Brussels by us,

Collective ideas for a smart future.

Report 8: Conclusions

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www.brusselsbyus.be

Summary

This report is the final summary report of the Brussels by us project. The Brussels by us project started in January 2019 and ended in December 2019. The project supported citizen participation in the Brussels-Capital region through the usage of a mobile application with beacon technology. Further, the project also organised different offline activities through co-creation workshops and walking tours to collect the opinions of users. Citizens could voice their opinions about the functional mixity in the North Zone, the design of the public space and commercial offer in the Central Zone (pedestrian area), and the connection between the universities (VUB/ULB campus) and the city in the University District. During the project lifetime, Brussels by us engaged 140 citizens through its offline activities and 640 citizens downloaded the mobile application. This report gives an overview of its main objectives, its Living Lab methodology, the technology as well as the main results per zone. For more in-depth results about each zone, the reader is advised to consult the specific reports per zone (report 2-6).

Overview

Report 8: Conclusions

This report is the final summary report that describe the processes and outcomes of the Brussels by us project. The project started in January and finished in December 2019, and was a collaboration between the Brussels-Capital Region and imec.

- Report 1: Introduction to the project.
  In this report, a brief overview of the project is presented. The initial description of work is summarized, followed by adjustments that were experienced during the realisation of the project. Further, the three experimentation zones are described, including their specific perimeter and themes of investigation. Finally, the several steps of the project methodology are explained, including the beacon technology and mobile application.

- Report 2: North Zone (Part I) - Report 3: Central Zone (Part I) - Report 4: University Zone (Part I).
  These three reports have the same blueprint and explain the first methodological steps for each zone: the North, Central and University zone. Each report presents the specific ecosystem, the themes and the contextual conditions of each zone. Next, the set-up and results of the first co-creation workshop are described. Based on the outcomes of these workshops, the specific questions for several beacon interactions are presented.

- Report 5: North Zone (Part II) - Report 6: University Zone (Part II).
  These two reports have the same blueprint and explain the final steps of the methodology for two zones: the North zone and the University zone. These reports analyse the data collected through the mobile app. Further, the second phase of co-creation workshops organised for each zone are then described and analysed. Final conclusions with recommendations towards the relevant stakeholders are presented.

- Report 7: Communication strategy.
  This report presents the communication strategy that was put into place for the Brussels by us project. It details all the promotional and outreach activities.

- Report 8: Conclusions.
  In this report, a final evaluation of the project is conducted. A general overview of the results is given, followed by the general impact of the project on the three zones of investigation.

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1. Participation and usage statistics

1.1. Usage of the Brussels by us mobile app

This section presents general statistics about the usage of the Brussels by us mobile application.

In total, 640 citizens downloaded the mobile application between 12/03/2019 and 31/10/2019. This period was preceded by a test period (from March to the beginning of April) during which 32 *test* users downloaded and registered on the mobile app.

The highest peak in the number of downloads was in April and September 2019, which correspond with, respectively, the launch of the North Zone campaign (23/04/2019) and the launch of the University campaign (16/09/2019). On 23/04/2019, 88 citizens downloaded the mobile application, which was the highest registered peak for the number of downloads per day. During May and June 2019, the number of downloads was rather low. Unfortunately, due to the elections, the communication campaign of Brussels by us had to be paused until the beginning of July. Therefore, no promotional activities were organised during this 3 month-period. During July and August 2019, the remaining communication efforts were dedicated to the promotion of the walking tours. In total, 365 users download the mobile application during the campaign in the North Zone, of which approximately 180 users shared their opinions via the mobile app and/or paper survey.

During September and October 2019, the Brussels by us mobile app was promoted on the VUB campus. During the opening week of the academic year (16 till 20/09/2019), 130 students downloaded the mobile application. The app was further promoted in October through the distribution of leaflets by hostesses on campus. In total, 275 users downloaded the mobile application during the campaign in the University zone, of which approximately 143 shared their opinions via the mobile app.

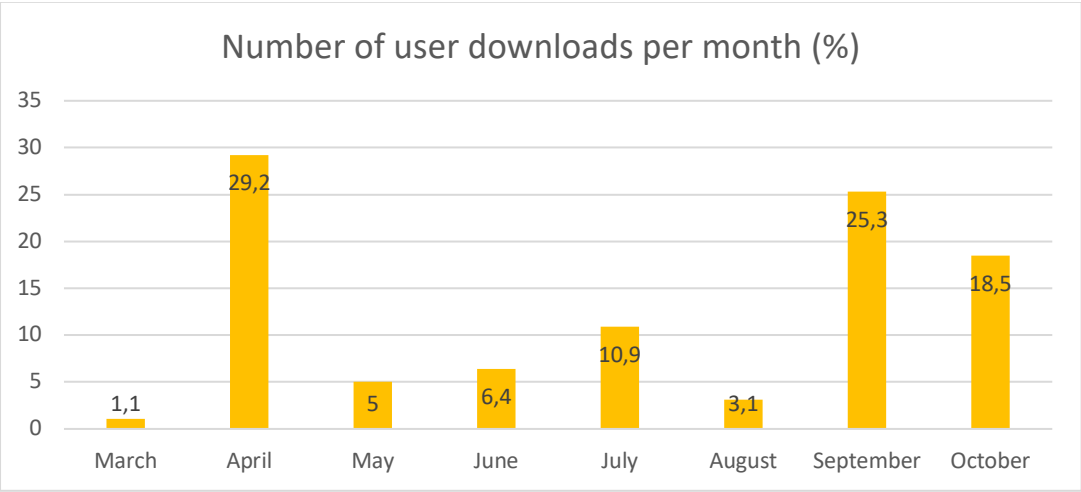


Figure 1: Number of downloads per month (%; N=644).

The Brussels by us mobile application was available in Dutch, French and English. In the graph below, the division among the users' languages is presented: most citizens downloaded the app in English (43.6%), followed by Dutch (32.8%) and French (23.6%). A statistical difference was found between the users' languages and the campaign. In the

North Zone campaign, there were more French-speaking users (35.4% versus 10.8%) whereas in the University Zone campaign more English (49.3% versus 41.5%) and Dutch-speaking users (39.9% versus 23.2%) participated.

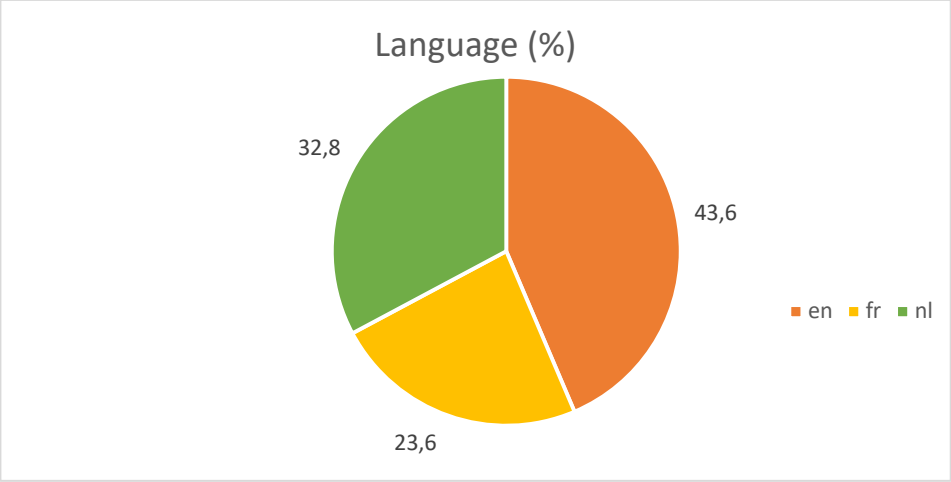


Figure 2: Division in language (%; N=644).

Last, in terms of division in the operating system (either Android or iOS) among the users, we see that 55.7% of the users had an iOS operating system, and 43.2% Android. A significant difference was found between the operation system and the campaign zones, in the North Zone a significant higher degree of the users participated through an Android device (48.1% versus 36.4%), whereas in the University Zone most participants had an iOS device (51.9% versus 63.6%).

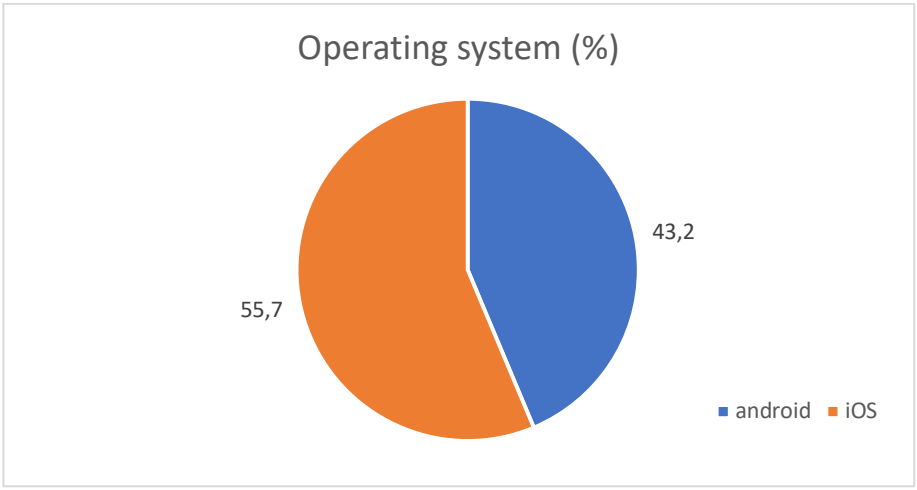


Figure 3: Operating system (%; N=644).

1.2. Participation in workshops & other events

The Brussels by us project also organised several co-creation workshops and other type of events (such as walking tours), whereby a total of **140 people** participated.

Table 1: Number of participants in workshops & other events.

Activity	Number of participants
North Zone - Co-creation workshop I	16
Central Zone - Co-creation workshop I	17
University Zone - Co-creation workshop I	8 (restricted invite)
North Zone - Co-creation workshop II	19
Walking tours	80
Total	**140**

2. A Living Lab methodology for participation in Brussels

2.1. Living lab Methodology

Within the Brussels by us project, a specific living lab methodology was designed and implemented to establish concrete outcomes. The goal of this methodology was to establish an ecosystem of stakeholders in each zone that collaborated on certain themes of investigation.

The methodology followed a tunnel approach, whereby an investigation first occurred of existing studies, economic and social trends as well as past, on-going and future projects related to the quality of life in each zone. Based on these findings, the perimeter and the themes of investigations were defined. Next, stakeholders were identified and invited to set up a participatory process with support of the (beacon) technology. Based on their inputs and first findings from the current state-of-the-art, a first co-creation workshop was set up. Public and private entities as well as citizens were invited. The results of the first workshop led to the creation of questions, which were then validated on a large-scale basis. For this validation, the collection of opinions occurred via the (beacon) technology. These data were then analysed and presented in another co-creation workshop, which led to the refinement of results with proper conclusions. Finally, recommendations for prototypes were formulated by the project. In the figure below, the consecutive steps of the Living Lab methodology are described:

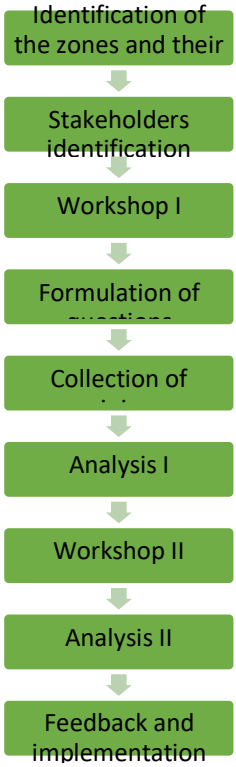


Figure 4: Methodology of the Brussels by us project

Stage 1: Identification of stakeholders

For each zone a mapping of relevant entities was conducted. To be relevant for the project, the entities needed to be either working within the zone and having relevant expertise for the project or having a current or future project that could be included in the Brussels by us project.

Once all entities were mapped, contacts were established and individual meetings were organized with the interested entities by imec and Shakeholders. They included private companies but also public institutions, city councils, citizens associations, and active groups in the neighbourhood.

The project was especially looking for entities that had questions around the scoping of their current or future project, and that were seeking the public's opinion for which the input would be relevant to have in the following months. Interested entities would become stakeholders of the project. While no signed agreement was made with these stakeholders, it was mentioned that a minimum level of engagement from them was required in order for the project to have an impact. For example, each stakeholder would be responsible for one interaction: they would first identify one current or future project for which they had a question, follow-up the formulation of the questions and at the end of the project hear the final results and support the implementation.

Stage 2: Workshop I

Following the preliminary interview with each stakeholder, a co-creation workshop was organized for each zone separately. At the workshop, all interested entities of the zone were invited to talk on different subjects related to the theme of the zone. The current and future projects were discussed and participants proposed and discussed ways to improve the zones according to the theme of the zone.

Stage 3: Formulation of the questions

Based on the outcomes of the workshop, questions were drafted and sent to the stakeholders for them to review. If needed, the questions and answer categories were adjusted and the final questions were programmed in the mobile application and web survey.

Stage 4: Collection of opinions

During a predefined period of time, the questions were available for citizens to answer, either via the mobile app, via the online survey or via paper surveys during the walking tours organized in the North zone.

- North zone : 23/04 – 30/08 (via mobile application, web survey and paper survey)
- Central zone : cancelled
- University zone : trial from 16/09 – 31/10 (via mobile application)

Stage 5: Analysis I

A first analysis of the collection of opinions was done for each interaction. This analysis highlighted the main trends for each project and major needs for each zone. The variations in the answers according to the participants' profile were also analysed. These first results were sent to the project's stakeholders.

Stage 6: Workshop II

The second workshop was organized with the aim to reflect on the results of the first analysis. The relevant stakeholders were present, as well as additional entities and interested citizens.

During this workshop, the results of the first analysis were presented. Participants were then asked to reflect on these results and to imagine a prototype that could answer the needs and wants of the citizens.

Stage 7: Analysis II

During the second analysis, the inputs given during the second workshop were grouped and visuals were made out of it. Visual prototypes were drafted for the North Zone, while for the Central and University Zone specific guidelines were formulated.

Concluding stage: Feedback and implementation

In the last phase of the project, the final results are handed over to the stakeholders. Based on the co-created results, they can steer their current or future project in a more informed way.

2.2. Project timeline

The Brussels by us project ran from January 2019 to December 2019. The table below describes the main tasks and activities related to the technology development, set-up of the Living Lab methodology and the community governance as well as the communication activities:

Table 2: Timetable of project's activities.

	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
Development mobile app	■	■	■	■								
Testing mobile app			■									
Support & bugfixing				■	■	■	■	■	■	■	■	■
Configuration beacons			■	■								
Installation beacons				■	■				■			
Set-up Living Lab methodology		■										
Workshop I - North Zone				■								
Campaign North Zone					■	■	■	■				
Workshop II - North Zone									■			
Workshop I - Central Zone				■								
Workshop I - University Zone									■			
Campaign University Zone									■	■	■	
Final reporting											■	■
Community building			■	■	■	■	■	■	■	■	■	■
Communication & promotion			■	■	■	■	■	■	■	■	■	■

The development activities mainly took place from January till mid-April 2019. The application was developed for Android and iOS devices, included three languages (EN – NL – FR) and the specific branding of the Brussels-Capital Region. In the beginning of April 2019, specific test sessions were organised with fictive scenarios to test the user experience

and usability of the application. Furthermore, imec also developed a content management system to program the content of the beacons. After the launch in April 2019, the technical team further supervised the technical performance of the application and solved any bugs if they occurred.

The Living Lab activities started from February 2019 onwards, with a mapping of the stakeholder for each zone, followed by individual meeting and eventual co-creation workshops. After the workshops, the initial input was validated through campaigns which ran from May till end of August in the North Zone, and from mid-September till end of October for the University Zone.

The community building and promotional activities were continuously running in parallel with the Living Lab activities. Most of the efforts were dedicated to the launch of the mobile application in April 2019, and towards the start of the campaign in the University zone in September 2019.

2.3. Project's highlights

01/01 Start of the project

The project officially starts; A press conference is organised on 25/01/2019. The event is organised at Marcel Bike Repair Shop. During the press conference, Céline Vanderborght (Smart City manager for the Brussels-Capital Region) presented the priorities of the Smart City Strategy of the Brussels-Capital Region. Pieter Ballon (director of imec-SMIT-VUB) presented the project and the mobile application as well as the beacon technology.

28/03 Launch of the website

The official Brussels by us website is launched.

01/04 Workshop I North zone

The first workshop of the North zone is organised at the Ubuntu café.

02/04 Workshop I Central zone

The first workshop of the Central zone is organised at 'Espace citoyen'.

23/04 Launch of the mobile application and start of the first campaign

The mobile application is officially launched and is available to download on the App Store and Google Play Store.

With the launch of the mobile app starts the first collection of opinions in the North Zone.

24/04 **Press kit**

A press kit is prepared for national media and sent towards De Tijd and L'Echo. The press kit announces the launch of the Brussels by us application. An interview is conducted with BX1.

12/07 **Clear Channel touchscreen**

A partnership was made with ClearChannel and a touch screen on the intersection of the Botanical Garden blvrd. and the King Albert II blvrd showed the interaction of Befimmo/Quatuor until end of August. Passers-by could provide their answers through the touch screen.

11/07 – 29/08 **Walking tours in the North zone**

Four walking tours were organized with the asbl Korei.

20/08 **End of the collection of opinions in the North zone**

The collection of opinions in the North zone stops. The first phase of the analysis begins.

22/08 **Workshop I University zone**

The first workshop of the University zone is organised in Silversquare (Elsene).

30/09 **Workshop II North zone**

The second workshop of the North zone is held at Lab North (CCN tower).

16/09 **Start of the campaign in the University zone**

The mobile application is launched in the University zone during the introductory week of the new academic year. This campaign was organised in collaboration with Infopunt from VUB

30/10 **End of the collection of opinions in the University zone**

The collection of opinions in the North zone stops. The final analysis begins

30/11 – 15/12

Final conclusions , visualisations and communication

Final analysis of the results of the three zones. Three visuals are developed by 51N4E to showcase the co-creation results of the North Zone. A final wrap-up is organised with the key stakeholders, and results are shared with the community

2.4. Lessons learned

- The Living Lab methodology specifically designed for this project relied on the principles of former designed research projects (cfr. Living Lab Characteristics and Their Outcomes: Towards a Conceptual Framework https://timreview.ca/article/748). The central components in this living lab methodology were the **iterative evaluation and co-creation of ideas**. Users were involved throughout different phases of the research project, and this from the initial ideation phase until a concrete concept for a (visual) prototype. Through the various iterative workshops and validation of results, the outcomes were further refined. During this process, a high degree of openness and transparency was applied: everybody could have access to the results and generate knowledge.

- The main advantage of the Living Lab methodology resides in its **flexibility** and its **iterative nature**. Not all phases of the Living Lab methodology were implemented for each zone. For the North Zone, every phase was implemented, for the University Zone a second co-creation workshop was not organised since only one main stakeholder was involved. For the Central Zone, only the first two phases of the living lab methodology were implemented. The Living Lab methodology was adjusted towards the context of each zone, and therefore, not all zones had to successfully implement all phases in this one-year project. If desired, the same methodology could be restarted for each zone (and for a longer period of time), with the same or different themes of investigation, and could yield additional results in terms of new interested stakeholders or projects. As such, Brussels by us also yielded a **blueprint** for smart city participation through a set of validated online and offline tools.

- One of the main lessons learned in this project is the combination of **online and offline participation tracks**. At first, the collection of opinions was organised through the Brussels by us mobile application. However, after analysing the first results, a bias in the demographic profile of the user was detected. Therefore, the Brussels by us team decided to offer additional means of participation in order to make the project **as inclusive as possible**: paper surveys were distributed during walking tours, a web survey was made available through the project website and a digital touch-screen in the North

zone was provided by Clear Channel. Through these efforts, a good gender and age balance among the participants was obtained (see. Chapter 5- Highlights per zone).

Figure 5: Clear Channel touch screen at the Quatuor location

Figure 6: Guided tour route and group picture

3. The Brussels by us mobile application: lessons learned for context-based questioning

In this chapter, lessons learned are described about the usage of the mobile app and the beacon technology for the collection of opinions in the Brussels-Capital Region. These experiences were collected during the campaign periods, and through the organised workshops with users.

3.1. The mobile application

The Brussels by us mobile app was available on the Google Play Store and App store, under the name "Brussels by us", from 23/04/2019 till 30/10/2019:

- https://apps.apple.com/us/app/brussels-by-us/id1459362877
- https://play.google.com/store/apps/details?id=be.imec.apt.bxlbyus&hl=en

Info box: Promotional text

Brussels by us is a citizen platform to voice your opinion about the Brussels-Capital region. Users of the application receive location-specific questions about current or future projects in three predefined zones: the North zone, the Central zone and the zone around the university campus (VUB/ULB). Within these zones, beacons are installed that connect with the application on your smartphone (Beacons are small Bluetooth transmitters). This way you receive questions about projects that are in a conception phase, and which offer the opportunity to voice your opinion! Users of the application are asked to turn on their location settings and Bluetooth for optimal usage. Whether you are a citizen, a commuter or a visitor of Brussels, share your opinion on matters from commercial offer to urban gardening and become an actor of change for a more livable future. The most popular opinions can be consulted in the application, and which will serve as input to the different initiatives and stakeholders who are involved in the project.

Brussels by us is a collaboration between the Brussels-Capital Region and imec (http://smit.vub.ac.be/). The project is running from January until December 2019. For more information about the project please consult: www.brusselsbyus.be

The application included the following features:

- Registration: via Facebook, Gmail or a private email address.
- Map: Geographical overview of the perimeter of the zones and specific locations of the beacons.
- A beacon interaction: Once the beacon signal was captured or a QR code was scanned, an interaction was activated on the mobile phone. Each interaction consisted of several card decks. A card deck could contain a question to answer or could be an info card.

The questions were always single response, with pre-defined answer categories. The amount of characters was limited for each question, to make it as easy as possible for the user to give a quick answer while on the move through the city. One interaction could have up to maximum ten questions. The interaction also contains a specific title and image and could be linked to a specific organisation.

- History of completed beacon interactions: Users could consult the completed interactions as well as the answers given.
- Automatic notifications: Once users entered the range of the beacon (max. 100 meters) a push notification was alerting them of a nearby interaction with available questions to voice their opinions.
- A default interaction: The default interaction asked some demographic information from the participants. This information included age category, gender, whether they were visitors, professionals or inhabitants of the zone and whether they were living in Belgium, in the Brussels-Capital Region or elsewhere.
- Result overview: Once a user filled in a question, he/she could consult the opinions of fellow users through a bar or pie chart.
- QR-code reader: The application also allowed users to scan a QR code to activate an interaction with questions. Therefore, the application requested access to the camera of the smartphone.
- Contact: Users could easily contact the Brussels by us project team through a button in the application.
- About Brussels by us: An about section was included in the application with a summary of the objectives of the project.
- Conditions of usage and privacy statement (Annex I): imec is data controller in the project. The collected personal data contained the registration information, demographic information, the fact one knows that a user has been within the range of a beacon, usage data and answers given to the questions in the application. The registration information was kept into a separate database and was not linked with the demographic information of answers given. The privacy statement can be found in Annex 1 of Report 1.

Figure 7: Screenshots of the mobile application

Lessons learned

- The mobile application enabled users to consult the **most popular opinions** after voting. These opinions were presented through graphs. This allowed the Brussels by us team as well as its users to consult the results in **real-time**, and to check on a regular basis if opinions diverged. For specific promotional activities or events, this was perceived as very useful.

- The mobile application allowed to ask the opinions of users when passing by a certain spot in time. Seen this interruptive nature, it was chosen to limit the amount of questions, as well as the amount of possible answer categories (maximum 5) and character count of each question (around 150 characters). Open text entry was not possible. On the one hand, this provided the advantage that users could participate in a **time-efficient manner** while on the move in the city, on the other hand this **restricted the user in providing a more elaborative answer**. Out of experience, the Brussels by us team received relevant input for most of the cases, however, for some it would have been more beneficial to collect more in-depth feedback. It was noticed that even though the questions and answer categories were already validated through co-creation workshops, **users liked to reflect a second time and provide other alternatives as solutions**. Therefore, for future participation projects, it is advised to also provide an open space for more elaborative answers and to allow for second-thought solutions during large-scale validation tracks.

- The **connection between the mobile application and the beacon technology** was very stable once a user entered the beacon's range. The mobile application also sent a push notification once a user entered the range of the beacon. For beacons that were placed in **closed, small spaces**, this was proven as very efficient. However, for beacons installed in **larger, open places**, the beacon signal was often interrupted by obstacles (cfr. next chapter). If interrupted, users had to search multiple times or had to find the perfect spot in order to activate the interaction. This often created frustration among users, as some of them were not able to activate an interaction, even though they were on location. Users also experienced this more easily and automatically when entering a space. Therefore, for future participative projects, it could be considered to also activate interactions when the connection is not successfully established. A balance has to be made here between the advantage of answering questions in-context, and the means to support continued participation of the user.

- Furthermore, in relation to the above-mentioned point, it seemed that users preferred to answer the questions at home (and therefore at a later point in time), than on the spot itself. From experience, users did not want to make the **effort** to walk along the beacon trajectory independently, and rather preferred to answer the questions remotely (via an online web survey), or when guided around the zone (cfr. The organised walking tours). It seems that the **incentive** to hunt for beacons is perceived as too low, without any direct return on the spot. Additionally, users frequently mentioned that they needed some time for reflection and were not willing to instantly provide an answer regarding these particular issues.

- The Brussels by us mobile application had a **map overview** of the different beacon locations. This map displayed the perimeter of the zone and the exact location of the beacons, where questions would be asked to a passer-by. This map was handy as users could monitor their location in real-time and geographically position themselves compared to the beacons, enabling them to "hunt" for them. However, for future participative projects, an **additional overlay** would make the map even more useful by displaying a short text about each beacon spot (e.g. name of the involved stakeholder and description of the investigated case). As such, users would know in advance the specific use cases, before making the effort to walk to the spot. This could also motivate users, as they might feel more connected with certain themes of investigation.

- For most of the users, it was perceived as too cumbersome to activate their Bluetooth, GPS and mobile internet. On one hand, some users did not exactly know how to activate these settings in the right matter (lack of **digital skills**), and on the other hand some users thought that the combination of these settings consumed too much **battery**. This caused frustration and drop-out of users after their first-time usage of the mobile application.

3.2. The beacon technology

The Brussels by us mobile application worked in relation with the "beacon" technology. Beacons are small Bluetooth emitters. These emitters constantly send out a Bluetooth signal which can be read by a Bluetooth equipped device such as a smartphone. In order to do so, the owner of the smartphone must have downloaded an app which can communicate with a beacon. When entering the range of a beacon, the app is triggered by the signal of the beacon and sends out a notification to the smartphone owner.

In the context of this project, beacons were placed in specific locations in the zones. Citizens who downloaded the app on their smartphone would then receive location-specific questions when passing by a point of interest.

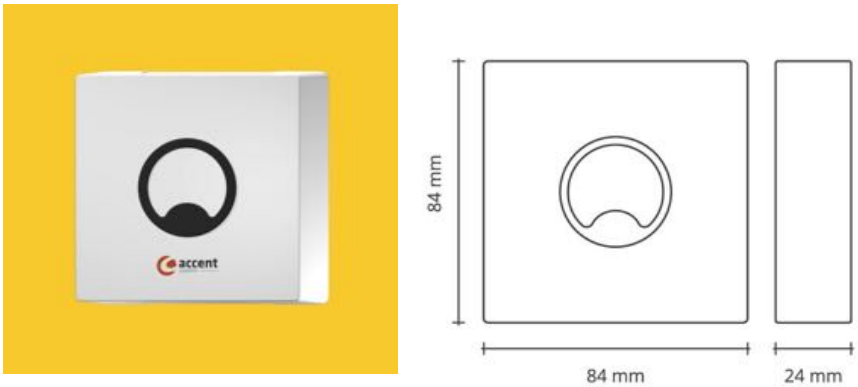


Figure 8: Illustration and dimension of the "iBKS beacon plus" from Accent system

In this respect, the beacon technology enabled researchers to ask questions related to specific locations and participants could answer these questions while being immerged in the relevant environment.

Figure 9: Illustration of the collaboration between a beacon and the mobile app in real life settings

The reason for choosing this combination of systems was its **context-awareness** functioning. Brussels by us deployed a context-aware system in the city, whereby the situational and environmental context about places was used to anticipate and to proactively trigger a question. The vision is, that a such, the user can better answer the specific questions, as they are made situation-aware and are provided with the usable experience on the spot. This allows the user to provide a more valuable answer, knowing the identity, activity and exact location and situation.

Info box: installation protocol of beacons

The beacons of the Brussels by us project were small white boxes with the logo on top of it. The beacons were installed at places or at heights that were not reachable by passers-by, in order to avoid theft or vandalism. Beacons do not require electricity as they have a battery life of 104 months. The installation did not require any drilling, as the boxes were installed by placing them inside a building, sticking them on a wall or window (double-sided tape), or through cable ties. Beacons do not need any maintenance and are waterproof.

All beacons in the Brussels by us project were installed at private places, with granted authorization from the owner of the building.

Figure 10: Example of an installed beacon behind the window at Rogier Square (Belfius).

In total, **35 beacons** were configured on **28 different spots** in the Brussels-Capital Region. The prospected beacon locations and interactions in the Smart Zone Central were not activated, nor did two interactions in the North Zone.

For some specific locations, a "clone" beacon (a copy) was configured in order to extend the range of the beacon and allow users to connect more successfully with the signal. As such, two beacons were activating the same interaction, increasing the chances of answers.

Figure 11: Overview of beacon locations in the North Zone

Table 3: Overview of beacon locations in the North Zone

Beacons installed in the North Zone
• Beacon 1: NMBS/SNCB – left entrance hall • Beacon 2: NMBS/SNCB – main entrance hall • Beacon 3: NMBS /SNCB – esplanade • Beacon 4: Noordplein / Place du Nord • Beacon 5: Creative District • Beacon 6: Rogier square • Beacon 7: Befimmo – Quatuor • Beacon 8: Befimmo – Zin • Beacon 9: Foyer Laekenois / Lakense Haard (no consent granted) • Beacon 10: Klavertje 4 (no consent granted) • Beacon 11: LabNorth • Beacon 12: Saint Roch school

Figure 12: Overview of prospected beacon locations in the Central Zone

Table 4: Overview of prospected beacon locations in the Central Zone

Prospecting beacons for the Central Zone
• Beacon 1: De brouckère plein • Beacon 2: Centre Administratif de Bruxelles • Beacon 3: Flower kiosk • Beacon 4: Muntplein • Beacon 5: Beursplein • Beacon 6: Fontainas plein • Beacon 7: Sint-Goriksplein • Beacon 8: Sint-Katelijne plein

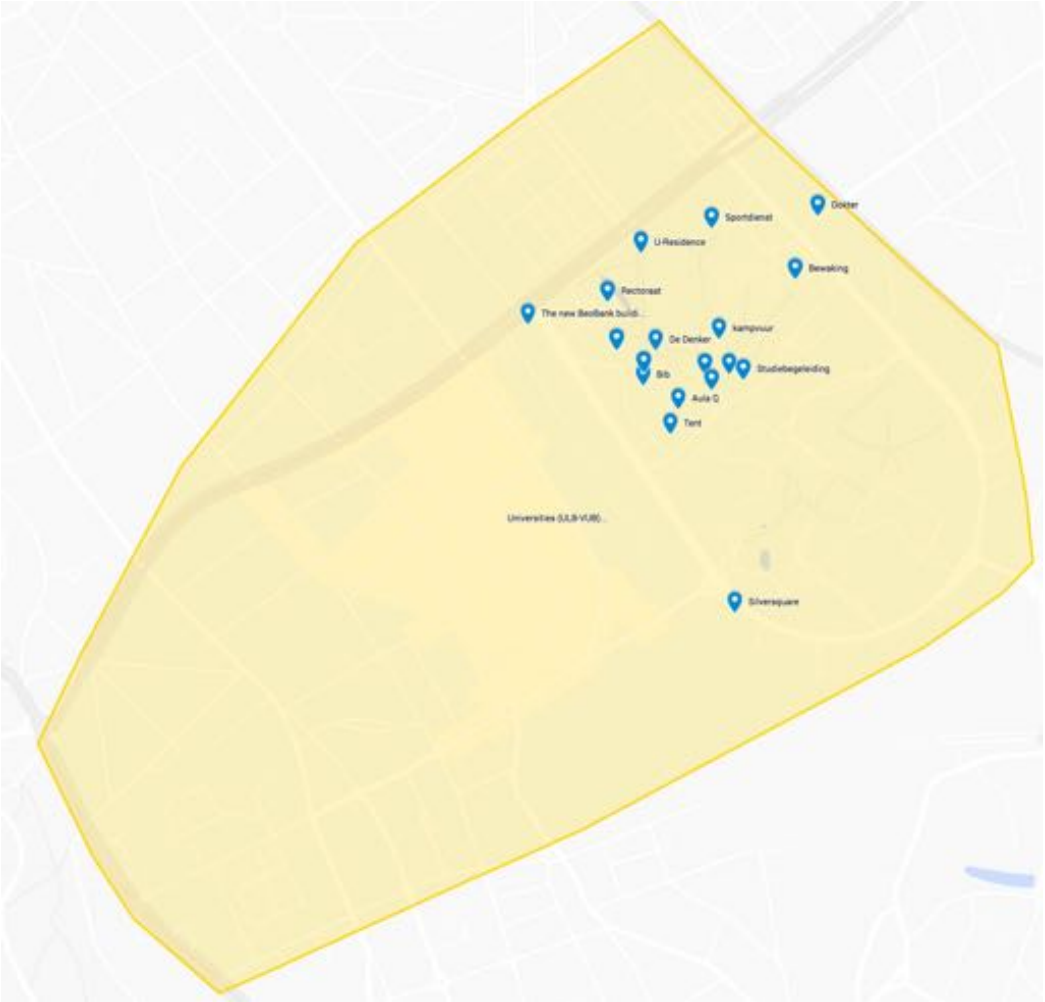


Figure 13: Overview of beacon locations in the University Zone

Table 5: Overview of beacon locations in the University Zone

Beacons installed in the University Zone	
• Beacon 1: Aula Q • Beacon 2: Student guidance / SBC • Beacon 3: Resto • Beacon 4: BSG • Beacon 5: Camp fire • Beacon 6: Security • Beacon 7: Doctor • Beacon 8: Sports • Beacon 9: De Denker • Beacon 10: Rectoraat • Beacon 11: Standaard student shop • Beacon 12: Tent	• Beacon 13: Student administration • Beacon 14: Library • Beacon 15: Info punt • Beacon 16: U-residence • Beacon 17: The new Beobank building (Befimmo) • Beacon 18: Silversquare (Befimmo)

Lessons learned

During the project, the following lessons learned related to the usage, configuration and placement of beacons were collected:

- Interference of signals due to obstructions in the area

The placement of the beacons is crucial for a successful reception of its signal by the smartphone. Since the beacons of Brussels by us were placed in the public space, there was often an interference of the signal due to obstructions in the area (e.g. thick walls, slope pavements, concrete benches, etc.). Therefore, the positioning of a beacon is crucial. From our experience, beacons optimal placement was behind a window facing the street or entrance (with successful reception of the mobile phone if the glass was not too tick), in a tree, or in an open, secured space. Furthermore, the height of the placement was also crucial. In the public space, the devices are best placed at the height of an average adult. If they are positioned too close to the ground, there is a higher probability that the signal will be interfered by obstructions.

A successful reception of the signal by a smartphone was always thoroughly tested before the launch of a campaign by the Brussels by us team, and such with several devices. The reception of the signal was tested by entering the range of the beacon and by approaching the beacon from different directions.

If the signal was interfered, "clone" beacons (a copy) were placed to strengthen the frequency of the signal.

- Continuous coverage for large spaces

Large space coverage represented another challenge faced by this project. Indeed, for large spaces such as the Rogier square, users had to come close to the actual location of the beacon rather than to the location of the Rogier square itself in order to activate the interaction on the mobile phone. This was an often-experienced issue by users, which was not in line with their expectations of the functioning of the technology.

The Brussels by us team tried to solve this issue by placing multiple beacons at larger spaces to strengthen the frequency of the signal. However, this was not always possible as the preference was given to secured, private spaces where mostly only one beacon was installed.

On the other hand, when beacons were too closely located next to each other (e.g. at the VUB campus) the signals were overlapping, causing the mobile application to be triggered simultaneously for multiple interactions. This was however not perceived as an issue by the users, as this way, the interactions were quickly activated.

- Internet and Bluetooth capabilities of mobile devices to receive the signal

On the mobile side, in order to be able to participate in the campaign, the users' device had to be equipped with Bluetooth, GPS and needed access to the Internet. The Bluetooth had to be activated in order to capture the beacon signal, and the GPS had to be turned on in order to know the participant's current position in relation to the beacon. When approaching the range of the beacon, the mobile app would then send a push notification to the user, informing him/hr that a new interaction was available. If the user's device was not equipped with Bluetooth nor GPS, the user had the possibility to activate the interaction by scanning

a QR-code on project-branded posters on the spot. However, the placement of these posters was not always permitted (as it was perceived as advertising in the public space).

Further, some users experienced difficulties when trying to access the Internet or receiving a GPS-signal when being indoors (e.g. the North train station). Therefore, users often had to wait for the reception of a signal, or had to search for a perfect spot near the beacon in order to activate the interaction.

Additionally, the constant usage of Wi-Fi, GPS and Bluetooth diminishes the battery life of mobile devices. This works counter-intuitive to the inherent characteristics of beacons, seen these devices are preferred for its low energy consumption (sending out signals with a high frequency, and low energy usage).

- Misperceptions and lack of knowledge about beacons

Although beacons are not completely new on the market, this technology is not yet well-known by the larger public. During the project, it was often noticed that people were concerned with the fact that beacons would track their locations or could access private information without their consent. However, beacons only transmit a signal and are not able to capture data about their environment. The beacons (iBKS Plus) are only apt to send out a signal which is then detected by the Brussels by us application.

Further, some companies also had misperceptions about the abilities of the beacon technology. A few requests for collaboration were sent to the Brussels by us team, as they though that as such, they would receive access to data about passage and people counting of certain locations in Brussels.

To remedy this misperception, a frequently asked question on the project website was devoted to explain the functioning of the beacon technology and to reassure citizens that no data was captured (neither monitored) through the devices. Moreover, the privacy statement of the mobile application clearly stated which personal data was collected, as well as the fact that the beacons did not capture any information about the users (apart from knowing that an interaction would be activated when they would be near the range of a beacon, and thus indirectly their location at a specific point in time).

- The placement of beacons in the public space: permits

Beacons are small devices (10X10 cm) and require manual placement for each location through a double-sided sticker, carrier straps or by placing the device at a secured spot. The Brussels by us team carefully prospected each location related to the specific use cases and gave preference to private properties. For private properties, authorization was requested from each involved stakeholder to allow the Brussels by us team to place the beacon. The stakeholder received an information guide with technical details about the devices. Even when questions were related to public space (e.g. the Rogier square), the beacon was installed at a private property and not at the public space itself. For instance, the beacon linked to the interaction regarding the Rogier square was placed behind the window of the Belfius tower.

Asking authorisation for placing beacons in public space required a lot of time, and often, these permits were not granted. Therefore, private properties were preferably chosen, and these permissions were always granted.

- Theft or vandalism of beacons

As mentioned above, the beacons were always placed at secured spots. This reduced the risk of vandalism or theft of beacons. During the project, only one out of 35 installed beacons was stolen.

4. Results - highlights per zone

Three zones were identified by the Brussels-Capital Region in collaboration with imec as particular zones of interest for the project. These were: the North zone, the Central zone and the University zone, with the following respective themes: functional mixity; design of the public space & commercial offer; the connection with the city.

The perimeter of the **North zone** encompasses the professional area, as well as the surrounding residential areas including, from North to South: Gaucheret/Masui up to the ringroad, and from West to East the Heilihavenlaan up to the quartier Brabant/Lazarus.

The perimeter of the **Central zone** encompasses the larger area around the pedestrian zone: from Anspach until Fontainas, and from Sint-Katelijneplein up to Muntplein.

The perimeter of the **University zone** encompasses the universities VUB and ULB, as well as U-Square.

Figure 5: Brussels by us zones: perimeter & themes

4.1. The North Zone

The results of the North Zone campaign were focused on three use cases: the North station; the Brabant and Rogier tunnel; as well as the ground floors and rooftops of the business district.

North Station (SNCB/NMBS)

Regarding the North station, it appeared that the station is seen as a closed and uninviting space by the participants. Participants suggested that the design of the station could be made more open and accessible for and from the neighbourhood. The contrast between the large, open main hall compared to the narrow halls was also pointed out. In general, participants also referred to the lack of meeting space in the station. In order to reach its "functional mixity goal", it was proposed that the station would offer (1) a **waiting area** (2) **social meetings places** and (3) a **co-working space**, therefore changing the perspective of the station from a "passing-by" area to a "destination" area.

Participants shared the opinion that the emphasis for the North station should not be put on commerce (e.g. convenience stores or "hipster concepts") but on social aspects: e.g. the creation of a meeting place for both professionals and inhabitants of the zone. Three social hubs were identified: a waiting area, a social meeting space for the neighbourhood and a co-working space. The space of the former museum was seen as the perfect multi-function spot for these hubs.

Related to the **waiting area**, participants would like to have a space that feels cosy and warm, without noise nuisance. To make the space feel warmer, the waiting area should include plants as well as books available for commuters and inhabitants to read. The provision of a small library would enable encounters between commuters and inhabitants (e.g. through a potential collaboration with Muntpunt). This should be supported with a good signalisation that the space is accessible for both travellers and inhabitants. Some participants also expressed the idea of having some public computers with Internet access.

For the **social meeting place**, participants suggested multiple ideas: a space for associations of the neighbourhood to host meetings or workshops, or to have a space for public presentations. Another idea was to have a place where people can meet and cook together through a mobile kitchen. Participants suggested to collaborate together with organisations that support migrants, and to work with local produces ('from farm to fork'). Further, the organisation of cultural activities was also suggested by the participants, for instance a local maintained cinema with movies from different cultures living in the neighbourhood. In support of the social activities, participants suggested to work through public, displaying short movies made by the local community or schools. In the same idea, exhibition spaces could be installed, allowing local artists, organisations and schools to display their arts and express themselves for commuters during their waiting time.

Lastly, the **co-working space** in the station would be a zone for professionals to meet and have access to WiFi and power outlets. In this zone, activities related to after-work drinks could also be organised.

Based on the suggested ideas of the participants in the workshop, a visual design was created by 51N4E to demonstrate how the former museum in the train station could look like in the future (Figure 14 – for more information see Report 5).

Figure 14: Co-creation of the North train station – The train station as a social hub for travellers and professionals in the neighbourhood.

Collective urban spaces: tunnels in the North District (Perspective.Brussels & Sint-Joost)

Participants described the collective urban spaces as cold, windy and not attractive. During the campaign, it became also clear that most of the participants did not feel safe enough to pass the Brabant tunnel or the Passage Rogier. Participants said that the tunnels act as physical barriers, impeaching the connection between both parts of the neighbourhood, with on one side inhabitants and on the other side professionals. To foster a better connection, participants stressed that efforts should go towards a redesign of the tunnels. In this perspective, three main ideas were discussed: adding natural elements, implementing urban furniture and organising food related activities.

Regarding the **natural elements**, greenery was seen as beneficial for several aspects. First, aesthetically, plants would give a nice green touch to the very mineral grey of these areas. Second, plants could work as acoustic panels between the road and the pedestrian side of the tunnels. The issue of growing plants in a low-light setting was raised, and participants proposed to grow shadow-loving plants such as moss, mushroom or ferns. The idea of a water stream inside the tunnels was also proposed in the aim of draining the areas from unpleasant smells. The water stream could then serve the additional purpose of watering the plants.

With regards to the **urban furniture**, the biggest issue of these tunnels is the lack of light, giving the spaces an unsafe feeling at night. More lights were seen as necessary in the tunnels, and if possible, in warmer tones. Participants also felt that the tunnels needed more colours to be attractive. The idea was raised by the participants to decorate the walls as exhibition spaces, on which local artists and schools could expose their ideas and work during a certain period of time. Further, the need for public bathrooms was expressed. More places to sit and rest were also seen as a need, and participants proposed ideas such as mobile benches.

Finally, **food** was seen as the ultimate "get-together" activity. In the context of the tunnels, food-trucks were seen as an ideal option. (see Figure 15 – more information in Report 5).

Figure 15: Co-creation of the public space – The Brabant Tunnel with more greenery, light and colours and food-related activities.

Ground floors and rooftops in the business district (Befimmo)

Finally, in regard to the ground floors and rooftops of the business district, participants easily reached the consensus to open up rooftops and ground floors for (1) **social and educational functions**, in combination with (2) **green infrastructure.** The idea behind these propositions is to transform ground floors and rooftops into accessible spaces for the community. Participants stressed that it is crucial that every function of these spaces **dialogues** with the public space, and that access should be granted to the community, despite technical and security concerns, in the evening and even weekend in order to create a vibrant city hub (see Figure 16 – more information in Report 5).

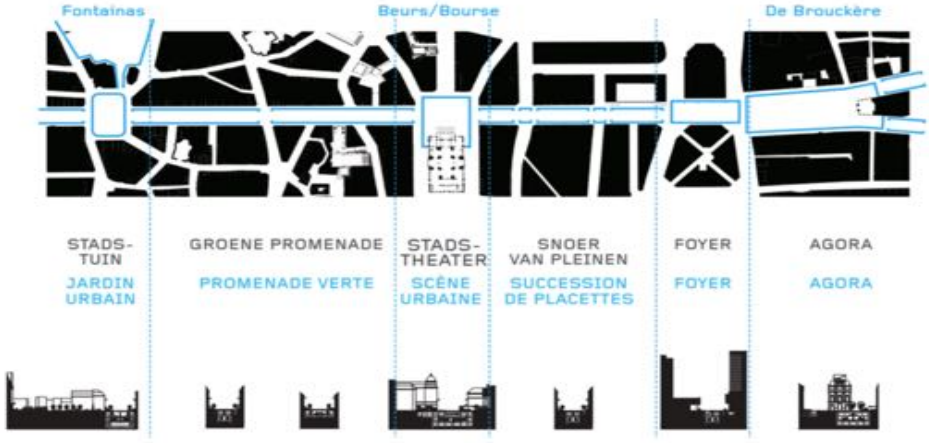
Figure 16: Co-creation of ground floors and rooftops in the North Zone

4.2. The Central zone

The main results for the Central zone indicated that participants were not willing to see more "big brands" implemented in this area. The tendency was leaning towards small-scale shops, such as craftsman shops or weekly markets on the pedestrian area.

In terms of activities, participants were very resourceful and creative. Among the proposed ideas there was a biking school and a repair café. Art exhibitions were also seemed as important to have in this zone, with many propositions such as a "free speech" podium, a wall dedicated to collective art, exhibition spaces throughout the pedestrian area, concerts organised on the Muntplein, etc. Overall, participants were the opinion that the pedestrian area was lacking urban infrastructure such as public toilets and benches. Sport infrastructure and collective games such as chess or ping-pong were seen as nice to have, as well as playgrounds. Moreover, information-related infrastructure, such as interactive screens, were seen as necessary at that location which was seen as an entry point to the city.

In the table below, the suggestions provided by the participants during the co-creation workshop are summarized per main square (More information can be found in report 3).



Place de brouckère	The foyer	Bourse
- More greenery - The Continental Hotel: a polyvalent space on the ground floor - Interactive, info screens - Open-air cinema - Thematic markets	- Continuation of interactive info screens - Continuation of the thematic markets - OR Open space	- "City theatre" - Speaker corner - Opinion walls - Sport exhibitions - Street theatre
Green walk	**Fontainas**	**Munt**
- Local craftsmen shops - Greenery with sport infrastructure - Benches and board games / ball games	- Chilling area / urban infrastructure - Educational workshops with schools - Seasonal activities - Urban gardening - A playground	- Seating area (classical concerts) - Touristic info point - Greenery - Public toilets

Table 6: Overview of suggestions per square

4.3. The University Zone

The University zone campaign encompassed two use-cases, the Beobank and the Silversquare building. While the Beobank building appears to be a well-known building in the University Zone, this was not the case for the Silversquare building. Overall, students appeared to be very much in favour of alternative mode of transportation and specific dedicated parking spots for (shared) bikes. This could represent an opportunity to install new infrastructure supporting alternative mobility options in the area specifically dedicated to students. Furthermore, participants were unanimous regarding the fact that the ground floor of the Beobank building should be turned into a space that would benefit the local community. A collaborative space on innovation and or space for sharing economy were popular choices among the respondents, pointing out the dynamic atmosphere of the zone. In terms of needs, the new Beobank building would be the perfect offer if it would include a canteen serving lunch and coffee, as many establishments in Brussels already do, but that seems to be missing in the area according to the participant's answers. It is to be noted that one of the biggest needs of students in the area seem to be a local supermarket.

Regarding the Silevrsquare building, participants perceived, activities such as cinema screenings (especially for students) and sport classes as favourable. To attract students specifically to the location, it appears that a reduction fee at the lunch restaurant and, a shared office subscription would be effective solutions.

During this campaign, a side-track was investigated. Indeed, the Brussels by us app was used by the stakeholder Infopunt to guide students on campus and learn inside facts in a game-friendly way. Since the Infopunt was already exploring several solutions to support their introductory week via a mobile-friendly way, the Brussels by us app seemed a perfect scenario to experiment with it. By doing so, the Brussels by us application was used for a different purpose and within a different context, without any necessary technical changes to the application. It allowed the Brussels by us team to explore and validate alternative usages of the technology for future projects. Although around 130 students downloaded the application in one-week time, not many students completed the quiz on all locations on campus. On average, each location was visited by 10 to 15 students who filled in the quiz-related question after one-week time. Out of these results, we can assume that students are not interested in exploring their campus via context-based questioning in a game-friendly way, and that the effort might be too big or the incentive too low.

4.4. Key performance indicators

The table below provides an overview of the key performance (KPI) indicators that were defined at the start of the project:

Description	KPI	Result
# Mobile application	1	*Implemented*
# Supported languages in the mobile app	3	*Implemented*
# Smart zones (equipped with beacons)	3	*2 smart zones*
# Beacons configured	35	*Implemented*
# Beacons installed per zone (minimum)	10	*Implemented*
# Communication actions (in support of the campaigns)	8	*Implemented*
# Incentive programs	1	*Implemented*
# Campaign report	8	*Implemented*
# Privacy-analysis & statement	1	*Implemented*
# External stakeholders participating in the project	4	*Implemented*

Table 7: Key performance indicators of the Brussels by us project

All of the KPI indicators were implemented, apart from the minimum number of smart zones equipped with beacons.

A mobile application was developed and launched in the **Apple and Google Play Store**, and it supported **three languages** (Dutch, French and English). A privacy statement was included in the mobile application (For more information, please consult Report 1 – Introduction).

35 beacons were configured and installed at 28 different spots in the Brussels-Capital Region, which respectively 10 locations in the **North Zone** and 18 in the **University zone**. After the identification of stakeholders and the organisation of a first co-creation workshop in the Central Zone, a large-scale beacon was not organised. There was an overlap with other research studies and participatory processes set up by the City of Brussels. Therefore, the research results from this Central Zone were handed over to the relevant partners for further investigation and inspiration in their trajectories.

The number of **communication actions** in support of the campaign was higher than 8. A variety of communication actions were organised (for more information please consult Report 7 – Communication strategy). It is estimated that approximately around 40 communication actions took place during the project lifetime (Facebook posts and advertisements, news and event updates on the project website, flyers, posters, interviews, presence at workshops and conferences, press releases, etc.).

Two incentive programs were implemented during the project lifetime: free participation to a walking tour of approximately two hours in the North Zone, and free ice creams for students during the University Zone campaign.

Finally, the **number of stakeholders** participating in the project was higher than 4. A stakeholder was defined as a collaborative partner who was interested in setting up a participatory process around an on-going or future project in the Brussels-Capital Region. The main participating stakeholders who participated during the whole project lifetime (stage 1 till stage 7 of the living lab methodology) were: NMBS/SNCB, Befimmo, perspective.Brussels, commune Sint-Joost-ten-Node, Lab North, Creative District, Saint Roch School, and the VUB Infopunt. Other participating stakeholders can be found back in Report 2, 3 and 4. These stakeholders were consulted during the mapping phase of project in the respective zones, or participated during one of the organised co-creation workshops.

5. Project partners

5.1. Financier

Cabinet Debaets

The Cabinet Debaets (CD&V) was in charge of the Development Cooperation, Road Safety, Regional and Communal Informatics and Digital Transition, Equal Opportunities and Animal Welfare in the Vervoort II Government (from 2014 to June 2019). After the elections in June 2019, the portfolio was reshuffled to Cabinet Clerfayt (DéFi).

The Cabinet supported the funding of the project.

5.2. Project coordinators

Imec-SMIT-VUB

The research group imec-SMIT-VUB is both part of the Vrije Universiteit Brussel (VUB) and the Belgian not-for-profit Research and Technology Organization imec. imec (Interuniversitair Micro-Electronica Centrum) is the world-leading research and innovation hub in nanoelectronics and digital technologies. Its research group imec-SMIT-VUB is specialized in fundamental, applied and contract research in the area of ICT, media, markets and policy. To understand the mutual shaping of technological, societal and individual processes SMIT research combines user, policy and business analysis with both quantitative and qualitative research methodologies.

The Application Prototyping Team (APT) of imec is also part of the 'Brussels by us' project, which is building software prototypes in many different domains (health, mobility, industry, energy, etc.). Prospective users are involved as much as possible and prototype evaluation is done in real-life settings, such as in smart city contexts through the living lab methodology.

Imec-SMIT-VUB is the coordinator of the Brussels by us project, with project promotor dr. Pieter Ballon, and project coordinators Carina Veeckman & Laura Temmerman.

Shakeholders

Shakolders is an initiative to develop new governance models for neighbourhood development. It is based on initiatives from the private real estate sector and aims to create coalitions with public authorities and civil society to rethink Brussels' based neighbourhoods.

Shakeholders was subcontracted by imec-SMIT-VUB to handle the community and stakeholder management of the project.

Changing World

Changing World specialises in workshop facilitation and change journeys for organisations and collectives (http://www.changingworld.eu).

Changing World was subcontracted by imec-SMIT-VUB to prepare the workshops, invite partners and stakeholders, facilitate the workshops and support the project team.

5.3. Communication and dissemination partners

CIRB-CIBG

The BRIC (CIRB-CIBG) is the Centre for Informatic for the Brussels-Capital Region. The BRIC is the public interest agency that aims to become the technologically neutral, competitive, reliable and high-quality partner of all public institutions in the Brussels-Capital Region that wish to take an informed and proactive approach to introducing innovative and coherent ICT in order to optimise efficiency on the one hand and improve the user-friendliness of the services offered to the people and businesses of Brussels as well as visitors to the Region on the other hand. In exercising its task, the BRIC helps the responsible minister of computing and digitalisation (https://bric.brussels/en/the-bric).

The CRIB is responsible for the launch event of the Brussels by us project. In this framework, the CRIB has subcontracted both "VO Citizen" and "Tipik". It is to be noted that the organization of the event, be it at the logistical level or at the level of the content (and the communication) is part of a public contract linking the CIRB to the agencies (Tipik and VO consortium). The budget foreseen by this public contract can only be allocated to elements having a direct link with the event and included in the specifications of this public contract.

VO Citizen

VO Citizen is a citizen communications agency based in Brussels and active in Belgium. They offer their expertise to public institutions, as well as NGOs and private companies. VO Citizen aim to raise consciousness, promote awareness or mobilise the public with regard to a societal theme. They convey ideas, values and messages to citizens by stimulating direct public participation (https://www.vo-citizen.be/en/we-are-29).

VO Citizen was responsible for the content and communication of the launch event of the Brussels by us project.

Tipik

Tipik is a Brussels based one-stop communication agency. Tipik is specialised in communication strategy graphic design, website maintenance, web efficiency and accessibility, event organisation, social media management, etc. (https://www.tipik.eu/who-we-are/)

Tipik was responsible for the logistic organisation of the launch event of the Brussels by us project