The Urban Lab of Europe!

JOURNAL

PROJECT

AVEIRO STEAM CITY - Urban Network for Upgrading STEAM Skills and Increasing Jobs Added-Value through Digital Transformation in a new economic context

Aveiro, Portugal

TOPIC

Jobs and skills in the local economy

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The AVEIRO STEAM CITY Project Journal n.3

See on UIA website

"Aveiro STEAM city" (ASC) intends to boost the use of new technologies in the public space, together with the aim to make these technologies accessible for a common public, such as students, teachers and citizens in general.

EXECUTIVE SUMMARY

This journal provides an update of the progress of the project Aveiro Steam City (ASC) at the time of writing (January 2022) covering four main aspects:

Main goals reached in year 2021, with a special focus on procurement and implementation activities;

Critical evidence coming from data collected in the 3 years;

Most significant communication activities put in place and main impacts of the citizens engagement activities developed.

Finally, a very last section reports some information and considerations on the main goals reached in terms of upscaling and legacy.

WHAT THE PROJECT IS ABOUT

Aveiro is well known as a territory of innovation, where coexists a vocation for digital technologies together with a profound cultural heritage.

The project, approved under the topic "**Jobs & Skills**", started in November 2018 and it's coming to a conclusion, with the closing event planned for March 2022.

The total investment reaches **6.1 million euros,** with funding from the European Commission through the UIA initiative of 4.9 million euros.

Aveiro STEAM city represents the backbone of the city's digital transformation strategy, a big political program called Aveiro Tech City, strongly endorsed by the mayor, recently re-elected, Mr. José Ribau Esteves.

The city of Aveiro is committed to develop a technological urban center of reference at European level, by promoting the spread of innovative solutions, through the creation of the first Living Lab of the city: Aveiro's Living Lab is composed of an advanced communications infrastructure and an innovative urban platform that, together, allow the provision of an open and large-scale technological laboratory in the city at the service of researchers, digital industries, startups, scaleups, R&D centers, entrepreneurs, creatives and other stakeholders interested in developing, testing or demonstrating concepts, products and/or services.

PARTNERSHIP

- City of Aveiro
- Instituto de Telecomunicações - R&D Institute
- Altice Labs - R&D Institute
- Universidade de Aveiro - Universities and Research Centre
- CEDES - Universities and Research Centre
- INOVARIA - association of businesses

UPDATE OF THE PROJECT

The most significant updates related to the project activities are described through **7 main domains:**

1. Aveiro Challenges
2. Aveiro Artistic Residences
3. Tech City Hub
4. Communication infrastructure and Use Cases
5. 5G
6. Tech Labs
7. Labor Observatory

1. **Aveiro Challenges**: for the 2nd edition of Aveiro Urban & 5G Challenges 59 applications has been received, from startups and scaleups, of which 15 had the opportunity to develop and test their projects and to benefit from the Aveiro Living Lab. The challenges to be address were directly proposed by the Municipality of Aveiro in order to tackle and resolve urban issues.
2. **Criatech Artistic Residences**: these artistic residences took place between September 27th and October 2nd(2021). This 2nd edition had 12 projects developed and 2 of them were awarded and presented during the Aveiro Tech Week.
3. **Tech City HUB**: the HUB was successfully equipped in the 2nd floor of the iconic building, the Atlas (https://www.uia-initiative.eu/en/news/cultural-heritage-leverage-urban-regeneration-atlas-building-aveiro-tech-hub). The official opening ceremony occurred in mid-October during the opening of Aveiro Tech Week 2021.
4. **Communication infrastructure and Use Cases**: the Institute of Telecommunications, together with the Municipality and the University of Aveiro, has been deploying an advanced, large-scale communications infrastructure, spread throughout the city of Aveiro. The infrastructure covers 44 strategic points in the urban area of Aveiro, in the form of smart lamp posts or wall boxes on building facades with communications technologies, edge-based computing units and sensors. All these points combine and interconnect a set of sensors, such as mobility sensors (GPS, radars, lidars and video cameras) and environmental sensors (such as temperature, humidity, pollution) with remote data collection units throughout the city, providing enough data to support a wide range of services and applications: from IoT and internet access to citizens, to mobility and intermodal services, smart parking, assisted driving, intelligent transportation systems, environmental monitoring, distribution of information and multimedia content, emergency and safety, health services, among others. The fully functional infrastructure has been extensively used in several use cases. Smart parking sensing units, repeaters and gateways are installed and are already integrated with the management system. Vehicular communication units are installed in 10 buses with regular connectivity through the SDN vehicular network (ITS-G5) providing both real-time and historical mobility data. Fixed sensing units have been deployed throughout the infrastructure and the number of units is continuously expanding, including RADARs, LiDARs and video cameras. According to the energy use case, the deployment of the electrical charging network in the 10 moliceiros docks has progressed: the electrical infrastructure in the road and the chargers were installed. The management system and the mobile app for the boat operators has been configured. Electrical distribution company finalized all technical procedures for the licensing of the electrical connections. The last

step consists in the establishment of an adequate cable management solution between the boats and the chargers, to be concluded by January 2022. Regarding the environment use case, the main goals for the last year were to continue the acquisition and analysis of the environmental data acquired by the installed monitoring stations, and to perform the air quality modelling activities for the Aveiro city. In this scope, the following activities were accomplished: maintenance and calibration of all meteorological, noise and air quality stations; development of programming language for the analysis of collected environmental data; deepening of knowledge in air quality modeling using data from environmental sensors. In the last year, Telecommunication Institute was able to develop the data endpoints to make all data available to 3rd parties and to the Digital Urban Platform, developed by Altice Labs.

5. **5G:** ASC 5G infrastructure was responsible for the support to the RSU (Road Side Units) backhaul network and V2X communications, supporting "see-trough" and VRU (Vulnerable Road Users) oriented applications. The setup and experimentation of 5G SA technology with edge computing architectures took place in the context of the R&DI support activities in the project's living lab, including the test and validation of Altice Labs 5G radio units – indoor and outdoor.
6. **Tech Labs:** the Tech Labs project aims to develop foundational skills and knowledge about STEAM competences in students and teachers from all educational levels. 31 Primary Schools in the Municipality were fully equipped and teachers were trained with the necessary skills to develop STEAM activities in a "classroom" context.
7. **Aveiro Labor Observatory:** over the year 2021, the Aveiro Labor Observatory conducted 4 Awareness Workshops (AW) devoted to four key areas identified as fundamental for skilling and upskilling the local talent for digital transformation. Notably: visualizing data and machine learning, Industry Support 4.0, mapping processes by digital means, content creation and digital dissemination. The AW reached a high number of participants and visualizations (even in the pandemic context) and reached a diversified audience. 12 Pilot Programs were also developed. A Competence Board, a tool for data extraction and analysis of only job advertisements, for the identification trends in the demand of competences using the ESCO reference base, were launched.

CHALLENGES

Challenge	Observation
Leadership Challenge level	The leadership of the project is solid; there is a continuity in terms of active participation of all partners in the steering committee's meetings.

Procurement

Challenge level

Regarding the Main Urban Authority (MUA), the most significant acquisition processes are related to the HUB's innovative interactive displays, to the electrical charging network for the Moliceiro boats and to the Tech Labs equipment. In particular:

- **Tech city HUB** - The procurement process developed was a public tender. As for 31/12/2021, the execution rate allowed the payment of 100% of the total amount of the contract.
- **Use Case Energy** (Moliceiro boats) - The procurement process developed was a public tender, which has been under execution. As for 31/12/2021, the execution rate allowed the payment of 62% of the total amount of the contract.
- **Tech Labs** - In 1st Cycle schools, the acquisition and installation of equipment was carried out in the 2019/2020 school year, followed by the training and technical monitoring of teachers in the same school year, extending until the 2020/2021 school year. Regarding STEAM equipment for 2nd and 3rd cycle schools, its acquisition and availability to the various educational establishments was carried out and completed in September/21.

With regard to the **Environment Use Case**, during the last year the procurement processes were focused on the maintenance and re-calibration of the monitoring equipment allowing to continue working properly the data.

For the **5G network**, a collaboration agreement was established with ASOCS, in order to develop integrated end-to-end 5G solutions targeting 5G Small Cells, comprising components both from Altice Labs and ASOCS. The so built solution will be commercialized in the international market both by Altice Labs and ASOCS.

Finally, Cedes needed to acquire a consultancy given by experts from INOVA+, TECHPITCH and AGILUS, for the development of a sustainable Urban Business Model that ensures the continuity of the Aveiro STEAM City project activities after its completion, for the evaluation of the Aveiro STEAM City project which includes the validation, updating and implementation (monitoring) of the indicator model created for the project.

Communication

Challenge level

The Aveiro Tech Week was the activity with main impact: besides reinforcing the institutional image and strengthen relationships between partners, it allowed the audience to have direct contact with the various activities developed and with all partners involved. This edition attracted media attention of the media promoting the growth of awareness at national level.

During all year, a variety of activities related to education axis were implemented, and in 2021 was held an online symposium on STEAM education with the collaboration of the city of Oulu in Finland. All the activities reach media attention, which result in some interviews to make news to promote activities and outcomes.

The award of the **Innovation in Community Engagement Award by Harvard University Innovation** to the city of Aveiro boosts dissemination of the project. The award was presented to the community by city's Mayor in a press conference, held on the 18th march 2021.

Scientific, industry and research partners were active in publication of articles, presentation on workshops, events, participation in panels, and keynotes on conferences.

Also, the partners took care of the communication via social media.

The University of Aveiro curated the release of an e-book, in PT and EN language, summarizing some key results of the skills gap analysis conducted by the Observatory.

Participative approach

Challenge level

The most significant citizens engagement activities were related to the **demonstration of the use cases.** Moreover, several users and stakeholders have been directly involved, such as the garbage collector company, the bus company, the tourism boats companies and the mobility and innovation departments in the municipality. Until October 2021, the Aveiro Tech City Living Lab was used by Portuguese and foreign companies, entrepreneurs and R&D Centers to develop their products. In total, 37 projects were developed under 5G and Urban Challenges and R&D initiatives. In the 2nd edition of Criatech Artistic Residences 12 entities with one project each took part to the initiative. In the area of education (in the academic year 2019/2020 and 2020/2021), the Tech Labs project involved 119 Teachers, 1890 students, 837 monitoring hours in classroom and 31 schools; the UBBU project involved 68 Teachers, 1368 students, 120 monitoring hours in classroom and 13 schools. The CodeHero project counted on 77 participants.

The events held during the Aveiro Tech week attracted the general public:

- 3 Tech Sessions: 16 speakers, 459 audience, 819 online audience
- 7 Workshops: 8 Partners, 186 participants, 990 online audience
- Gaming: 9830 visitors and 25k online audience
- Criatech: 25 art installations, 40 artists, 12 countries and 8946 visitors
- Prisma: 13 art installations, 25 artists, 9 countries, more than 9k visitors

Monitoring and evaluation

Challenge level

According to the data collected, with training and steam education activities, partners were able to:

. Increase the STEAM and digital skills by 69% in unemployed people and 82% in school community (teachers and students);

. Increase by 80% the opportunity for participants to obtain better paying, more sustainable, productive and qualified jobs;

. Include 75% of trained participants into the job market;

Aveiro Living Lab encouraged the creation, test and development of 37 new products or services. This infrastructure was used by 26 Companies/ Entrepreneurs/ R&D Centers. The Urban Platform allows citizens, city council employees, entrepreneurs and companies to access and use different types of data, thus contributing to support their decision-making process in a more conscious way. 100% coverage of 5G communication services in the defined area was reached. The data collected in the mobility and environment domains, considering the vehicles, bicycles, people and even boats ("moliceiros"), provide an understanding of the current traffic in the city, in the different areas, including the driving behavior of the people, difficult times and areas of the city, and even the mobility flow of all transport means. The fusion of data of video cameras, radars Wi-Fi probing is also able to detect non-safety areas and non-safety situations involving vehicles and vulnerable road users. The integration of mobility and environment data enables the development of routing based on environment and the understanding of mobility effects on the environment. The data collected during the last year drove in the further characterization of the air quality and noise in Aveiro. The collected and analyzed time series indicate road traffic, residential combustion (during winter) and some restaurants and tourism activities as the main sources of atmospheric emissions in Aveiro. Previously to the communication of these data to the population, a careful processing is advisable.

Organizational arrangements

Challenge level

Nothing specific to report.

Upscaling

Challenge level

- **Tech Labs** – the effort of these years strongly contributed to the creation a consolidated layer of STEAM education in the Educational Community. Currently, it is possible to provide STEAM courses to all students in the Municipality. As part of the Tech Labs project, the "STEAM Artistic Residences" initiative was launched, with the aim to promote, in the Educational Community of the Municipality, the development of artistic content using the STEAM methodology, involving artists, teachers and students in the same project. Simultaneously, in a collaborative and concerted way, another European city (Oulu in Finland – European Capital of Culture in 2026) will undergo the same process, providing that everyone involved experiences the same creative process.
- **Bootcamp | Training** - the positive results obtained with the implementation of "Bootcamps", in which the trainees were able to tackle a specific need from companies (training in java and JavaScript), guarantee their quick integration in the job market; this pattern reflects the great potentiality to upscale the initiative in order to have more qualified human resources and a more competitive labor market for companies. 100% satisfaction from the attendees and 75% of job placement in the field of ICT (even considering the pandemic) was reported.
- **Challenges** - the implementation of the challenges left a strong legacy considering the number of (international) companies/entrepreneurs/R&D Centers that developed that tested and created their products; a new edition of the challenges for 2022 is going to be launched in February 2022.
- **Tech City HUB** - it is definitely one of the most tangible legacy of the project.
- **Aveiro Tech City Living Lab** - the implementation of the Living Lab in Aveiro was a significant step in the affirmation of the City Telecommunications arena. Coherently with this new positioning, Aveiro submitted an application to become an official member of the Free Tech Zones in the area of Telecommunication, as defined by the Portuguese Government (the process is called ZLT - Zonas Livres Tecnológicas).
- **Labor Observatory** - it is currently acknowledged as an independent and solid voice: trust from stakeholders in order to explore collaboration in the future, including industry representatives, Labor institutions, and education and training representatives, was expressed.
- **5G** - at the conclusion of a long auctioning process of the radio spectrum for 5G, in the last quarter of 2021, the Aveiro STEAM City 5G infrastructure started and evolution from a pure experimental pre-commercial stage to a public carrier grade 5G network. Deployment of innovative 5G services and applications – centered on the improvement of city's sustainability and quality of life of its citizens – are ready to go massive.
- **Communication infrastructure** - this platform will continue to be available in the city in different areas, such as environment, mobility, tourism, autonomous driving and many others. Aveiro is now in the process to turn this infrastructure in a free technology zone recognized by the Portuguese government (see 5)), and to be a hub of technology and available to the outside.

FINAL CONSIDERATIONS

The data collected during the project development led to understand that Aveiro is considered to be an environment where start-ups, companies, R&D Centers, etc. can effectively interact in the domain of technological innovation. All these considerations depict the city as promising place to test and develop new technologies. Data collected throughout the project reflect a good performance overall and present a significant impact to city and its citizens. This evidence will not only assure the **sustainability** of the Aveiro Tech City Living Lab, but will also make sure that activities or actions that are expected to positively impact on citizens will continue to be carried out in the future.

Considering all the activities under analysis throughout the year of 2021, the overall evaluation is very positive. Nonetheless, some activities had notably a higher performance than others.

Regarding the creation of**qualified talent**, Tech City Bootcamps were undoubtably successful in redirecting individuals' careers in order to enter the labor market as developers. This activity not only provided its participants with technical skills, but also enabled them to develop soft skills such as problem solving, resilience, self-learning, communication and interpersonal skills, etc.

From a macro perspective, the Tech Labs have definitely raised the bar when considering not only the increased capacity of children and teachers in STEAM and digital skills, but also the potentiality in terms of scalability and volumes.

Taking into account the qualitative and quantitative analysis conducted to the 5G challenges, both the technical support and the infrastructure of the Aveiro Tech City Living Lab were strong and effective, and efficiently allowed the test of new solutions. The major takeaway from the data collected in this activity was that the Living Lab infrastructures effectively enable real environment testing of 5G solutions and this aspect was actually considered to be crucial and determinant for all teams as it permitted the development and validation of their products/services.

In the opinion of the writer, the ASC project will effectively conclude during the last months of work scheduled for 2022.

Therefore, there will be **two challenges for the future:**

- a more contingent one, linked to the ability to leverage the last year of **monitoring**. In fact, the UIA projects already concluded that considered the final year of monitoring as a moment of fine tuning but also of relaunching some project activities with the highest potential for scalability, proved to be smart in terms of guaranteeing the legacy of the project.
- secondly, a crucial challenge for city makers will be linked to the real communication and usage of the data providing that derives from the communication infrastructure and the digital urban platform with the departments of the Municipality, from a **business intelligence** perspective.

In other words, what has happened in the past with many so-called "smart city" projects is that the data capture was not followed by a true integration with policy decision making. This is certainly a very complex challenge, also because we know that in the empirical reality there is no perfect correlation between political choices and the evidence of the data. The so-called "evidence-based policy" is a fascinating science but it can't ignore the real dynamics of the context, which are economic, environmental, political, anthropological, ecological and social. The city of Aveiro has all the premises and the potential for a reasonable work to enhance the data capture activity, so it will be interesting to follow the organizational evolutions of the city in this direction.

Jobs and skills in the local economy

See on UIA website