and results of this WP during the M25-M39 period have been:

- The prototype regarding the visual interfaces to display the information generated by FuturePulse platform was updated based on the information extracted from the pilot users.
- Based on use cases specific requirements and pilot users feedback, new platform functionalities were designed and developed.
- The FuturePulse API was delivered, integrating all available technical components of WP2 and WP3.
- The final prototype of the three FuturePulse applications (Record Labels, Live Music, and Music Platform) was delivered.
- All CERTH's services (artist and genre popularity, playlist collection and analysis, track recognition, charts and events data collection) deployed on an AWS EC2 instance to ensure high availability and performance.
- The deliverable D4.6 FuturePulse use case applications v3 and D4.7 Final FuturePulse platform and applications were submitted.

5.5 WP5: Pilots and Evaluation

The goal of WP5 is to thoroughly evaluate the FuturePulse platform so its outcomes are improved over the course of the project leading to a close-to-market-ready solution. This is done by identifying potential future customers among three key use cases: Record Labels, Live Music and Music Platforms. These future customers are targeted to become testers of the platform, or pilot users. These pilot users -- record label managers, festival bookers, marketers, music editors and DJs, artists, producers, brands, shops, etc. -- were recruited by each WP5 partner or Use Case leader, who set up tests of the platform according to the technical timeline and the available technical features for each phase of the process. WP5 is key to the success of the

FuturePulse project as it will be the only way to evaluate the impact and value of the solution on the market.

The WP5 pilots are separated into three phases: Small Scale, Medium Scale, and Large Scale. In the third year, WP5 progressed by holding the Medium and Large Scale Pilots between M25 and M39.

During the reporting period, the tasks T5.1, T5.2, T5.3 & T5.4 were active. The related progress and outcomes are presented in brief as follows.

The main activities and results of this WP during the M25-M39 period have been:

- The requirements for the pilots were refined and included in the Action Plan Year 3.
- The Medium Scale and Large Scale pilots were performed.
- Feedback and insights were provided to the other WPs of the project.
- M25: The deliverables D5.2/10 Record Label pilot report v1, D5.3/11 Live Music pilot report v1 and D5.4/12 Music Platform pilot report v1 were submitted.
- M38/39: The deliverables D5.5/13 Record Label pilot report v2, D5.6/14 Live Music pilot report v2, D5.7/15 Music Platform pilot report v2 and D5.8/16 Final pilot report were submitted.

5.6 WP6: Innovation Management, Dissemination and Exploitation

The main objective of this Work Package is twofold: a) to generate awareness about the project and its achievements in the general public and in communities of interest, b) to pave a clear path to exploitation and sustainability for the project outcomes.

During the last period of the project, the overall project activity strongly focused towards delivering a platform, focusing on the most niche aspects of our value proposition, that could be openly shared and that could support the dissemination and exploitation activities performed.

The activity in WP6 initially involved the delivery of a detailed Year 3 Action Plan, specifically covering the Outreach and Exploitation sections of this report. This task, requested as a result of the second review of the project, turned out to be very useful to thoroughly study and prepare the overall activity of dissemination and exploitation in a way that could optimise the impact of the project in the music sector.

The COVID-19 situation strongly impacted the initial strategy of WP6 for the 3rd year. In consequence, a contingency plan was designed trying to cope with the planned impact given the new sudden circumstances. As part of this contingency plan, a three-month extension that was requested and granted. This period has been key for the outcomes of our dissemination and exploitation activities.

The contingency plan and the overall WP6 activity involved all partners, who chorally brought their expertise and best efforts to achieve the biggest impact possible in the music sector.

As a result, detailed at task level in the sections below, the project reached an important “momentum” in the last months of the project, where relevant actors and

different stakeholders in the music industry approached the project interested in using the platform commercially.

This activity was complemented by a continued market research and by discussing and building the joint exploitation plan of the project. In order to shape this, it is worth mentioning the relevant feedback obtained from the pilots, the general public using the Open platform, the Advisory Board and the conversations held with the industry leads that contacted us.

The dissemination activities including website, social media sites, management of the participation in events like Primavera Pro, Sónar+D, the Sónar Innovation Challenge or the presence in important websites like Music Business Worldwide, have strongly supported the impact of the project and its future exploitation.

The main activities and results of this WP during the M25-M39 period have been:

- The attendance and organisation of events, workshops and project showcases was performed. Among them, the Sónar Innovation Challenge (SIC) and the Open webinars brought a lot of interest from the sector.
- 7 scientific publications were accepted in journals and conferences.
- FuturePulse website was updated and public deliverables were published.
- Communication activity included the engagement of the audience through social media, a promotional video for our participation in the Primavera Pro online conference, three electronic Newsletters and the coordination with Sónar+D for the Sónar Innovation Challenge and the Sónar+D panel.
- Press & Media activity covered several articles, interviews and podcasts. Among them, the article published in Music Business Worldwide is of great relevance.
- Regarding exploitation, we delivered an updated market research and IPR analysis.
- The exploitation plan of the project has been developed. It includes a detailed and updated view of the Music Industry (pre and post COVID-19), evaluation of the competition, SWOT analysis and market size for the different possible types of customers.
- Liaison/cluster activities continued with H2020 projects We Are Europe¹, MARCONI², HRadio³ and Bloomen⁴.
- Deliverables D6.5/9 Communication & dissemination report v2 and D6.6/10 Exploitation report were submitted.

5.7 WP7: Project Management

The objective of this work package is to support the project in succeeding its goals through strong coordination and continuous monitoring, assessment and reporting.

The main activities and results of this WP during the M25-M39 period have been:

¹ <https://weare-europe.eu>

² <https://www.projectmarconi.eu>

³ <https://www.hradio.eu>

⁴ <http://bloomen.io/>

- Work was performed on day-to-day management, effective work and control of deadlines, work plan follow-up, deliverables and milestones follow-up, project advancement, problems to be solved, decision-making processes, motivation and cooperation.
- An amendment was submitted to extend the duration of the project by three months. The amendment was approved on August 4th, 2020.
- The External Advisory Board (EAB) and User Panel (UP) were kept involved together in the last phase of the project.
- A KPI follow-up and quality assurance for the overall project was performed, together with peer-review workflow for deliverables, risk management and contingency plans.
- The Data Management Plan was monitored. Updated information is included in section 6 of this report.
- Deliverable D7.6/9 Final periodic activity and management report was submitted.

5.8 WP8: Ethics requirements

The objective of this WP is to ensure compliance with the 'ethics requirements' set out in this work package.

The Coordinator and the consortium ensured the application of the ethical considerations and requirements included in the deliverables D8.1: POPD – Requirement No. 1 (Protection of Personal Data) and D8.2: H – Requirement No. 2 (Humans). We kept monitoring that no personal data was used by the technical modules of the platform and signed Consent Forms were obtained from external users.

6 Update of the data management plan

During the period M25-M39, the consortium periodically reviewed the Data Management Plan delivered on M24 (*DMP: D7.4 – Data Management Plan v2*). Following, we provide some updates to this DMP.

Surveys and Questionnaires

Surveys and questionnaires have followed the same procedures than in D7.4.

FAIR Data

All public deliverables are available to download on the [project website](#).

During the period, 7 papers have been added to the Zenodo repository⁵. Currently, the repository contains the following:

- Papers:
 - [“VenueRank: Identifying Venues That Contribute To Artist Popularity”](#))

⁵ Zenodo is a general-purpose open-access repository developed under the European OpenAIRE program and operated by CERN

- [Music retiler: Using NMF2D source separation for audio mosaicing](#)
- [Boosted seed oversampling for local community ranking](#)
- [Data-Driven Song Recognition Estimation Using Collective Memory Dynamics Models](#)
- [LinkAUC: Unsupervised Evaluation of Multiple Network Node Ranks Using Link Prediction](#)
- [An Analysis of the Effect of Data Augmentation Methods: Experiments for a Musical Genre Classification Task](#)
- [GAP: Geometric Aggregation of Popularity Metrics](#)
- [Unsupervised Evaluation of Multiple Node Ranks by Reconstructing Local Structures](#)
- [LAVARNET: Neural network modeling of causal variable relationships for multivariate time series forecasting](#)
- [Extending Deep Rhythm for Tempo and Genre Estimation Using Complex Convolutions, Multitask Learning and Multi-input Network](#)
- Dataset:
 - [T-REC Song Recognition Dataset](#)
- FuturePulse API [documentation](#)

Personal Data

FuturePulse datasets and technical modules do not include personal information. Every pilot participant and user of the FuturePulse platform signed the Informed Consent that we deployed as part of the sign in process defined in previous Data Management Plans and Ethical requirements.