Platform Development

Living document

Version 2.1

Deliverable 4.1.
Platform API and Backend

Deliverable 4.2.
Platform Administration Frontend

Deliverable 4.3.
Platform Clients

Project title:	SimpliCITY – Marketplace for user-centered sustainability services
Project acronym:	SimpliCITY
Project duration:	10/2018–03/2021
Project number:	870739
Work package/Tasks:	WP4 / T4.1, T4.2, T4.3
Project website:	www.simplicity-project.eu

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Document versions:

Version	Date	Changes	Author/s
v0.1	28.10.2019	Alpha Phase, Repositories complete	Michael Kager, Christoph Wögerbauer
v1.0	30.04.2020	Beta Release (Design-Study)	Michael Kager, Thomas Layer-Wagner, Christoph Wögerbauer
v1.1	28.8.2020	Beta Release (Pilot 1)	Michael Kager, Thomas Layer-Wagner, Christoph Wögerbauer
v1.2	23.12.2020	Beta Release (Pilot 1 – Update)	Michael Kager, Thomas Layer-Wagner, Christoph Wögerbauer
v2.0	27.02.2021	Beta Release (Pilot 2)	Thomas Layer-Wagner, Christoph Wögerbauer
v2.1	05.03.2021	Beta Release (Pilot 2 – Update)	Thomas Layer-Wagner, Christoph Wögerbauer

List of abbreviations

API	Application Programming Interface
OGD	Open Government Data
POI	Point of Interest
UX	User experience
UI	User interaction

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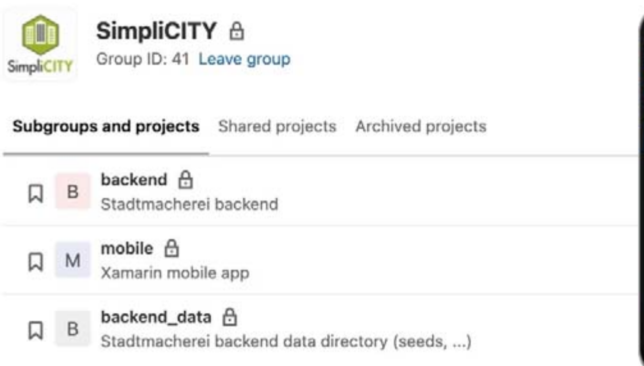
1. Executive Summary

This summary document provides an overview of the deliverables, that are part of Work Package 4 within SimpliCITY, namely, Platform Development. The deliverables themselves are the source code for the backend, frontend and client development and structured in three internal repositories with a git as open-source distributed version control system on the Polycular infrastructure (GitLab server). Therefore we provide this document to bundle and show the interconnectedness of the repositories as well as deliverables within Work Package 4.



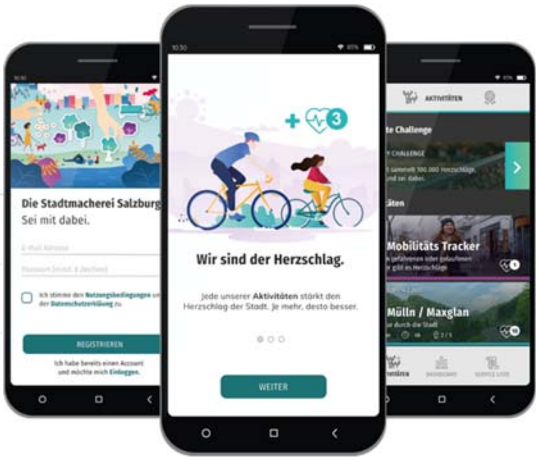
SimpliCITY
Group ID: 41 Leave group

Subgroups and projects | Shared projects | Archived projects

B backend
Stadtmacherei backend

M mobile
Xamarin mobile app

B backend_data
Stadtmacherei backend data directory (seeds, ...)


Die Stadtmacherei Salzburg
Sei mit dabei.
REGISTRIEREN
Wir sind der Herzschlag.
Jede unserer Aktivitäten stärkt den Herzschlag der Stadt. Je mehr, desto besser.
WEITER
Mobilitäts Tracker
Mülln / Maxglan

The deliverables closely follow the aim of the project as described in the project application:

„Creation of a platform that bundles the sustainability offers of a city and increases the commitment of the users with the participating services through incentives and challenges.“

The purpose of this summary is to give a brief overview in the development process of all three mentioned parts of the platform.

SimpliCITY digital gateway to local green services
Challenges / Gamification
Incentivisation / Nudging
Service Mapping / Listing
bike mobility
local consumption
social inclusion

2. Administrative Information

Basic information on the SimpliCITY project and the present deliverable:

Project title	SimpliCITY - Marketplace for user-centered sustainability services
Project coordinator	Salzburg Research Forschungsgesellschaft mbH (SRFG), Salzburg, Austria; project manager: Petra Stabauer BSc MSc
Project partners	Polycular OG, Hallein, Austria Stadt Salzburg (City of Salzburg), Austria Salzburger Institut für Raumordnung und Wohnen – SIR (Salzburg Institute for Regional Planning & Housing), Salzburg, Austria Uppsala Kommun (City of Uppsala), Sweden University of Uppsala, Sweden
Funding	JPI Urban Europe, Innovation Actions (Call: Making Cities Work) Funding is being provided by Vinnova (Sweden) for the Swedish project partners, and the Austrian Research Promotion Agency (FFG) for the Austrian project partners.
Project nr.	870739
Deliverable numbers	D4.1, D4.2, D4.3
Deliverable titles	Deliverable 4.1. Platform API and Backend Deliverable 4.2. Platform Administration Frontend Deliverable 4.3. Platform Clients
Authors	Thomas Layer-Wagner (Polycular OG), Christoph Wögerbauer (Polycular OG), Michael Kager (Polycular OG)
Version & status	Version 2.1
Date	05.03.2021

3. Platform development

This deliverable document provides insight in the process of the development process. It builds on the information of D3.4 Platform Backlog and Report and task T3.4 Conceptual design of SimpliCITY architecture, data models and user experience to specify data.

The deliverables themselves are the source code for the backend, frontend and client development and structured in three internal repositories with a git as open-source distributed version control system on the Polycular infrastructure (GitLab server).

We provide this document to bundle and show the interconnectedness of the repositories as well as deliverables within Work Package 4.

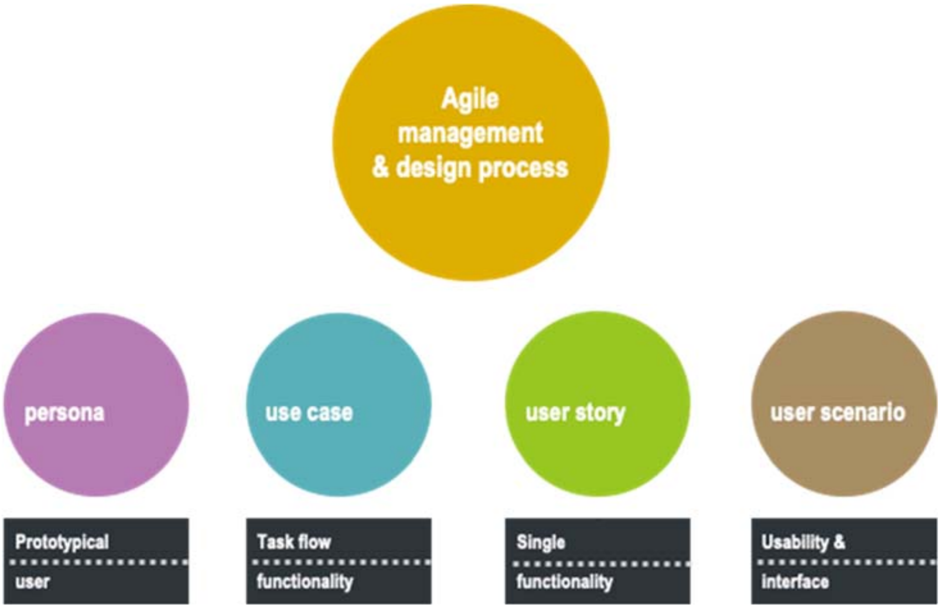
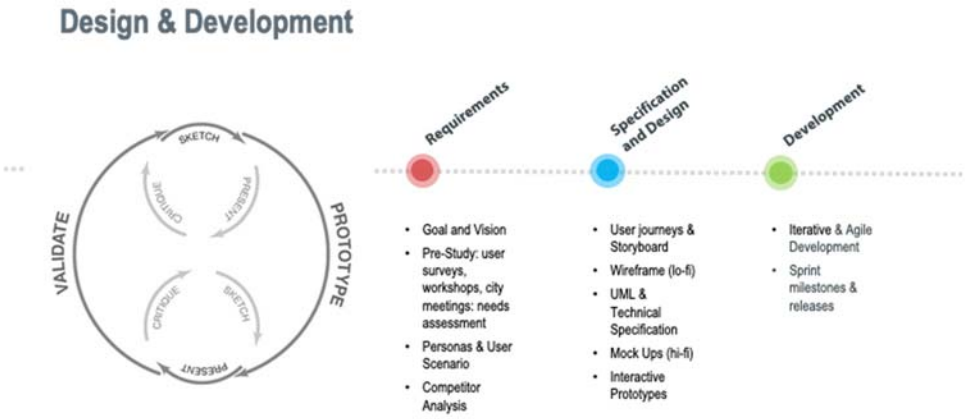


Figure 1: Agile management & design process

The development process is based on continuous software development principles (Theunissen & Van Heesch, 2017), (Clarke, O’Connor, & Yilmaz, 2018), namely:

- **Efficiency and effectiveness.** Involves striving for the optimal balance between efficiency (quality) and effectiveness (resources invested). The ambition is to achieve as much as possible for both efficiency and effectiveness without losing the balance. Regarding efficiency, the primary means in lean is eliminating waste. Effectiveness refers to delivering working software, achieving customer satisfaction, and simplicity. Additionally, measurements are required for checking if development and operations are on the right track. Both, efficiency and effectiveness should strive for a sustainable pace.
- **Learning and improvement.** The objective is the improvement of the development process as well as the learning outcome. Regular feedback sessions both internal as well as with different categories of users. Focus on short feedback loops, sharing ideas, uncertainties and mistakes.

- **Flexibility**. Possibility of learning from new situations. The objectives are to benefit from insights uncovered in the development process or through interaction and testing with potential users.
- **Time to market.** A focus is placed on short delivery cycles and frequent releases. The objective is to deliver features as fast as possible. Improvements will start earlier and there is a better fit between end-user, customer, organization, and development team.
- **Trust and attituded.** Especially with respect to the development team, which requires thinking outside of the box for involvement of other parties and high autonomy for the project team.
- **Competences.** The capable team involved in the development of the SimpliCITY platforms covers game development, web development, interaction design and user research as well as business strategy. The Polycular team has weekly project meetings to ensure shared and coherent view on the software product. GitLab, JIRA and Mattermost are used for internal communication, task division and development.
- The team is focused on delivering added value. The objective is to achieve a **competitive advantage** by focusing on core competences and outsource commodity services.
- This includes **involvement** from consortium partners, end-users, service providers, local administration and other interested parties. We attempt to communicate our vision to interest parties in order to share common goals and share principles and priorities. The diagram below illustrates our iterative, continuous software development process:



- Goal and Vision
- Pre-Study: user surveys, workshops, city meetings: needs assessment
- Personas & User Scenario
- Competitor Analysis

- User journeys & Storyboard
- Wireframe (lo-fi)
- UML & Technical Specification
- Mock Ups (hi-fi)
- Interactive Prototypes

- Iterative & Agile Development
- Sprint milestones & releases

Figure 2: Design & Development

- The **testing** of the platform runs within WP 5 and 6, in partnership with the municipalities. We collect feedback both from the platform system via data analytics with respect to usage and functionalities, as well as through questionnaires and qualitative inquiry with selected users. We iteratively developed functionalities, aiming for a minimum viable product (MVP) for a first release during pilot phase 1 and with made improvements for pilot phase 2 based on user and partner feedback.
- **Evaluation** will continuously start with platform launch, until the end of the project according to indicators established within the consortium. Of particular interest with respect to the design and development of the platform, UX, UI and behaviour change

results will be evaluated both for the overall platform as well as for different components and features. Testing will be used wherever possible with respect to game mechanic features such as messaging, rewards, referrals and social influence mechanisms, throughout pre-testing and testing. Finally, UX and UI is evaluated qualitatively and quantitatively at different development stages, iteratively.

4. Platform Components and Repositories

This section provides an overview of the deliverables, that are part of Work Package 4 within SimpliCITY, namely, Platform Development. The deliverables themselves are the source code for the backend, frontend and client development and structured in three internal code repositories with a git as open-source distributed version control system on the Polycular infrastructure (GitLab server). The SimpliCITY Platform consist out of several components. Together they form what we call the SimpliCITY cloud.

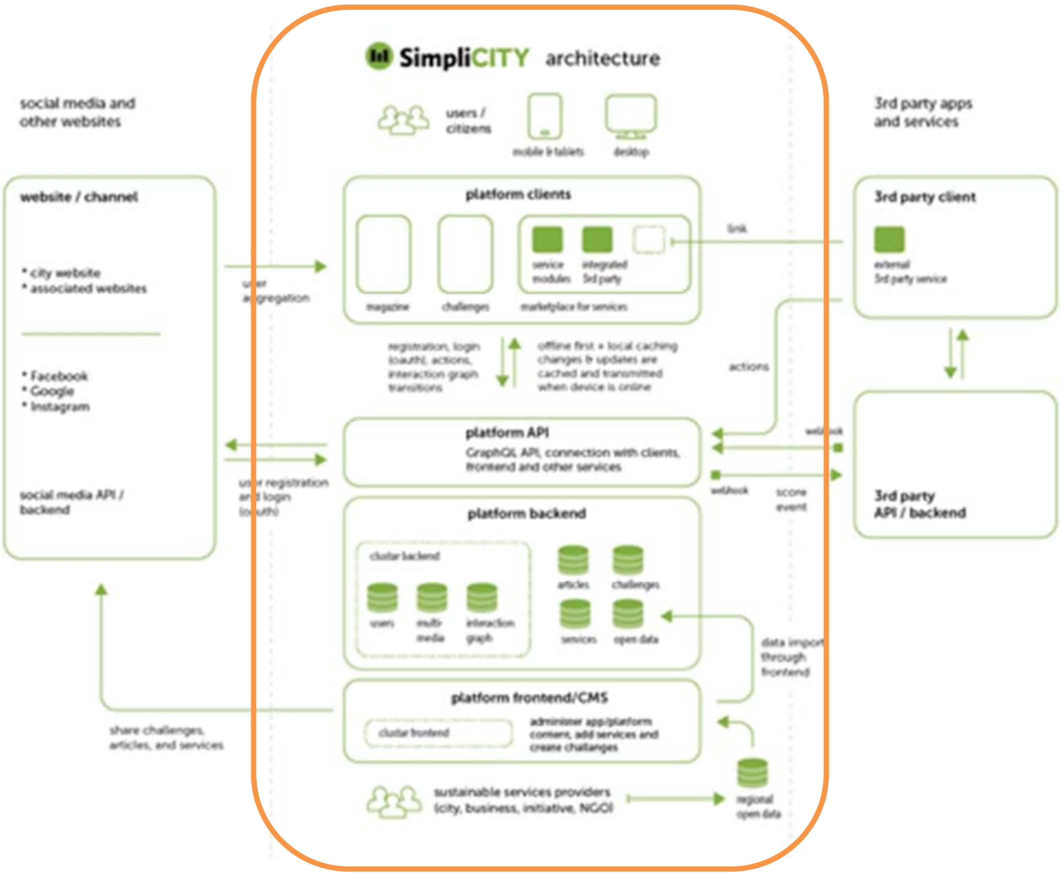
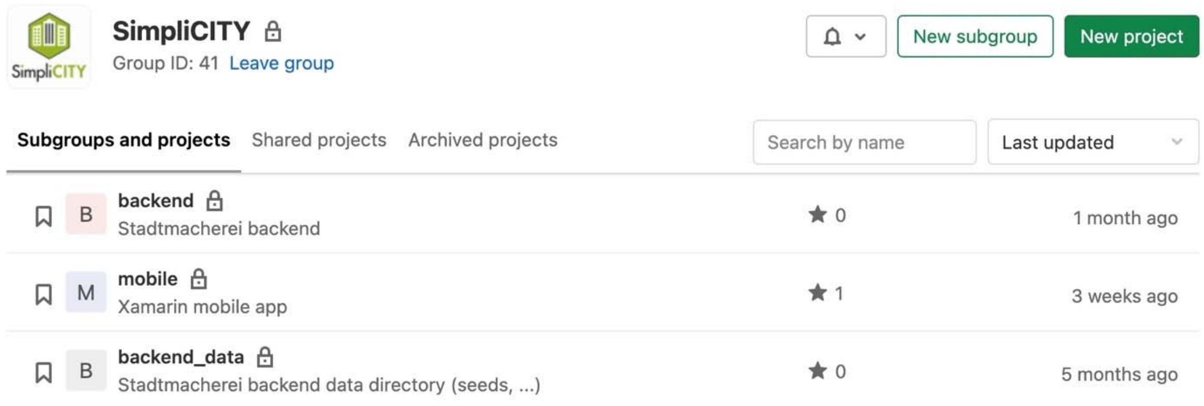

SimpliCITY architecture
social media and other websites
users / citizens
mobile & tablets
desktop
3rd party apps and services
website / channel
* city website
* associated websites
* Facebook
* Google
* Instagram
social media API / backend
user aggregation
platform clients
magazine
challenges
service modules
integrated 3rd party
marketplace for services
link
3rd party client
external 3rd party service
registration, login (oauth), actions, interaction graph transitions
offline first + local caching changes & updates are cached and transmitted when device is online
actions
platform API
GraphQL API, connection with clients, frontend and other services
user registration and login (oauth)
webhook
webhook
score event
3rd party API / backend
platform backend
cluster backend
users
multi-media
interaction graph
articles
challenges
services
open data
data import through frontend
platform frontend/CMS
cluster frontend
administer app/platform content, add services and create challanges
share challenges, articles, and services
sustainable services providers (city, business, initiative, NGO)
regional open data

Figure 3: SimpliCITY System Architecture

The platform (SimpliCITY cloud) consists of the following components and these are tied to our repositories. See a list of our repositories below.

- **Deliverable 4.1. Platform API and Backend**, delivering data (middle of the diagram) Repositories: *backend* and *backend_data*
- **Deliverable 4.2. Platform Administration Frontend**, offering overview and management tools and various data importers (bottom) Repositories: *backend* and *backend_data* (data importers)
- **Deliverable 4.3. Platform Clients**, both a mobile app and a web version (top) Repositories: *backend* (web) and *mobile* (apps)



SimpliCITY

Group ID: 41 Leave group

B	backend Stadtmacherei backend	★ 0	1 month ago
M	mobile Xamarin mobile app	★ 1	3 weeks ago
B	backend_data Stadtmacherei backend data directory (seeds, ...)	★ 0	5 months ago

Figure 4: Overview of internal repositories

For this reason, we bundled this document to show the structure and interconnectedness of the deliverables and the code repositories.

There are multiple instances of the SimpliCITY cloud running in a *live* and a *stage* environment to be able to continuously test and update without interfering with the end users.

Access to the repositories is granted via a simplicity-guest account on the Polycular Gitlab infrastructure and can be requested from Thomas.Layer-wagner@polycular.com or Christoph.Woegerbauer@polycular.com.

The next section will explain the purpose and content of the three main code repositories.

5. Backend repository (D4.1, D4.2, D4.3)

The backend repository includes the API that provides data for the Clients (Web Portal & App) as well as the Web Portal and Administrative Fronted that it tightly coupled with the API and running on the same environment.

It includes API interfaces as REST endpoints and additionally a GraphQL Schema. The Backend is the part of the system running solely on a web server. It interacts with the web & app client via a predefined defined interface and protocol.

The SimpliCITY backend consists of the following technologies:

- Elixir
- Elixir: Ecto (ecto_sql + postgrex)
- Elixir: Plug
- Elixir: Jason
- Database: PostgreSQL

The web client depends on the standard web stack of:

- HTML
- CSS
- JavaScript: Node.js

The repository has a testing foundation, with tests ordered by their priority, described in **D 3.4 Platform Backlog and Report.**

5.1. Web Portal

The **Web Portal** is publicly accessible at: https://stadtmacherei-salzburg.at/ and consist of 4 main sections.

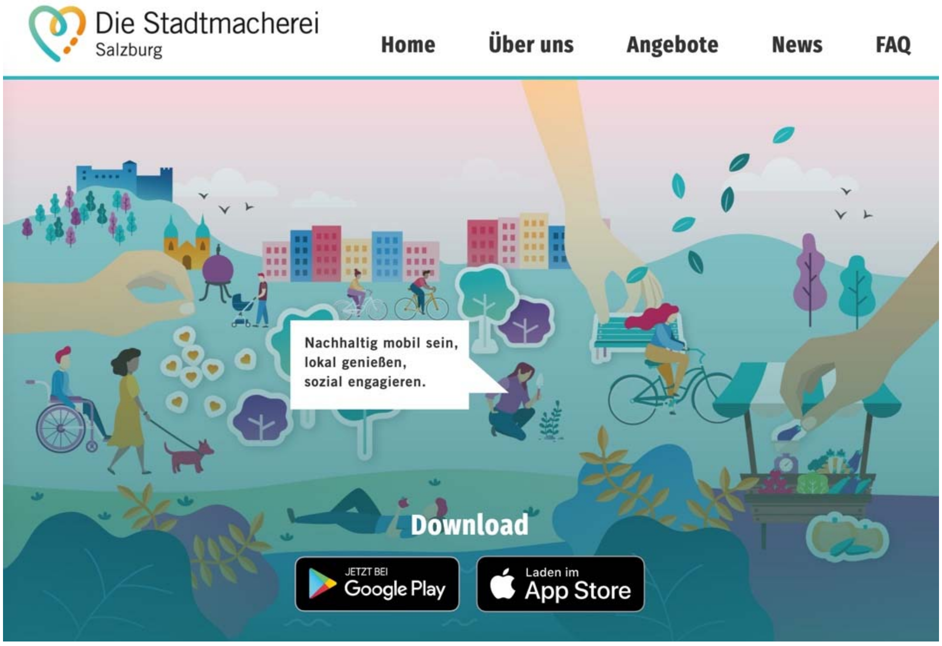
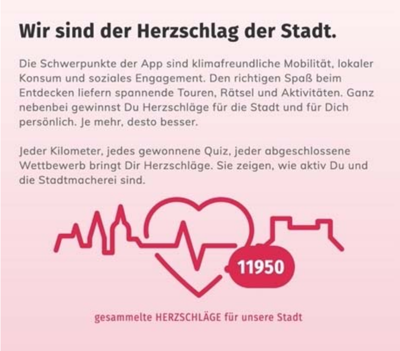


Figure 5: part of Salzburg version of the web portal landing page

- An **overview page** for introduction of the Portal as well as the associated app. It also includes a section that provides insights on the activity and the collected heartbeats.



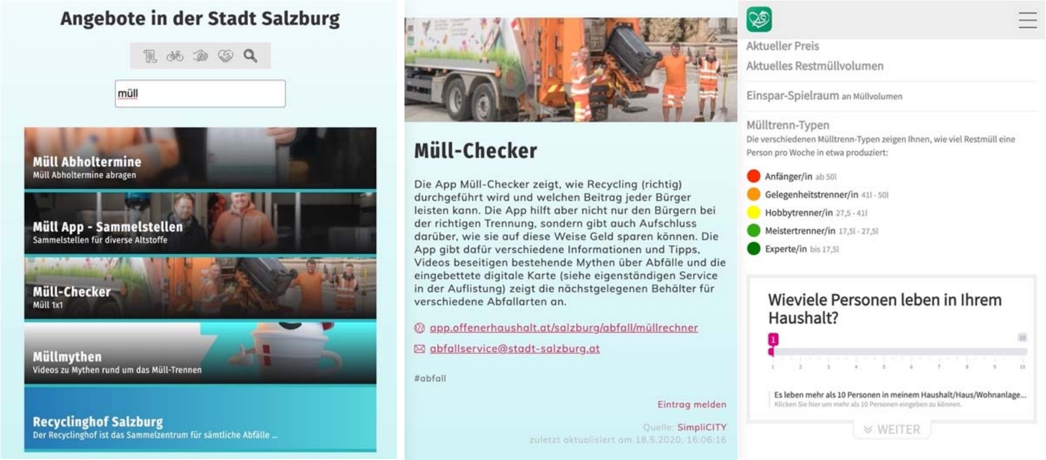
Wir sind der Herzschlag der Stadt.

Die Schwerpunkte der App sind klimafreundliche Mobilität, lokaler Konsum und soziales Engagement. Den richtigen Spaß beim Entdecken liefern spannende Touren, Rätsel und Aktivitäten. Ganz nebenbei gewinnst Du Herzschläge für die Stadt und für Dich persönlich. Je mehr, desto besser.

Jeder Kilometer, jedes gewonnene Quiz, jeder abgeschlossene Wettbewerb bringt Dir Herzschläge. Sie zeigen, wie aktiv Du und die Stadtmacherei sind.

- A section with **about (**Über uns) and **FAQs** which provides more information and context, as well as a user manual how to use the app

- A **service listing** (Angebote) mirrors what is inside the app and filterable and searchable list of services in the municipality.



Angebote in der Stadt Salzburg

müll

Müll Abholtermine
Müll Abholtermine abragen

Müll App - Sammelstellen
Sammelstellen für diverse Altstoffe

Müll-Checker
Müll 1x1

Müllmythen
Videos zu Mythen rund um das Müll-Trennen

Recyclinghof Salzburg
Der Recyclinghof ist das Sammelzentrum für sämtliche Abfälle ...

Müll-Checker

Die App Müll-Checker zeigt, wie Recycling (richtig) durchgeführt wird und welchen Beitrag jeder Bürger leisten kann. Die App hilft aber nicht nur den Bürgern bei der richtigen Trennung, sondern gibt auch Aufschluss darüber, wie sie auf diese Weise Geld sparen können. Die App gibt dafür verschiedene Informationen und Tipps, Videos beseitigen bestehende Mythen über Abfälle und die eingebettete digitale Karte (siehe eigenständigen Service in der Auflistung) zeigt die nächstgelegenen Behälter für verschiedene Abfallarten an.

app.offenerhaushalt.at/salzburg/abfall/müllrechner

abfallservice@stadt-salzburg.at

#abfall

Eintrag melden

Quelle: SimpliCITY
zuletzt aktualisiert am 18.5.2020, 16:06:16

Aktueller Preis
Aktuelles Restmüllvolumen
Einspar-Spielraum an Müllvolumen
Mülltrenn-Typen
Die verschiedenen Mülltrenn-Typen zeigen Ihnen, wie viel Restmüll eine Person pro Woche in etwa produziert:

- 🔴 Anfänger/in ab 50l
- 🟠 Gelegenheitstrenner/in 41l - 50l
- 🟡 Hobbytrenner/in 27,5 - 41l
- 🟢 Meistertrenner/in 17,5l - 27,5l
- 🟢 Experte/in bis 17,5l

Wieviele Personen leben in Ihrem Haushalt?

Es leben mehr als 10 Personen in meinem Haushalt/Haus/Wohnanlage...
Klicken Sie hier um mehr als 10 Personen eingeben zu können.

Wherever possible web-apps of the service providers were directly integrated in both web portal service listing and in according web views of the associated apps.

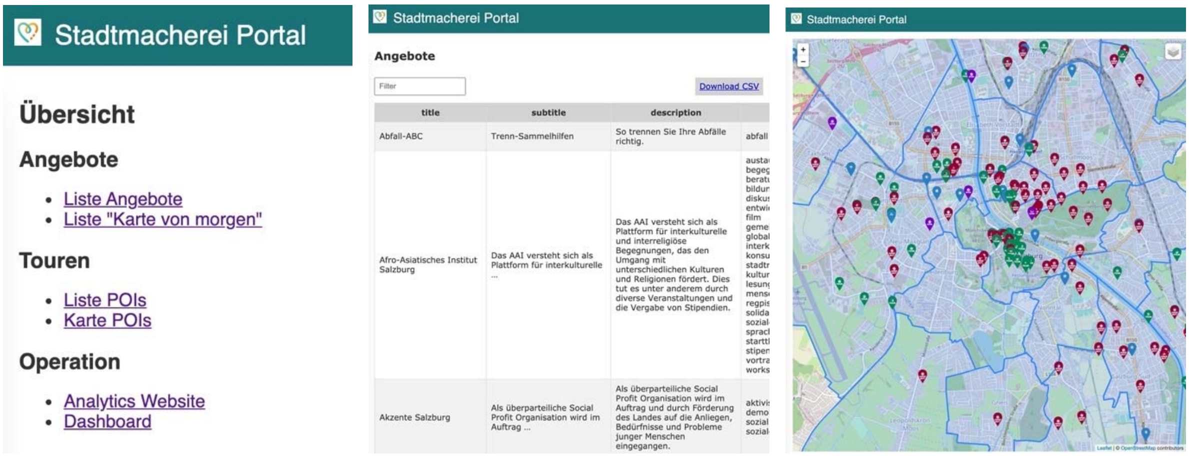
- **News section** serves news and is tied to the notifications within the app. It provides regular updates and is much like a blog providing insights and background information for the users and used in the outreach on social media to drive traffic to the platform (both web portal and app).

Additionally, the website of the web portal provides imprint, data privacy statement and terms of use.

5.2. Administrative Frontend

Besides the public **Web Portal** there is an **administrative frontend** to both web portal and apps. It offers an overview of data like the list of services (Angebote), Points of interest (POIs) for tours and highlight spots of the week, as well as access to operational data and statistics and integrates a matomo open-source analytics dashboard of the web portal.

Internally accessible **administrative frontend:** https://live.web.sici.clustar.net/portal/



Stadtmacherei Portal

Übersicht

Angebote

- Liste Angebote
- Liste "Karte von morgen"

Touren

- Liste POIs
- Karte POIs

Operation

- Analytics Website
- Dashboard

Stadtmacherei Portal

Angebote

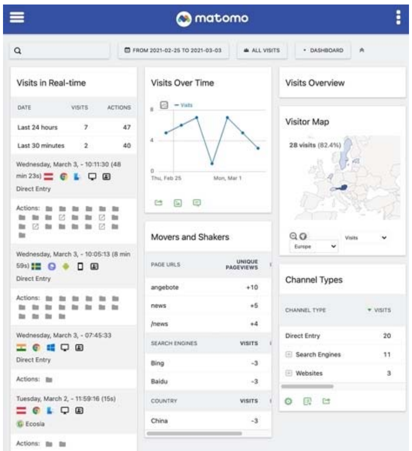
Filter

Download CSV

title	subtitle	description	
Abfall-ABC	Trenn-Sammelhilfen	So trennen Sie Ihre Abfälle richtig.	abfall
Afro-Asiatisches Institut Salzburg	Das AAI versteht sich als Plattform für interkulturelle ...	Das AAI versteht sich als Plattform für interkulturelle und interreligiöse Begegnungen, das den Umgang mit unterschiedlichen Kulturen und Religionen fördert. Dies tut es unter anderem durch diverse Veranstaltungen und die Vergabe von Stipendien.	austa begeg berat bildur diskus entwi film geme global interk konsu stadtr kultur lesung mens regpis solida sozial sprach startt stipen vortra works
Akzente Salzburg	Als überparteiliche Social Profit Organisation wird im Auftrag ...	Als überparteiliche Social Profit Organisation wird im Auftrag und durch Förderung des Landes auf die Anliegen, Bedürfnisse und Probleme junger Menschen eingegangen.	aktivis demo sozial sozial

Stadtmacherei Portal

Figure 6: lists and a map overview offered via the administrative front end



Visits in Real-time

DATE	VISITS	ACTIONS
Last 24 hours	7	47
Last 30 minutes	2	40

Wednesday, March 3, - 10:11:30 (48 min 23s)
Direct Entry
Actions:

Wednesday, March 3, - 10:05:13 (8 min 59s)
Direct Entry
Actions:

Wednesday, March 3, - 07:45:33
Direct Entry
Actions:

Tuesday, March 2, - 11:59:16 (15s)
Ecosia
Actions:

Visits Over Time

Movers and Shakers

PAGE URLS	UNIQUE PAGEVIEWS
angebote	+10
news	+5
/news	+4
SEARCH ENGINES	VISITS
Bing	-3
Baidu	-3
COUNTRY	VISITS
China	-3

Visits Overview

Channel Types

CHANNEL TYPE	VISITS
Direct Entry	20
Search Engines	11
Websites	3

Figure 7: matomo dashboard

6. Mobile repository (D4.3)

For ease of developing a cross platform app and regarding experience in C# within the development team, Xamarin was the preferred choice and selected for the client development. The current version of the apps are available at the respective app store of the operating system offering both a version for iOS and Android.

The apps were built as a native apps to be able to provide features such as the mobility tracker and tracking the progress within tours or when looking for POIs. These are features that are in contrast hard to implement in just a web app.

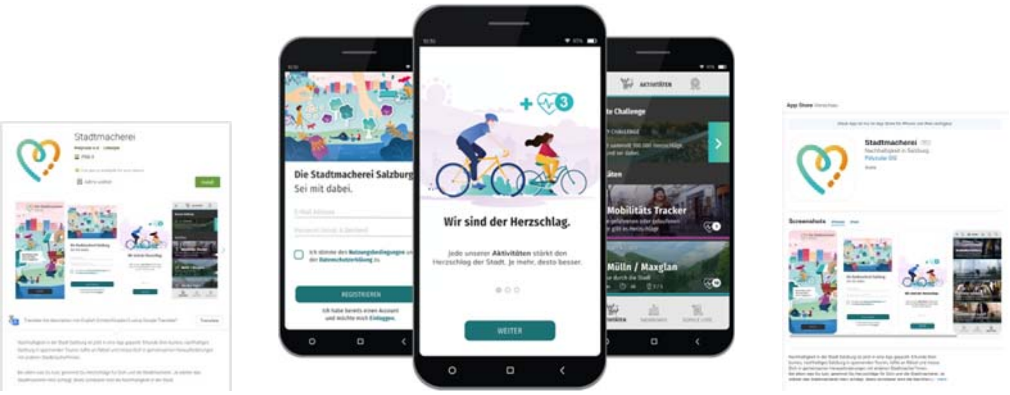


Figure 8: apps released in both stores (Android left, iOS right)

Download Link for the apps in the respective stores.

JETZT BEI Google Play

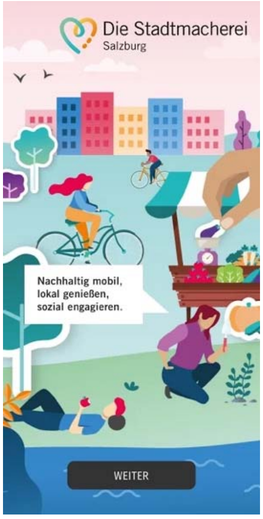
Laden im App Store

https://play.google.com/store/apps/details?id=com.polycular.simplicity

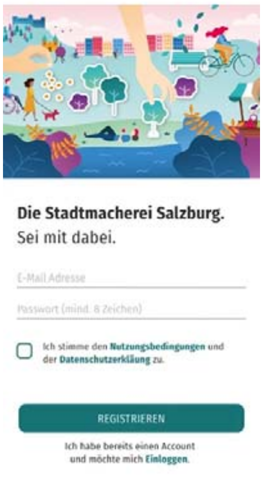
https://apps.apple.com/at/app/id1494908831?mt=8

In analogy to the web portal the apps consist of 4 main sections namely:

- **Introduction**, registration & **login** and **onboarding** illustrated by the images below (left to right).



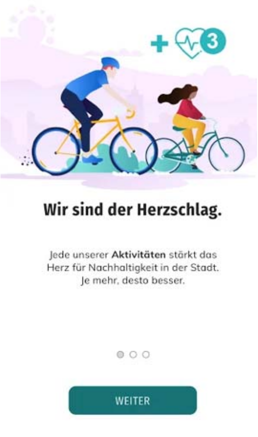
Nachhaltig mobil, lokal genießen, sozial engagieren.



Die Stadtmacherei Salzburg.
Sei mit dabei.

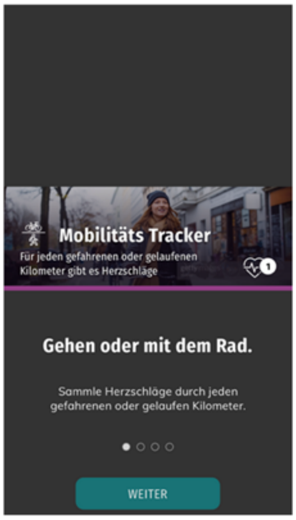
□ Ich stimme den Nutzungsbedingungen und der Datenschutzerklärung zu.

Ich habe bereits einen Account und möchte mich Einloggen.



Wir sind der Herzschlag.

Jede unserer Aktivitäten stärkt das Herz für Nachhaltigkeit in der Stadt. Je mehr, desto besser.

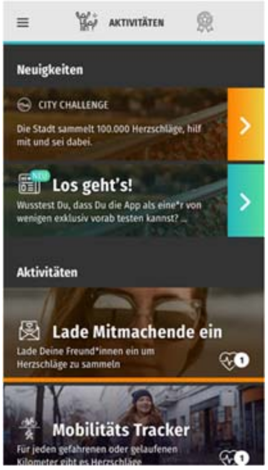


Für jeden gefahrenen oder gelaufenen Kilometer gibt es Herzschläge

Gehen oder mit dem Rad.

Sammle Herzschläge durch jeden gefahrenen oder gelaufen Kilometer.

- **Activities** (activities and challenges). There is a list of activities (left) currently available for you consisting of mobile tracker, tours (right), highlighted services and locations per week as well as an overview of the currently available challenges (middle).

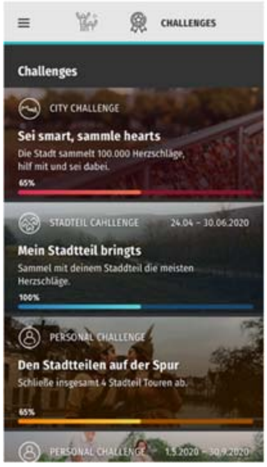


Die Stadt sammelt 100.000 Herzschläge, hilf mit und sei dabei.

Wusstest Du, dass Du die App als eine*r von wenigen exklusiv vorab testen kannst? ...

Lade Deine Freund*innen ein um Herzschläge zu sammeln

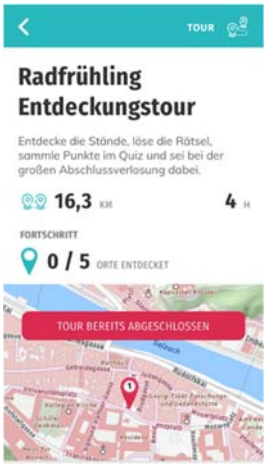
Für jeden gefahrenen oder gelaufenen Kilometer gibt es Herzschläge



Die Stadt sammelt 100.000 Herzschläge, hilf mit und sei dabei.

Sammel mit deinem Staddteil die meisten Herzschläge.

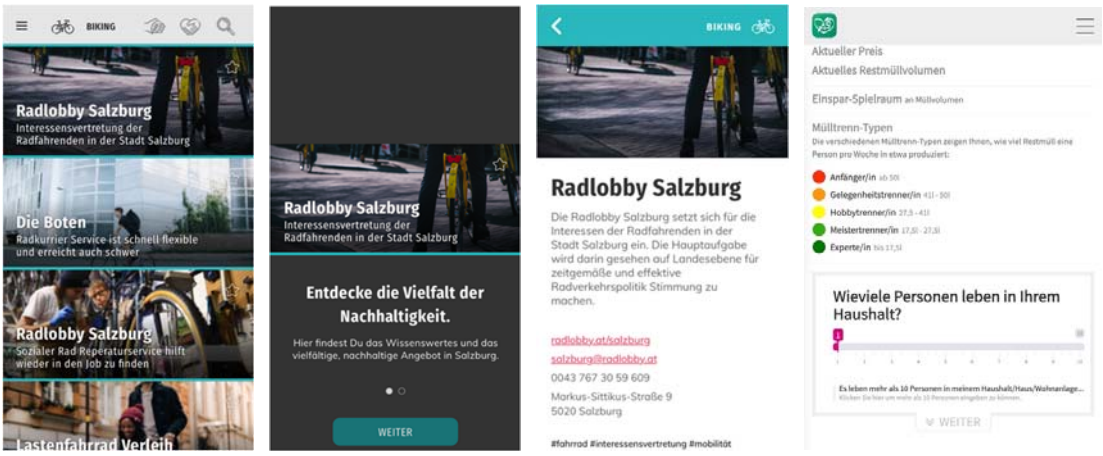
Schließe insgesamt 4 Stadtteil Touren ab.



Radfrühling Entdeckungstour

Entdecke die Stände, löse die Rätsel, sammle Punkte im Quiz und sei bei der großen Abschlussverlosung dabei.

- **Service listing** (Angebote) is a filterable and searchable list of services in the municipality. Instead of a native implementation of the view, the app uses dynamic web views formatted and delivered directly from the web portal. Wherever possible, web-apps of the service providers were directly integrated in the app.



Radlobby Salzburg
Interessensvertretung der Radfahrenden in der Stadt Salzburg

Die Boten
Radkurrier Service ist schnell flexible und erreicht auch schwer

Radlobby Salzburg
Sozialer Rad Reperaturservice hilft wieder in den Job zu finden

Lastenfahrrad Verleih

Radlobby Salzburg
Interessensvertretung der Radfahrenden in der Stadt Salzburg

Entdecke die Vielfalt der Nachhaltigkeit.

Hier findest Du das Wissenswertes und das vielfältige, nachhaltige Angebot in Salzburg.

Radlobby Salzburg

Die Radlobby Salzburg setzt sich für die Interessen der Radfahrenden in der Stadt Salzburg ein. Die Hauptaufgabe wird darin gesehen auf Landesebene für zeitgemäße und effektive Radverkehrspolitik Stimmung zu machen.

radlobby.at/salzburg
salzburg@radlobby.at
0043 767 30 59 609
Morkus-Sittikus-Straße 9
5020 Salzburg

#fahrrad #interessensvertretung #mobilität

Aktueller Preis
Aktuelles Restmüllvolumen

Einspar-Spielraum an Müllvolumen

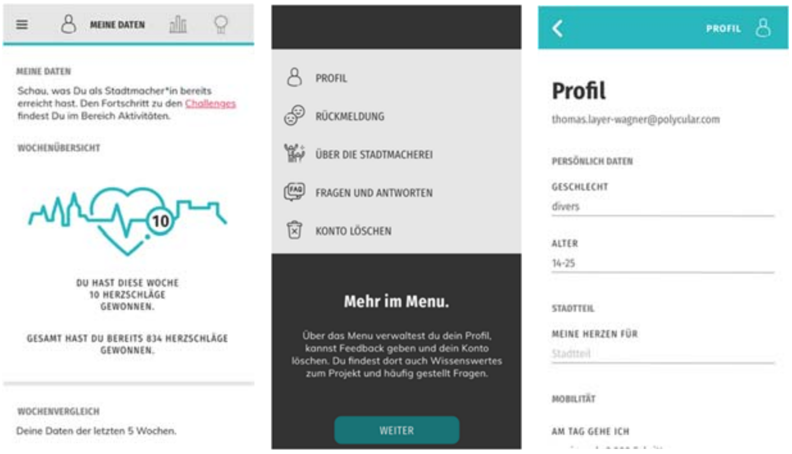
Mülltrenn-Typen
Die verschiedenen Mülltrenn-Typen zeigen Ihnen, wie viel Restmüll eine Person pro Woche in etwa produziert:

- 🔴 Anfänger/in ab 50l
- 🟠 Gelegenheitstrenner/in 41l - 50l
- 🟡 Hobbytrenner/in 27,5 - 41l
- 🟢 Meistertrenner/in 17,5l - 27,5l
- 🟢 Experte/in bis 17,5l

Wieviele Personen leben in Ihrem Haushalt?

Es leben mehr als 10 Personen in meinem Haushalt/Haus/Wohnanlage...
Klicken Sie hier um mehr als 10 Personen eingeben zu können.

- **Dashboard** and **profile data** provide an overview of the activities od the individual as well as the whole community in the municipality.



MEINE DATEN
Schau, was Du als Stadtmacher*in bereits erreicht hast. Den Fortschritt zu den Challenges findest Du im Bereich Aktivitäten.

WOCHENÜBERSICHT

DU HAST DIESE WOCHE 10 HERZSCHLÄGE GEWONNEN.

GESAMT HAST DU BEREITS 834 HERZSCHLÄGE GEWONNEN.

WOCHENVERGLEICH
Deine Daten der letzten 5 Wochen.

Mehr im Menu.

Über das Menu verwaltest du dein Profil, kannst Feedback geben und dein Konto löschen. Du findest dort auch Wissenswertes zum Projekt und häufig gestellt Fragen.

Profil
thomas.layer-wagner@polycular.com

PERSÖNLICH DATEN
GESCHLECHT: divers
ALTER: 14-25

STADTTEIL
MEINE HERZEN FÜR: Stadtteil

MOBILITÄT
AM TAG GEHE ICH

Additionally, the apps include imprint, data privacy statement, terms of use and additional onboarding and error screens when needed.

A full overview of the design is available as attachment to **D 3.4 Platform Backlog and Report.**

7. Backend Data repository (D4.1, D4.2)

This last repository serves for data import from various providers like the “Karte von Morgen” or the OGD available from the communities. It also allows us to import the data from the self-authoring templates provided to the project partners and additional partners contributing content e.g. tours.

More about the self-authoring templates is provided by **D 5.1 Self-authoring templates for modules.**

References

Clarke, P., O'Connor, R. V., & Yilmaz, M. (2018). In search of the origins and enduring impact of Agile software development. *Proceedings of the 2018 International Conference on Software and System Process - ICSSP '18*, 142–146. https://doi.org/10.1145/3202710.3203162