



Deliverable 4.1

Open source tools for transport poverty solutions

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Abstract

This deliverable documents the technical work conducted in the frame of Task 4.1 (Open software tools for solutions to transport poverty) of the HiReach project, devoted to the comprehensive analysis of existing software packages and development of new open software tools that can provide solutions to transport poverty issues.

About HiReach

HiReach aims at addressing the mobility needs of different groups vulnerable to transport poverty and social exclusion like people with temporarily or permanent reduced mobility, children, young and elderly people, women, migrants and ethnic minorities, low income and unemployed, to favour more inclusive and flexible mobility solutions. The project also analyses geographical and spatial elements affecting transport poverty to figure out mobility options that can serve the needs of such groups in different target areas like urban-peripheral, peri-urban, rural, and remote or deprived territories.

By combining different attributes of available transport concepts and bottom-up initiatives with new operational schemes and IT applications, HiReach explores viable business models for small scale, modular and easily replicable mobility services that can be provided at affordable prices and/or with minimum subsidies. For the first time, community transport services, informal ridesharing and van pooling, innovative ride-hailing mobility services and on-demand public transport are assessed within the scope of a new collaborative and fair business environment.

The HiReach mechanism for exploring, generating and testing inclusive mobility solutions is based on the creative work of and innovative entrepreneurs, but also on social innovation through the direct involvement of different social groups as developers, co-users and co-owners of the proposed solutions. HiReach is working in 6 EU study regions: Counties of Esslingen and Göppingen (Germany), Naxos and Small Cyclades (Greece), Inner Area Southern Salento (Italy), Guarda and Torres Vedras (Portugal), Buzău (Romania), North and South-East Luxembourg.

Disclaimer

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Acronyms and abbreviations

ACRONYM	DEFINITION
API	Application Programming Interface
HMI	Human-Machine Interface
ICT	Information and Communications Technology
IoT	Internet of Things
IT	Information Technology
JSON	JavaScript Object Notation
MSP	Multi Sided Platforms
NFC	Near Field Communication
QR	Quick Response code
REST	Representational State Transfer
RFID	Radio-Frequency Identification
RPC	Remote Procedure Call
SDK	Software Development Kit
SEPA	Single Euro Payments Area
SOAP	Simple Object Access Protocol
XML	Extensible Markup Language

Executive summary

This deliverable documents the technical work conducted in the frame of Task 4.1 (Open software tools for solutions to transport poverty) of the HiReach project, devoted to the comprehensive analysis of existing software packages and development of new open software tools that can provide solutions to transport poverty issues.

By means of providing APIs (Application Programming Interfaces) and open source tools for startups, startups and innovative entrepreneurs are opened to a realm of new possibilities in the transportation sector. That allows the removal of constraints on the development of new projects in the sector whenever IT tools, only available to bigger companies or incumbents, otherwise would be lacking.

The goal of Task 4.1 is twofold:

- To identify existing open source tools which may be applied in the scope of solutions to transport poverty;
- To develop new open access tools/APIs that are lacking in the scope of solutions to transport poverty.

In fact, the HiReach work on open software tools is an ongoing process and this deliverable provides a “screenshot” of the results achieved to date. The first goal (identification of existing tools) has already been achieved, and key outputs have been made available on the project website (<https://hireach-project.eu/open-software-tools-apis>).

On the other side, for the sake of the overall project success, it was decided to extend the timespan of Task 4.1 as far as the second goal (development of new tools) is concerned, for a better alignment with the activities of the HiReach Startup Lab.

The Startup Lab, a pillar of the HiReach approach, foreseen the involvement of startups and young entrepreneurs in an acceleration programme aimed at the development of innovative and more inclusive transport solutions and business models.

Our approach is to develop tools/APIs in close cooperation with the startups, during the acceleration programme (Task 4.4) and the testing of solutions (task 4.5). This approach will ensure the applicability, usefulness and validity of the tools/APIs since these will be developed/tested in actual real-world conditions.

1 Introduction

1.1 Purpose and scope

This deliverable was elaborated under the scope of **WP4 (Development of mobility solutions)** of HiReach, which comprises a vertical set of activities that seeks to explore viable business models for small scale, modular and easily replicable mobility services that can be provided at affordable prices and/or with minimum subsidies. This Work Package is set to be devoted, in short, to the development of mobility solutions that can make an impact on the project ambitious objectives (aforementioned, under the “about HiReach section”).

More specifically, the present deliverable documents the interim findings from **Task 4.1 (Open software tools for solutions to transport poverty)**, whose goal is twofold:

- **To identify existing open source tools which may be applied in the scope of solutions to transport poverty;**
- **To develop new open access tools/APIs that are lacking in the scope of solutions to transport poverty.**

By means of providing APIs and open source tools for startups e.g. to develop, test, and simulate new routes, parametrize and study loading of transportation path, understand environmental impact and better refine economic and financial models on top of geographic information systems etc., startups and innovative entrepreneurs are opened to a realm of new possibilities in the transportation sector. That allows the removal of constraints on the development of new projects in the sector whenever IT tools, only available to bigger companies or incumbents, otherwise would be lacking.

Two to three open access tools/APIs will be developed to meet product development needs in the scope of transport poverty. Their target are developers of solutions to transport poverty. The tools are being selected based on highest potential to overcome market barriers to entry of startups with low capital. This selection takes into consideration the barrier analysis presented in Deliverable 3.4 (**Drivers and barriers of organizational frameworks aimed at delivering innovative mobility options**), as well as the prospection of tools already existing in the open market and the needs of startups engaging in the HiReach Startup Lab (Task 4.4).

As far as possible, these tools will be linked and applied directly by the innovative mobility product managers, customised to the needs of vulnerable groups, developed in the HiReach Startup Lab and subsequently selected for testing.

In fact, the HiReach work on open software tools is an **ongoing process** and this deliverable provides a “screenshot” of the results achieved to date. The first goal (**identification of existing tools**) has already been achieved, and key outputs have been made available on the project website (<https://hireach-project.eu/open-software-tools-apis>) and are specifically described in this report.

On the other side, for the sake of the overall project success, it was decided to extend the timespan of Task 4.1 as far as the second goal (**development of new tools**) is concerned, for a better alignment with the activities of the HiReach Startup Lab.

The Startup Lab, a pillar of the HiReach approach, foresees the involvement of startups and young entrepreneurs in an acceleration programme aimed at the development of innovative and more inclusive transport solutions and business models.

Our approach is to develop tools/APIs in close cooperation with the startups, during the acceleration programme (Task 4.4) and the testing of solutions (Task 4.5). This approach will ensure the applicability, usefulness and validity of the tools/APIs since these will be developed/tested in actual real-world conditions.

While releasing this report, the participants to the Startup Lab have just been selected after an EU-wide open call. The applicants are a valuable source of information and we are currently conducting a **questionnaire** to discover their context and needs, to consider which types of tools/APIs to prioritize.

1.2 Structure of the document

This deliverable is organised along four chapters and three annexes.

This introduction (**Chapter 1**) offers a first glance of the Task 4.1 objectives, the links between the activities performed and the other components of the project.

Chapter 2 presents the key technical concepts and definitions, the methodology, the approach and the means that were used for the identification, the analysis and the structuring of available open source tools.

The key results obtained to date are presented in **Chapter 3**, regarding the identification and analysis of software functionalities and open tools/APIs, as well as the building of an online toolbox on the HiReach website containing currently identified open tools/APIs.

Finally, **Chapter 4** describes how new tools are going to be developed in coordination with the engagement of startups in the HiReach Startup Lab.

Three annexes present the structure of the instruments used to gather, structure, store and present information related to open software tools.

2 Methodology

2.1 Concepts and definitions

2.1.1 Open Source Tools

The term **open access** refers to free and unrestricted access to the results of a research. As stated in the 2003 Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities (Max Plank Society, 2003) a contribution is **open access** if the author(s) grant(s) to all users a free, irrevocable, worldwide, right of access to, and a license to copy, use, distribute, transmit and display the work publicly and to make and distribute derivative works. The most commons licenses used in open access releases are Creative Commons.

In computing, the most notable concept is the **open source software**. Its definition specifies that free redistribution is allowed, the source code must be included, modifications, derived work and their distribution is permitted, along with the attached license (Opensource.org, 2007). Another very similar concept is the **free software**, whose definition is based on the four essential freedoms (Free Software Foundation, 2020):

- The freedom to run the program for any purpose,
- The freedom to study how the program works, and change it,
- The freedom to redistribute copies,
- The freedom to distribute copies of a modified version.

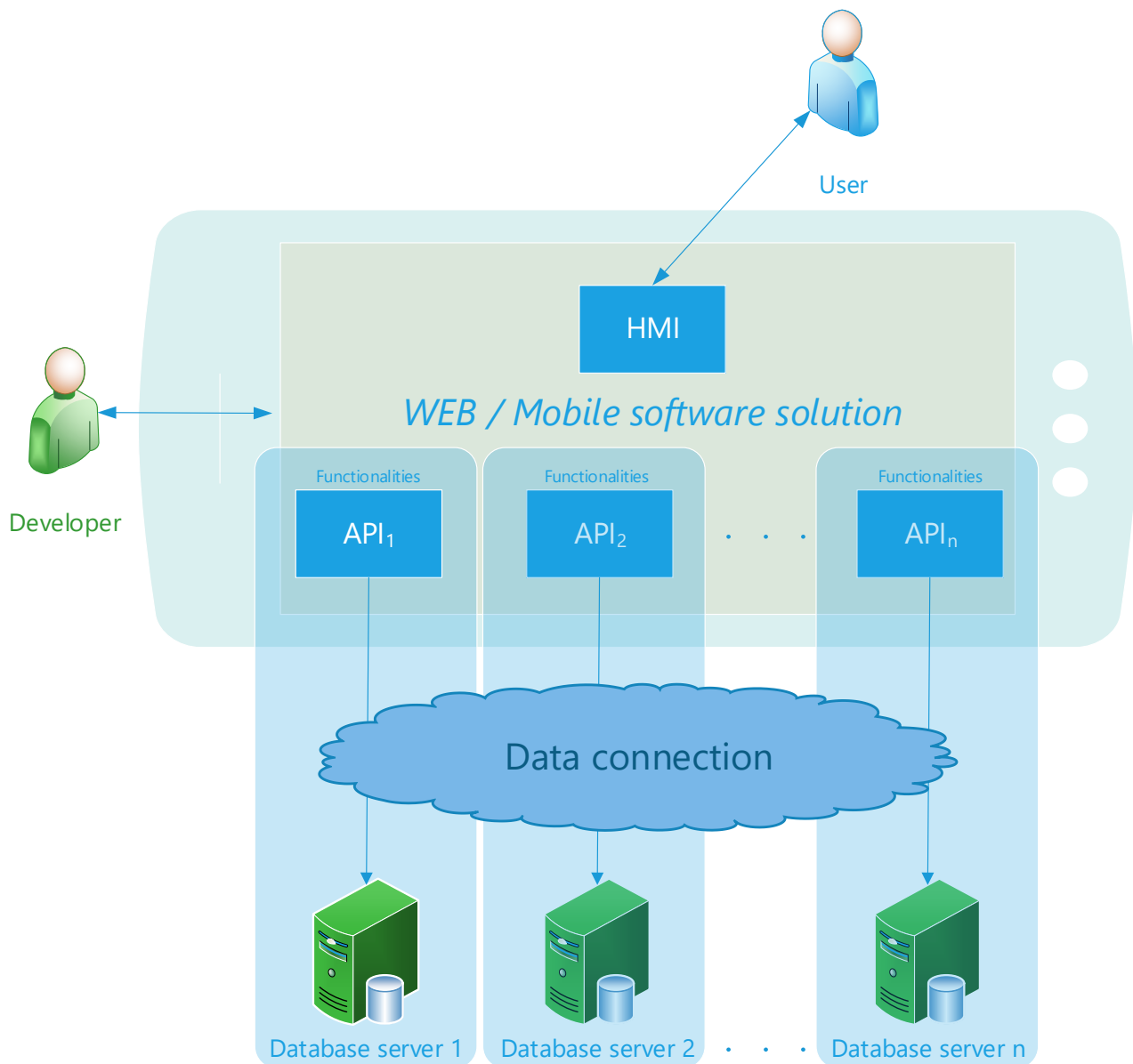
2.1.2 Application Programming Interfaces (APIs)

Creating innovative mobility services to tackle transport poverty is usually not possible without the use of Information Technology. In this regard, almost every service needs to implement a **software solution** customised or configured to the needs of specific vulnerable groups.

A **functionality** can be defined as each action/task a computer, **software solution**, or piece of electronic equipment is able to do (Cambridge Dictionary, 2019), that will, for example, be presented afterwards to end users via an Human-Machine Interface (HMI), and is, usually, accomplished by an **API**.

A relevant representation of API's place in a software solution is presented in the figure below. Each API creates an interface between the WEB / Mobile software solution (that can be in a browser or standalone app on a computer/smartphone) and a database with information.

Figure 2-1: Representation of how APIs work



Source: Own elaboration

To conclude, an API is a connection (a callable software function or set of functions) between a software solution (that, in our case, will be developed by the startups involved in the HiReach Startup Lab) and a database with specific information.

2.2 Overall approach

The final goal of **Task 4.1 (Open software tools for solutions to transport poverty)** is to develop and provide useful software tools/APIs to the startups selected for the HiReach acceleration

program, that might be integrated in their own software solution as a support for their services.

In this regard, Task 4.1 started with the identification of **existing** (open source) tools/APIs useful for startupper aiming at working in the transport poverty domain, to be disseminated through a **toolbox** built on the HiReach website. Although these tools may be used by any stakeholder involved in this field, our first goal is to support the startups involved in the HiReach Startup Lab.

Considering that a tool or an API is usually used to implement a functionality in a software solution, the search for existing ones was based on **identifying the most common functionalities**. In this regard two steps were taken:

- to determine (through **desk research**) what was done in other existing mobility related projects/services regarding their **software solutions** and to discover what **functionalities** were implemented, relevant to HiReach's vulnerable groups,
- to find out (by contacting them) if the **experts** involved in developing of solutions to transport poverty (entrepreneurs, startupper, software developers, etc.) have specific needs or recommendations regarding the **tools/APIs/functionalities** to develop their software solutions.

Based on the analysis of existing software solutions we sought, on the one hand, to draw some conclusions regarding the usefulness and usage of the software functionalities to be proposed to the startups, and, on the other hand, to gather the necessary information to support the search for already existing open-source tools/APIs.

Although the analysis was primarily focused on the functionalities targeted at HiReach's vulnerable user groups, some of the considered software functionalities were not oriented specifically to them but had a more general use (e.g. credit card payment, route finding, messaging, etc.). They were still considered useful, as they may be important to the startups and eventually adapted to the needs of a specific user group. In this regard, the functionalities were split in two categories:

- **general purpose functionalities**, and
- **vulnerable user groups-oriented functionalities**.

Information sources included:

- **Private funded mobility related services**, more likely to detail the benefits of using their software solutions. Although they did not reveal how the software was developed or customized, or the tools that were used for that, there was enough information available to allow an analysis of these solutions, especially regarding the implemented functionalities.
- **Publicly funded mobility related projects** that usually are required to provide more information about their results and are more prone to use open-source tools.
- Analysis of software solutions from **transportation ICT suppliers** that offer integrated solutions for developers of mobility related services.
- **Feedback from the experts**.

Based on this analysis, further development of software will take place to provide APIs/tools that the startups can integrate in their own developments, if not already existing.

2.3 Operational steps and instruments

At this stage, activities have been organised in two main steps, briefly described below.

1. **Identification of information sources:** based on the general approach (provided above), the data collection efforts considered the following sources:
 - The barrier analysis presented in Deliverable 3.4 (Drivers and barriers of organisational frameworks aimed at delivering innovative mobility options).
 - Case studies from Deliverable 3.2 (Innovative mobility solutions: case study description and analysis).
 - Other case studies relevant to HiReach vulnerable groups.
 - Relevant research projects.
 - Other references available from above sources.
 - The entrepreneurial ecosystem, such as the “f6s” platform¹.
 - Discussions with experts.

Selection of the information sources for the software solution analysis was an important step, as it is important to consider the needs, opinions and implementation results of all the actors involved like public or private companies that run existing services or want to implement new ones, suppliers for transportation ICT solutions, research consortiums, or individual experts.

The starting point was to use the findings from HiReach's previous work done in WP3, namely from Deliverables 3.2 and 3.4.

Deliverable 3.4 (**Drivers and barriers of organisational frameworks aimed at delivering innovative mobility options**) mentioned many barriers affecting the development of inclusive mobility solutions that could be overcome by using appropriate and properly adapted ICT solutions. The ability to use an application is the main issue, mainly for elderly and persons with disabilities, so an important aspect is to create simpler applications with adapted graphics, content or interfaces. Payment for the service usage is a barrier if the user does not possess a credit card, like some of the low-income individuals, and this can be facilitated by creating simpler and more adapted payment solutions. Prices for using inclusive mobility services can be lowered if the providers have access to free software, or software tools, like the ones that will be developed within HiReach. All in all, it is important that ICTs are designed in a user-friendly and accessible way.

Deliverable 3.2 (**Innovative mobility solutions: case study description and analysis**) was the initial source for the software solutions analysis, as some of the analysed case studies included an ICT application: Boleia, Fairfahrt, GoOpti, GoOV, PickMeApp, Uber. Good practices elsewhere were also analysed and the references to those

¹ www.f6s.com/

cases directed the search to other mobility services that use ICT solutions (e.g. BlaBlaCar, Kussbus, Buurauto, Roshni Rides and others).

As for contacting the experts or members of the entrepreneurial ecosystem, a database with contact details was built, considering at first the companies whose software solutions were analysed, experts and companies involved in HiReach's activities, found through online platforms (e.g. f6s) or by using our own contacts.

Regarding the selection of information sources for existing open tools/APIs API databases like RapidAPI (available at <https://rapidapi.com/>) or ProgrammableWeb (available at <https://www.programmableweb.com/>) were used.

2. **Gathering information:** several instruments were created and used by HiReach to gather, structure, store and present information. Such instruments were designed to provide enough information to decide what is relevant for the startups, and to provide a proper support for conclusions.

In this regard, the following tools were developed:

- **Software solutions Excel tool:**

The list of existing software solutions and related functionalities was compiled in an Excel spreadsheet for easy access (see **Annex I**). Beside the functionalities, other information was stored in this Excel tool, like source type, contact details, targeted users (within the scope of HiReach), number of uses / users, and other software details.

- **Experts Questionnaire:**

Interviews with experts were conducted to gather details about software functionalities. The information as used to populate the **Software solutions** Excel tool mentioned above.

Selection and contacting of the experts included:

- those involved in the HiReach's multidisciplinary ideation workshop that was organised and held on 27th and 28th March 2019 in Brussels² (target size around 40),
- startups that sent an application for the HiReach Startup Lab (target size around 100),
- representatives of the organisations that wish to host a HiReach Pilot (target size around 30),

² 44 participants in total from 13 countries, including representatives of the HiReach project, the relevant Take-Up Group members, public authorities, transport operators and professionals, startups and entrepreneurs (selected by means of an open call) met in a two days workshop to explore creative business models for the needs/problems identified while analysing the targeted transport demand.

- experts from the entrepreneurial ecosystem (such as “f6s” platform),
- representatives of the analysed mobility related projects/services (target size around 150).

Annex II presents the questionnaire. It is structured into 6 sections so it can cover three types of interviewees:

- The one whose service include a software solution and already consider vulnerable groups in it.
- The one whose service include a software solution and do not consider vulnerable groups in it.
- The one who wishes to implement a software solution into its service.

This questionnaire is publicly available on Google Forms at the following address:

<https://forms.gle/gbvMdvDLKBqb9CSS8>

The questionnaire was disseminated mainly through e-mail messages or social media posts/messages and it was estimated that the sample size will include between 100 and 150 answers. Currently this is a work in progress; final results will be elaborated to improve and extend the analysis of functionalities, APIs, and needs.

- **APIs Excel tool**

This tool had the goal to provide information about the existing open tools/APIs discovered by searching based on the functionalities and the needs/challenges reported by the experts.

In principle, **open source** tools/APIs were supposed to be considered. But, as the search progressed, other types of tools were encountered, which contained a certain degree of openness. For example, **free to use** software, which means that is distributed with no cost to the user, but the source code is typically not made available, or **freemium** software that is provided free of charge, but with limited usage or features which can be exceeded by paying a fee. These types were also included in the tool as they can prove to be useful for startups during their participation in the Start-up Lab.

In addition to the functionalities that these tools/APIs provide, other information was stored in this Excel tool (see **Annex III**), like links to the full description and the source code, licence information, usage or implementation restrictions, and technical data.

3 Key results

This section describes the results of the work previously presented. It is important to emphasize that these are not the final results, as the work is still in progress at the moment of writing this document.

3.1 Software solutions analysis

This activity is finalised: about 150 software solutions were identified and analysed. This led to the identification of 11 general purpose functionalities and 6 vulnerable user groups-oriented ones, which are presented and described in the following, along with the number of software solutions that incorporate them.

3.1.1 General purpose functionalities

Background Map (125 software solutions): A location-based service used to position and orient the user on a map.

Markers on map (114 software solutions): Allows to show important locations/objects on a map, by using customized symbols.

Messaging system (chat/notifications) (53 software solutions): Allows real-time communication between users or between the user and the system.

Messaging system (e-mail) (4 software solutions): Allows communication between users or between the user and the system by using e-mail messages.

Payment (123 software solutions): Allows to pay for a product or service with usual electronic means (credit card, PayPal, Google Pay, Apple Pay, etc.).

Route planner (63 software solutions): Offers an optimal trip between two or more locations, using one or more transport modes. In some cases, it allows saving a preferred route as favourite.

Secure login (135 software solutions): User login into the software solution, by using different methods (user and password, fingerprint, through another existing account, etc.).

Service evaluation (43 software solutions): This may include the evaluation of the service itself, or for the drivers / passengers / trips, by using different types of communication methods.

Timetables (13 software solutions): a schedule of the times when certain things, related to the mobility service, are to happen.

Travel instructions (47 software solutions): Presentation to the user of directions for a selected route by using audio or visual instructions.

Trip booking (88 software solutions): Planning, reserving and making arrangements for a trip.

3.1.2 Vulnerable user groups-oriented functionalities

Emergency assistance (3 software solutions): Call local emergency services or close relatives right from the software solution.

Error trapping / Geofencing (2 software solutions): describes the process of defining geographical boundaries and detecting that the user enters (or exits) the boundaries or is

not following the route intended. Mediation will be based on user-specific re-planning of routes using pre-set personalised strategies (Barham et al., 2015).

NFC/ RFID / QR / Barcode reader (30 software solutions): Scanning is used to validate an action with minimum effort: to reserve a disabled parking space, to check in and out of the vehicle, to register using a membership card etc.

Other means of payment (17 software solutions): Allows to pay for a product or service with adapted means, like:

- Prepaid cards.
- A wallet that can be loaded with the desired amount.
- By using promotional codes.
- SEPA direct debit.
- Vouchers.
- Gift cards.

Trip booking for others (9 software solutions): Caretakers, close relatives, friends or neighbours can book trips for those who do not manage to do it for themselves.

Trip monitoring / sharing (28 software solutions): Trip details can be shared with caretakers, close relatives, friends or neighbours, or they can automatically monitor it. They will receive an alert, if necessary, or it can detect the location of the user in real-time.

3.2 Existing open tools/APIs

This activity is a work in progress. At this moment, 77 APIs have been identified, clustered into 7 categories:

- Transportation (58 APIs),
- IoT (1 API),
- Payment (1 API),
- Social media integration (3 APIs),
- Chat bot (4 APIs),
- Cloud services (7 APIs),
- Gamification (3 APIs).

Some of the categories derived from the software solutions analysis and others from the discussions with the HiReach pilot hosts (having mobility-related problems that can be addressed by the startups who will be involved in the Startup Lab) that have come up with 6 distinctive IT challenges for which the stakeholders demand a solution, namely:

- Multi Sided Platforms (MSP),
- Gamification,
- Internet of Things (IoT),

- One-stop shop for mobility,
- Journey and Route Planning,
- App development/enhancement.

Regarding the licence type of the APIs, which is important for startups considering they usually have limited budget, current results include:

- Free to use – 15 APIs,
- Freemium – 51 APIs,
- Open source – 18 APIs.

It can be noted that some APIs have more than 1 licence type, as they may have different components with different licences, or, for example, access to some data or services is not free, and that there is a higher number of freemium tools available, which is a common practice for attracting growing businesses.

Also, 2 more functionalities were discovered, *Fares / prices* (the cost of traveling by using a mobility service) and *Weather data / forecast* (data about current or forecasted weather conditions).

3.3 Online Toolbox

Since January 2020, identified and analysed tools/APIs are made public through an online toolbox on the HiReach website at the following address:

<https://hireach-project.eu/open-software-tools-apis>

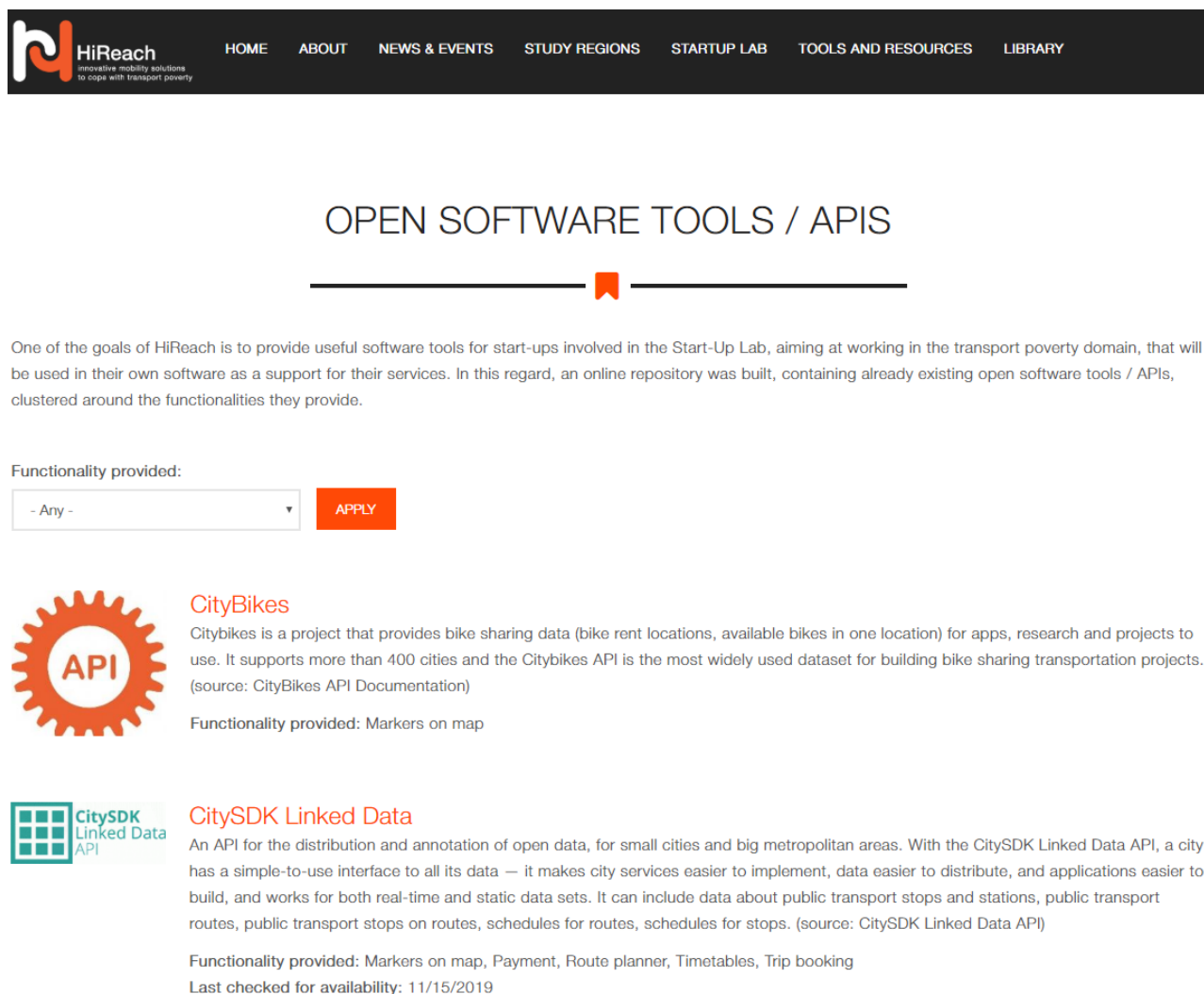
Alternatively, users can find the online toolbox by accessing the website's home page and using the **Tools and Resources** menu.

The content is structured based on the functionalities, which is the most relevant criteria to the startups who will be involved in the Startup Lab, as they will be asked to develop their own software solution as a support for their services, and is presented through three types of pages:

- The main webpage (Figure 3-1) which contains a description of the toolbox and all the tools/APIs in alphabetical order. For every tool/API the page will display its logo and name, a short description, provided functionalities and the day when it was last checked for availability.

From this page, the user has the possibility of selecting a certain functionality (through a drop-down menu), or to click on the name of a chosen tool/API to access its information.

Figure 3-1: Main webpage of the toolbox



The screenshot shows the main webpage of the HiReach Open Software Tools / APIS. The header features the HiReach logo and navigation links: HOME, ABOUT, NEWS & EVENTS, STUDY REGIONS, STARTUP LAB, TOOLS AND RESOURCES, and LIBRARY. The main heading is "OPEN SOFTWARE TOOLS / APIS". Below this, a paragraph states: "One of the goals of HiReach is to provide useful software tools for start-ups involved in the Start-Up Lab, aiming at working in the transport poverty domain, that will be used in their own software as a support for their services. In this regard, an online repository was built, containing already existing open software tools / APIs, clustered around the functionalities they provide." A filter section titled "Functionality provided:" includes a dropdown menu set to "- Any -" and an "APPLY" button. Two tool cards are displayed: "CityBikes" and "CitySDK Linked Data".

CityBikes
 Citybikes is a project that provides bike sharing data (bike rent locations, available bikes in one location) for apps, research and projects to use. It supports more than 400 cities and the Citybikes API is the most widely used dataset for building bike sharing transportation projects. (source: CityBikes API Documentation)
 Functionality provided: Markers on map

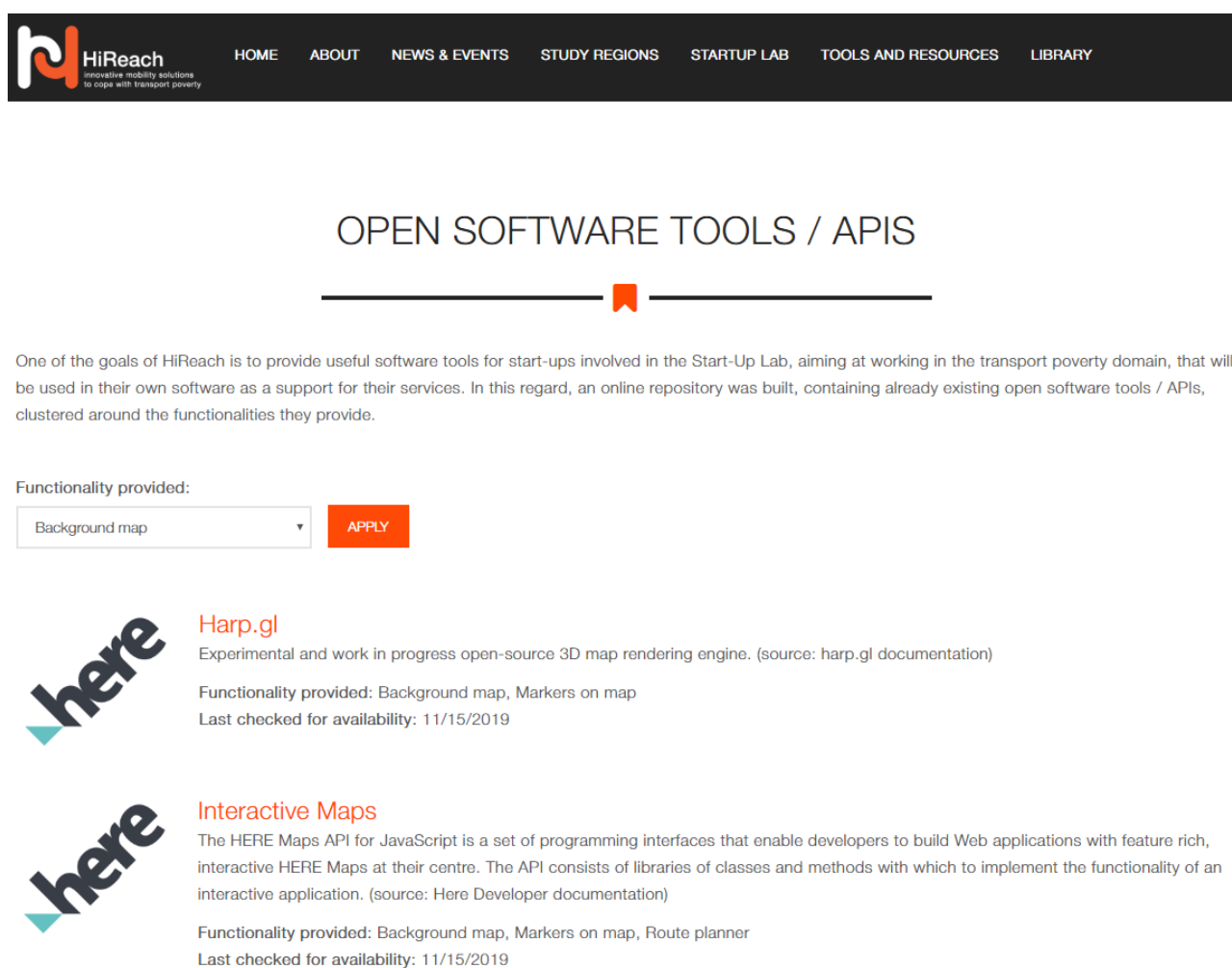
CitySDK Linked Data
 An API for the distribution and annotation of open data, for small cities and big metropolitan areas. With the CitySDK Linked Data API, a city has a simple-to-use interface to all its data — it makes city services easier to implement, data easier to distribute, and applications easier to build, and works for both real-time and static data sets. It can include data about public transport stops and stations, public transport routes, public transport stops on routes, schedules for routes, schedules for stops. (source: CitySDK Linked Data API)
 Functionality provided: Markers on map, Payment, Route planner, Timetables, Trip booking
 Last checked for availability: 11/15/2019

Source: <https://hireach-project.eu/open-software-tools-apis>

- A webpage that will display all the tools/APIs that can be used to implement a certain functionality (Figure 3-2) and the content is similar to the main page.

This type of page can be reached after selecting the functionality through a drop-down menu. Also, on this page the user can click on the name of a chosen tool/API to access its information.

Figure 3-2: The webpage displaying tools/APIs clustered around a functionality



One of the goals of HiReach is to provide useful software tools for start-ups involved in the Start-Up Lab, aiming at working in the transport poverty domain, that will be used in their own software as a support for their services. In this regard, an online repository was built, containing already existing open software tools / APIs, clustered around the functionalities they provide.

Functionality provided:

Background map APPLY

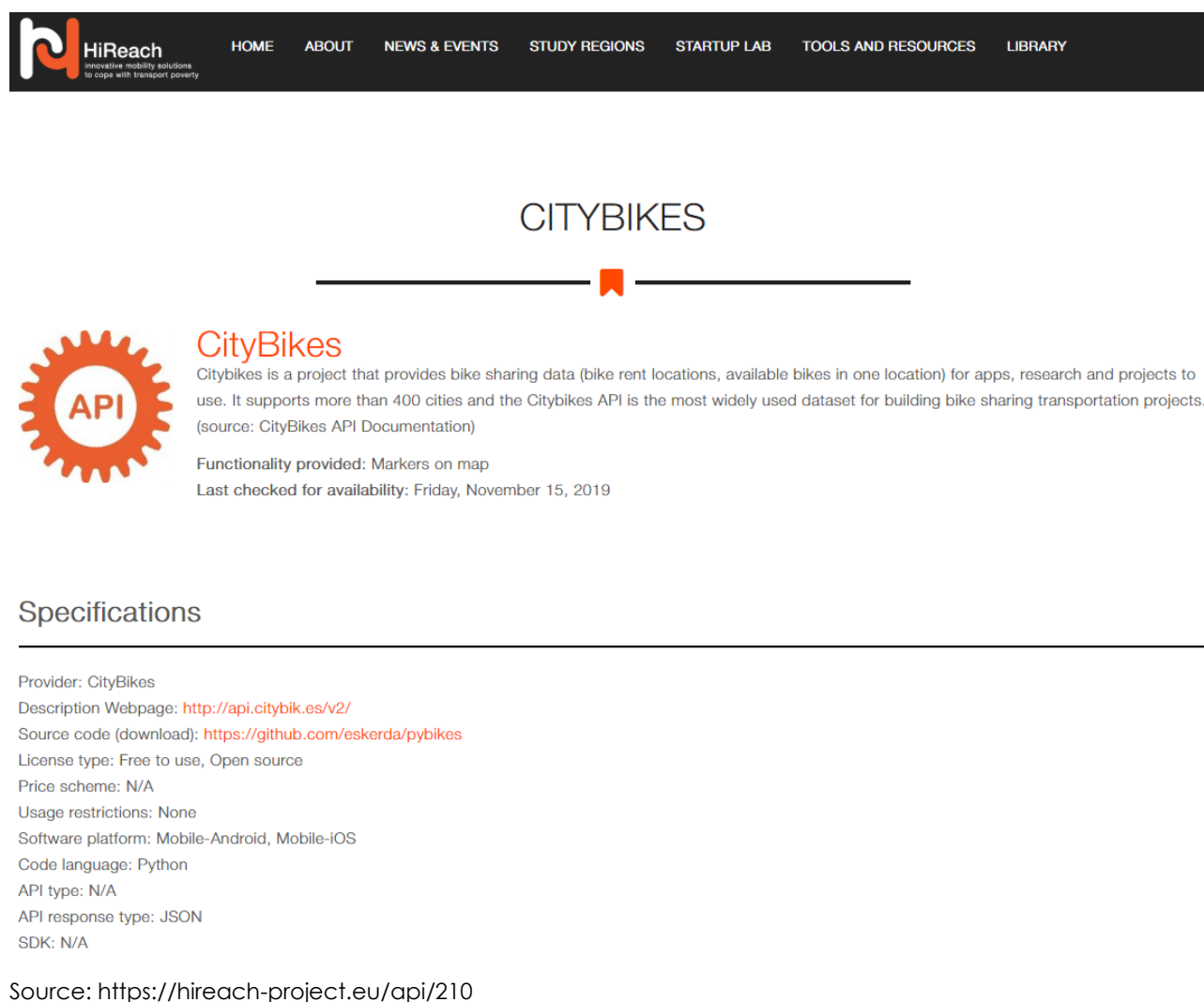
Harp.gl
Experimental and work in progress open-source 3D map rendering engine. (source: harp.gl documentation)
Functionality provided: Background map, Markers on map
Last checked for availability: 11/15/2019

Interactive Maps
The HERE Maps API for JavaScript is a set of programming interfaces that enable developers to build Web applications with feature rich, interactive HERE Maps at their centre. The API consists of libraries of classes and methods with which to implement the functionality of an interactive application. (source: Here Developer documentation)
Functionality provided: Background map, Markers on map, Route planner
Last checked for availability: 11/15/2019

Source: https://hireach-project.eu/open-software-tools-apis?field_functionality_provided_tid=56

- A page that will display all the information used to describe a certain tool/API (Figure 3-3): logo and name, a short description, provided functionalities, the day when it was last checked for availability and its technical specifications.


Figure 3-3: The webpage displaying information for a certain tool/API



HiReach
innovative mobility solutions
to cope with transport poverty

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CITYBIKES



CityBikes

Citybikes is a project that provides bike sharing data (bike rent locations, available bikes in one location) for apps, research and projects to use. It supports more than 400 cities and the Citybikes API is the most widely used dataset for building bike sharing transportation projects. (source: CityBikes API Documentation)

Functionality provided: Markers on map
Last checked for availability: Friday, November 15, 2019

Specifications

Provider: CityBikes
Description Webpage: <http://api.citybik.es/v2/>
Source code (download): <https://github.com/eskerda/pybikes>
License type: Free to use, Open source
Price scheme: N/A
Usage restrictions: None
Software platform: Mobile-Android, Mobile-iOS
Code language: Python
API type: N/A
API response type: JSON
SDK: N/A

Source: <https://hireach-project.eu/api/210>

4 What's next?

As said in the introduction, the HiReach work on open software tools is an ongoing process that is advancing in parallel and in coordination with the involvement of startups in the HiReach Startup Lab.

The key issue for the coding activity is to agree on the direction of further development of useful APIs/tools to be integrated in the startups' software solutions during the acceleration program (and, afterwards, in pilot implementations).

For this, the Open Source toolbox will be continuously enriched, and a lecture is foreseen during the Bootcamp (the first step of the acceleration programme)³, that has the purpose to present to the startups the results of the work performed until then: what are the usual functionalities (general and specific to vulnerable groups), and what are the open APIs/tools already found that can be used to implement them. Also, during this stage, common discussions will take place to better understand which are the specific needs of the startups, selected at that point, in terms of software development.

It is to be noted that these discussions will involve all the startups participating in the Bootcamp, not only the ones that will be selected for the acceleration program (at the end of the Bootcamp), for which APIs/tools will be developed⁴. Therefore, the next step after Bootcamp is to contact the selected startups and find out more specific details about their requirements. This will better define what is necessary and relevant to be further developed in terms of APIs/tools.

Coding APIs/tools activity will take place from March to June 2020, after the Bootcamp ends and the final decisions regarding development of new APIs/tools are made. Periodic evaluations are foreseen to assess the current situation of this activity. There are two intermediate steps, an alpha version, foreseen to be provided one month after coding activity will start, and a beta version, foreseen to be provided one month later.

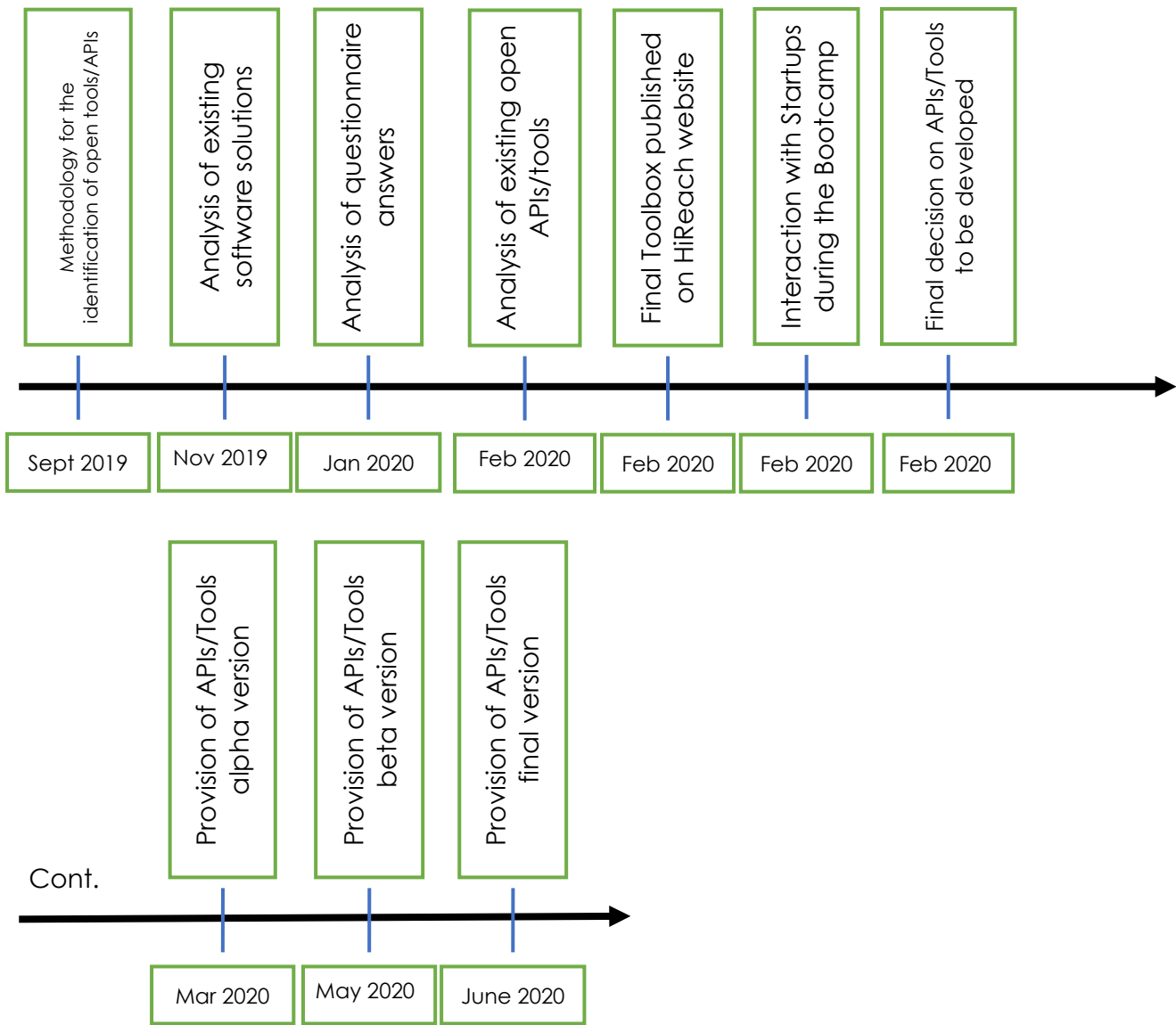
During the Acceleration program periodical support will be provided for the startups to assist them in integrating the APIs/tools developed in HiReach in their own software solutions. At the end of the acceleration program, the APIs/tools should reach their final version, including fine-tuning resulted from the tests that will be performed after integrating them in startups IT solutions.

Considering the work performed so far and the next steps presented in this section, a clearer view over the milestones of Task 4.1 is shown in Figure 4-1.

³ The Bootcamp is one immersive week, with 25 startups involved. During this phase, startups will work on a mobility solution and related business model, linked to a real pilot or transport poverty challenge. It will take place in Vienna (Austria), on 17 to 22 February 2020.

⁴ After the Bootcamp, only the 10 most promising startups will be selected to go ahead in the next phases of the acceleration programme.

Figure 4-1: Milestones for Task 4.1



Source: Own elaboration

References

Cambridge Dictionary (2020). "Meaning of functionality in English". Accessed on January 01, 2020 from <https://dictionary.cambridge.org/dictionary/english/functionality>

Free Software Foundation (2020). "What is free software?". Accessed on January 01, 2020 from <https://www.gnu.org/philosophy/free-sw.en.html>

Max Plank Society (2003). "Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities". Accessed on January 01, 2020 from https://openaccess.mpg.de/67605/berlin_declaration_engl.pdf

Opensource.org (2007). "The Open Source Definition". Accessed on January 01, 2020 from <https://opensource.org/docs/osd>

Annex I – Structure of the Software solutions Excel tool

Name / title

Name or title of the considered source of information.

Source type

Various sources of information were considered for this analysis and it was important to take into consideration their nature, as they provided different types of information. The following list is based on the sources of information mentioned in the methodology:

- Mobility research project
- Mobility service
- Mobility ICT company (suppliers of mobility ICT solutions)
- Interviewee (expert)

Contact details

Contact details of the considered source of information:

- Webpage
- E-mail / Contact form

Target users

Within the scope of HiReach, a set of seven vulnerable user groups were considered:

- Low income and unemployed people
- People living in rural and deprived areas
- Elderly people
- Children and young people
- People with reduced mobility
- Migrants and ethnic minorities
- Women

Number of uses / month

The number of uses of the software solution, reported over time, was considered, to be able to evaluate its importance.

The following threshold values were be used:

- Under 100
- 100 to 999
- 1.000 to 9.999
- 10.000 to 99.999
- 100.000 to 999.999

- Over 1.000.000

Number of registered users / downloads

The number of registered users/ downloads of the software solution was also used to evaluate its importance.

The following threshold values were used:

- Under 100
- 100 to 999
- 1.000 to 9.999
- 10.000 to 99.999
- 100.000 to 999.999
- Over 1.000.000

Software platform

This category was used to describe what kind of platform is used to deliver the software solution:

- Web based
- Desktop
- Mobile - Android
- Mobile - iOS

Software details

If the software is specifically described, e.g. in a user manual, video tutorial, blog, etc., webpage link was stored in this field.

Source code link

If any source code related to the described software was to be found, the webpage link was stored in this field.

Software functionalities

This category contains a list of functionalities regarding the analysed software solutions or required by interviewed experts.

A field was inserted for every functionality and, as it was not evident, at the beginning of the research, what functionalities will be identified within the existing software solutions, at first it was defined a field named "Others", where all the identified functionalities were included (at the end, the amount of information in this field was minimized). Then, as we continued the analysis and find out that many solutions used a specific functionality, we extract it in a different field to be able to mark it individually.

As mentioned before, the functionalities were split in two categories:

- general purpose functionalities, and
- vulnerable user groups-oriented functionalities.

Annex II – Experts questionnaire

Section 1 – Company – general information

1. Company name: *(text field)* – optional answer for anonymity
2. Is your company currently a start-up (no more than 5 years old, and below 100,000€ yearly revenue)? *(radio buttons)*
 - Yes
 - No
3. Which of the following best describes your position in the company? *(dropdown list)*
 - Manager
 - Technician
 - Software developer
 - Other, please specify *(text field)*
4. What type of mobility/transport service does the company provide: *(checklist)*
 - ✓ Ridesharing
 - ✓ Ride-hailing
 - ✓ Car-sharing
 - ✓ Shared transfers
 - ✓ Vehicle rentals
 - ✓ On-demand bus service
 - ✓ Travel assistant
 - ✓ Regular Public Transport services
 - ✓ Other, please specify *(text field)*
5. What is the number of trips/uses of your service? (please specify if per day, month or year) *(text field)*
6. Does your service include a mobility/transport software solution/app for its users? *(radio buttons)*
 - Yes
 - No

If yes, jump to section 2. If no, jump to section 5

Section 2 – Software app – general information

7. For which software platform is your app developed? *(checklist)*
 - ✓ iOS
 - ✓ Android
 - ✓ Windows
 - ✓ Linux
 - ✓ Web based
 - ✓ Other, please specify *(text field)*

- ✓ I don't know / I prefer not to answer
- 8. What is the number of registered users? *(radio buttons)*
 - Under 100
 - 100 to 999
 - 1,000 to 9,999
 - 10,000 to 99,999
 - 100,000 to 999,999
 - Over 1,000,000
 - I don't know / I prefer not to answer
- 9. What is the number of app downloads? *(radio buttons)*
 - Under 100
 - 100 to 999
 - 1,000 to 9,999
 - 10,000 to 99,999
 - 100,000 to 999,999
 - Over 1,000,000
 - Not applicable
 - I don't know / I prefer not to answer
- 10. Do you consider vulnerable groups in your solution? *(radio buttons)*
 - Yes
 - No

If yes, jump to section 4. If no, jump to section 3

Section 3 – Software app – specific data

11. What functionalities are available in your software solution/app? *(checklist):*
- ✓ Background map
 - ✓ Emergency assistance
 - ✓ Error trapping / Geofencing
 - ✓ Fares / Prices
 - ✓ Markers on map
 - ✓ Messaging system (chat/notifications)
 - ✓ Messaging system (e-mail)
 - ✓ NFC / RFID / QR / Barcode reader
 - ✓ Other means of payment
 - ✓ Payment (credit card)
 - ✓ Route planner
 - ✓ Secure login
 - ✓ Service evaluation
 - ✓ Timetables
 - ✓ Travel instructions
 - ✓ Trip booking

- ✓ Trip booking for others
 - ✓ Trip monitoring / sharing
 - ✓ Weather data / forecast
 - ✓ Other, please specify (*text field*)
 - ✓ None
12. HiReach project is foreseen to develop new open-source APIs/tools to help implement new functionalities. In this regard, what other functionalities do you consider useful for your service, that may be provided to you by HiReach as open source? (*text field*) – optional answer
13. Please estimate how much would it cost to develop such tools by yourself. (*text field*) – optional answer
14. Does your software solution/app incorporate free/open-source tools/APIs? If so, please mention some of them. (*text field*) – optional answer

Jump to section 6

Section 4 – Software app – specific data, including vulnerable user groups

11. What type of vulnerable user group(s) are specifically considered in your software solution/app? (*checklist*)
- ✓ Low income and unemployed people
 - ✓ People living in rural and deprived areas
 - ✓ Elderly people
 - ✓ Children and young people
 - ✓ People with reduced mobility
 - ✓ Migrants and ethnic minorities
 - ✓ Women
 - ✓ Other, please specify (*text field*)
12. What general purpose functionalities are available in your software solution/app? (*checklist*):
- ✓ Background map
 - ✓ Fares / Prices
 - ✓ Markers on map
 - ✓ Messaging system (chat/notifications)
 - ✓ Messaging system (e-mail)
 - ✓ Payment (credit card)
 - ✓ Route planner
 - ✓ Secure login
 - ✓ Service evaluation
 - ✓ Timetables
 - ✓ Travel instructions
 - ✓ Trip booking
 - ✓ Weather data / forecast

- ✓ Other, please specify (*text field*)
 - ✓ None
13. What vulnerable user groups-oriented functionalities are available in your software solution/app? (*checklist*):
- ✓ Emergency assistance
 - ✓ Error trapping / Geofencing
 - ✓ NFC / RFID / QR / Barcode reader
 - ✓ Other means of payment
 - ✓ Trip booking for others
 - ✓ Trip monitoring / sharing
 - ✓ Other, please specify (*text field*)
 - ✓ None
14. HiReach project is foreseen to develop new open-source APIs/tools to help implement new functionalities. In this regard, what other functionalities do you consider useful for your service, that may be provided to you by HiReach as open source? (*text field*) – optional answer
15. Please estimate how much would it cost to develop such tools by yourself. (*text field*) – optional answer
16. Does your software solution/app incorporate free/open-source tools/APIs? If so, please mention some of them. (*text field*) – optional answer

Jump to section 6

Section 5 – Software app – specific data for new solutions

7. If you would develop a software solution/app, what software platform would you consider to be suitable? (*checklist*)
- ✓ iOS
 - ✓ Android
 - ✓ Windows
 - ✓ Linux
 - ✓ Web based
 - ✓ Other, please specify (*text field*)
 - ✓ I don't know / I prefer not to answer
8. What type of vulnerable user group(s) would you consider when developing your software solution/app? (*checklist*)
- ✓ Low income and unemployed people
 - ✓ People living in rural and deprived areas
 - ✓ Elderly people
 - ✓ Children and young people
 - ✓ People with reduced mobility
 - ✓ Migrants and ethnic minorities
 - ✓ Women

- ✓ Other, please specify (*text field*)
 - ✓ None
9. What general purpose functionalities should be available in your software solution/app? (*checklist*):
- ✓ Background map
 - ✓ Fares / Prices
 - ✓ Markers on map
 - ✓ Messaging system (chat/notifications)
 - ✓ Messaging system (e-mail)
 - ✓ Payment (credit card, digital wallet)
 - ✓ Route planner
 - ✓ Secure login
 - ✓ Service evaluation
 - ✓ Timetables
 - ✓ Travel instructions
 - ✓ Trip booking
 - ✓ Weather data / forecast
 - ✓ Other, please specify (*text field*)
 - ✓ None
10. What vulnerable user groups-oriented functionalities should be available in your software solution/app? (*checklist*):
- ✓ Emergency assistance
 - ✓ Error trapping / Geofencing
 - ✓ NFC / RFID / QR / Barcode reader
 - ✓ Other means of payment
 - ✓ Trip booking for others
 - ✓ Trip monitoring / sharing
 - ✓ Other, please specify (*text field*)
 - ✓ None

Jump to section 6

Section 6 – End of questionnaire

Thank you!

Annex III – Structure of the APIs Excel tool

API Name

Name of the considered API source.

Source code link (download)

If any source code related to the described software was to be found, the webpage link was stored in this field.

Provider

Name of the company, provider of the API.

API description Webpage

Webpage address that contains all the details and description related to the API.

Description

Short description of the API.

License type

This category was used to describe how the API's may be used or redistributed and had three fields:

- Freemium
- Free to use
- Open source.

Price scheme

As *Freemium* means that a piece of software is provided free of charge, but with limited usage or features, this category was used to store the Webpage link where additional costs are mentioned.

Usage restrictions

This category was used to mention if the API requires other elements or it is restricted to a specific location.

Software platform restrictions

This category was used to describe if the API's implementation is limited to a certain software platform, as follows:

- Web based
- Desktop
- Mobile - Android
- Mobile - iOS

Code language

This category was used to describe in which language the API is written (e.g. Python, Ruby, C++, etc.), where available.

API type

This category was used to describe the type of communication and behavioural approach used (e.g. REST, SOAP, XML-RPC, JSON-RPC, etc.), where available.

API response type

This category was used to describe the media type used by an API to send a response for its operations (e.g. JSON, Image, XML, etc.), where available.

SDK

This category was used to describe if SDKs are available for the API and for which software platform / language.

Software functionalities provided

This category contains a list of functionalities provided by the analysed APIs.

The functionalities were imported from the **Software solutions** tool. Also, a field named "Others" was defined, where all the newly identified functionalities were included (at the end, the amount of information in this field was minimized). Then, as we continued the analysis and find out that many APIs provide a specific functionality, we extract it in a different field to be able to mark it individually.

As mentioned before, the functionalities were split in two categories:

- general purpose functionalities, and
- vulnerable user groups-oriented functionalities.

Document History

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0.1	22/12/2019	Razvan Gheorghiu and Valentin Iordache (UPB)	First draft
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0.3	16/01/2020	Razvan Gheorghiu and Valentin Iordache (UPB)	Final draft
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0.5	29/01/2020	Razvan Gheorghiu and Valentin Iordache (UPB)	Updated version after first review
0.6	30/01/2020	Silvia Maffii (TRT)	Second review - QA
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