



# Report on

# THE TRANSFERABILITY experience and user participation process

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Project funded by the Interreg Sudoe Programme through  
the European Regional Development Fund (ERDF)

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## 1. Introduction

The task 1.4 of the TR@NSNET project is part of TG.1 Demonstrators replication whose objective is to study the processes of adaptation and transfer of a demonstrator from one environment to another, in order to capitalize in the definition of good practices and methods that will be memorized in TG3. We offer to reproduce the demonstrators/experiments developed within one university in another university.

The activity developed in 1.4 is: Use of digital technology on campuses, service needs in terms of services. Shared analysis. Partners are Polytechnic University of Madrid (UPM), La Rochelle University (ULR) and University of Toulouse III – Paul Sabatier (UT3).

In a previous project called CAPARI, UT3 in cooperation with University of Toulouse II - Jean-Jaures (UT2) and University of Albi (INUC) were interested in daily life on university campuses and how the use of digital technologies contributes to improve access to services by taking into account the challenges of sustainable development. This project CAPARI is proposed as a demonstrator to be reproduced in UPM and ULR.

From March 2020 to April 2021, we were faced with radical changes in our social life and in our life at work or in our studies due to the COVID-19 pandemic. Although the CAPARI project was not designed to address the issues and problems related to this very particular context, it provides elements on which to rely to think about our campuses of the future. In a way, the pandemic crisis has made it more urgent or more obvious to implement, on campuses considered as test territories for experiments that had been thought of as at the heart of the CAPARI project and which consisted in developing "eco-responsible" or "eco-citizen" practices in connection with the use of digital technologies.

## 2. Survey on Use of digital technology on campuses in UT3

### 2.1 - CAPARI Project presentation

The initial idea was to consider university campuses as "medium-sized cities" on a French scale. The Campuses are indeed used by a wide variety of users (students, teacher-researchers, technical and administrative staff, employees of service companies, etc.). Because of their administrations and activities, campuses can be understood as "experimental medium-sized cities" on which we can test devices, applications... which may then have to be disseminated more widely, in the urban area, or even beyond, in the regional area.

Accordingly, the goals of the project were:

- To analyse the daily life on campuses of universities,
- To study how digital technologies participate to improve access to services,
- To take into account sustainable development issues,
- To consider activities that link what happens on campuses to the territories or neighbourhoods in which they are inserted.

## 2.2 - Methodology of CAPARI Project

In order to analyse, on university campuses, the uses of ecologically responsible digital technology and to promote collaborative and participatory activities via digital applications, three work packages were defined (WP1 only was of interest in the Tr@nsnet Project).

WP1 - Analysis of campus uses and digital uses on campuses

A quantitative methodology was chosen, using the questionnaire survey (live and online). This protocol has been supplemented by focus groups for the qualitative collection of information and opinions.

We have chosen three hypotheses:

- Digital equipment can both facilitate or hinder socio-territorial dynamics.
- Digital technologies contribute to the improvement of campus uses and facilitate citizen engagement... or, conversely, they generate or increase exclusions.
- The use of virtual spaces can either participate or hinder the practice of physical spaces

Four questions guided our thinking:

- What is the place of digital technology in the university community?
- What are users' digital expectations and apprehensions?
- What are the digital uses of communities on different campuses, and what links can be analysed with the uses made of the campus?
- What are the modalities of ecological and citizen commitments, and what is the role of digital?

To answer these questions, the questionnaire had 9 headings and 63 questions. List of headings: respondent's status, housing type, internet access and equipment, mobility: mode and digital use, campus uses, digital uses: IoT focus, commitments, appreciation of location: environment quality, respondent's information.

----- *This questionnaire in French, Spanish and English has been shared with UPM and ULR.*

## Focus Groups

The focus groups made it possible to develop a qualitative approach that complemented the data from the quantitative survey. The discussions took place around the following general reflection:

"How to live well your Campus? To what extent and in what ways can digital help? » and the three questions below, with specific instructions.

### 1) Assessment of the quality of life on campus:

Instruction: "Would you say it's good to live on your campus? What for? »

Ask between 2 and 5 strengths/weaknesses of the quality of life on campus.

Note: For students, it is not a question of evaluating the quality of teaching or teachers. Overall the quality of life on campus. Ditto for other types of campus users.

### 2) Sustainability practices on campus:

Instruction: "Do you think it's easy to have a sustainable lifestyle and practices on campus?"

Ask what sustainable practices are possible/facilitated on campus and which are constrained or prevented.

Suggest types of practices: mobility, food, etc.

### 3) Role of digital technology and its uses on campus:

Instruction: "Do you think that digital technology could improve the quality of life on campus and in particular help to better live its citizen commitments?"

Ask what uses of digital technology should be developed for this.

WP2 - Design and deployment of participatory applications for sustainable development

WP3 – Appropriation and evaluation

WP 2 and 3 benefited from the information gathered by the surveys and focus groups and opted for development through an "agile method", which was based on collaborative development and was deployed by our project manager:

- Collaborative development based on communication and exchange between computer scientists, representatives of the envisaged services (BU, DSI, CROUS) and student interns and campus users,
- Development of a generic application neOCampus App adaptable to different campuses,
- integration and improvement of existing applications (cartOCampus, bibliOCampus)
- integration of new applications following the proposals made by users during focus groups

## 2.3 - Results of the survey in UT3

The survey was answered by 2125 respondents and contained 120 variables. Results are presented in a jointed presentation document of 50 pages.

## 3. Demonstrator replication at UPM

### 3.1 Questionnaire adaptation

The original survey from UT3 has been analysed and adapted considering the specific characteristics of the Montegancedo Campus from UPM and the constraints resulting from the Covid-19 crisis.

The major novelties are the inclusion of questions related with the use of IoT solutions, and the impact of the Covid-19 in mobility and work schedules.

After different iterations and feedback from UT3 experts, the final questionnaire consists of 61 questions grouped in 11 sections.

#### Personal information:

1. Select your age range: 18-25, 26-35, 66-45, 46-55, 56 or more.
2. Genre: man, woman.
3. Nationality (free text).
4. Education level: high-school, bachelor, master, PhD, vocational training.

#### Workplace information:

5. Select your workplace: CAIT, CEDINT, CBGP, EUSOC, IMDEA Software, Computer Science Faculty.
6. Select your activity at the University: student, professor, researcher, staff, external services.
7. How many years have you been in the campus? 0-10.
8. Do you belong to an exchange programs such as Erasmus, research stay or similar? yes/no.

#### Residence information:

9. Select your family type: married with children, married without children, single with children, single without children.
10. Select your property regime: owner, rent, family house.
11. Select your current situation in terms of housing occupancy: flatmates, family members, couple, single.
12. Select the autonomous community in which you usually reside: Madrid, Castilla la Mancha, Castilla León.
13. Write your postal code (free text).

#### Most and least liked aspects about the campus:

14. Select the aspects you like the most about the campus:



- Fauna and Flora
- Air quality
- Parking
- Geographical location
- Building equipment
- Cleanliness
- Internet connection
- Digital resources
- Sports facilities

15. Select the aspects you like the least about the campus:

- Mobility and transportation
- Restauration
- Geographical location
- Sports facilities
- Internet connection
- Building equipment
- Digital resources
- Parking
- Cleanliness
- Air quality
- Fauna and flora

**Use of Internet of Things in the campus:**

16. Are you familiar with the term Internet of Things (IoT)? yes/no.

17. Answer the following questions related to IoT devices: never, very little, little, frequently, daily.

- You use IoT devices
- You have thought of acquiring IoT devices
- They are useful to you
- You would recommend its use to friend or family
- You are concerned about the data obtained through these devices

18. How useful or interesting would it be to deploy IoT devices on campus? 1 (not useful at all) -10 (really useful).

19. Specify for what use(s) you would find your campus deployment useful: yes/no.

- Savings in electricity or water consumption
- Lighting control
- HVAC control
- Ecology (measuring noise, pollution, biodiversity)
- Security (Detect presence or intruders, locks, cameras)
- Measure the environmental conditions of classrooms and offices.
- Health (accident prevention)

20. Would you add any other uses to the above list? (free text).

**Environment and sustainability awareness:**

21. Do you believe that the Campus and its members live in a sustainable way with the environment, respecting the flora and fauna of the surroundings? yes/no.
22. Select the areas where priority action should be taken for the sustainable development of the campus.
  - Energy efficiency (automatic control of air conditioning and lighting)
  - Energy (installation of renewable sources)
  - Mobility (electric vehicle recharging points)
  - Intra-campus mobility (bicycle and scooter rentals)
  - Cleanliness and recycling (garbage cans and smart containers)
  - Biodiversity (improvement of conditions for fauna and flora)
  - Security (cameras and intrusion detection)
  - Air quality (installation of CO2 and other particle sensors)
23. With respect to the above areas, do you think it would be useful to monitor and study them by means of sensors? yes/no.
24. Select the areas in which priority should be given to sustainable development within the building where you work.
  - Energy consumption
  - Air conditioning
  - Lighting
  - Water consumption
  - Recycling
  - Air quality
  - Safety
  - Noise levels
25. If you have checked at least one of the above areas, do you think it would be useful to monitor and study it using sensors? yes/no.
26. Would you support the implementation of renewable energy as an energy source for the campus? yes/no.
27. Would you like to actively participate in IoT developments to improve services on campus and contribute to sustainable development? yes/no.



### Transport: time spent and possibilities

28. What means of transportation do you usually use?

- Own vehicle
- Public transportation
- On foot
- Bicycle
- Rental or shared car
- Scooter
- Electric bicycle
- Cab

29. How far in kilometres do you live from the campus?

- 10 - 20
- 20 - 30
- 30 - 40
- 40 - 50
- 5 -10
- 50 or more

30. What means of transportation do you usually use to get to your job?

- Own vehicle as driver
- Public transport
- Other's vehicle as a companion
- Bicycle
- UPM Shuttle
- Motorcycle
- On foot
- Rental or shared vehicle

31. How long does it usually take you to get to campus?

- < 20 min
- > 60 min
- 20 – 40 min
- 40 – 60 min

32. Do you make any stops before going to work? : yes/no

33. Would you consider using the following means of transportation to get to campus?

Never, occasionally, frequently.

- Own vehicle
- Rental or shared vehicle
- Bicycle
- Electric bicycle
- On foot
- Scooter
- Electric scooter
- Motorcycle

34. Would you consider using public transport and/or the UPM shuttle if the lines and/or timetables and facilities were increased?: 0-10
35. Would you use a carpooling platform or service to get to your workplace with colleagues working on campus? yes/no.
36. Select, if used, the services that you usually use to commute to work:
- Consult traffic
  - No
  - Check the arrival time of public transportation
  - Check someone's location
  - Send location to pick up someone
  - Order a taxi/uber/cabify

**Mobility: Movement within the campus and electric vehicles**

37. Do you usually commute within the campus? yes/no.
38. Select the other centers or places, apart from your workplace, that you visit on campus.
- Technological Innovation Support Center (CAIT)
  - E.T.S. of Computer Engineering
  - Sports area
  - Plant Biotechnology and Genomics Research Center (CBGP)
  - Center for Integral Domotics (CEDINT)
  - None, I am only at my work center
  - Center for Biomedical Technology (CTB)
  - Supercomputing and Visualization Center of Madrid (CESVIMA)
  - The Madrid Institute for Advanced Studies in Software Development Technologies (IMDEA Software)
  - Ignacio da Arriba" Microgravity Institute (Instituto de Microgravedad "Ignacio da Arriba")
39. Would you use a rented bicycle or scooter to get around campus? 0-10.

**Work Schedule: after and before COVID-19**

40. Weekly frequency of attendance on campus
- Less than 1 day
  - 1 day
  - 2 days
  - 3 days
  - 4 days
  - 5 days
41. Please select your approximate time of arrival and departure from campus BEFORE Covid-19.
- 10-12h a 18-20h
  - 8-10h a 16-18h

- 8-9h a 14-15h
42. Please select your approximate time of arrival and departure AFTER Covid-19
- 10-12h a 18-20h
  - 14-15h a 20-21h
  - 8-10h a 16-18h
  - 8-9h a 14-15h
43. Select the locations where you prefer to work (Before/after Covid-19):  
home/campus.

### **Internet access: devices, applications and platforms**

44. Do you have Internet access at your usual place of residence? yes/no.
45. How much money do you spend monthly on your Internet provider?
- 10 - 30 €
  - 30 - 60 €
  - > 60 €
46. Select which WIFI hotspots do you use to connect to the Internet?: never, occasionally, frequently
- Campus
  - Public networks
  - Private networks
  - Cybercafé
  - Call-center
  - Home
47. Do you have a data plan contracted on your cell phone? yes/no.
48. What is your contracted data limit?
- < 5 GB
  - > 50 GB
  - 10 - 20 GB
  - 20 -50 GB
  - 5 - 10 GB
  - No limit
49. Do you exceed your contracted data plan on your cell phone? yes/no.
50. Select the main uses you make on the Internet
- Communication
  - Leisure
  - News
  - Buy
  - Mobility
  - Social Networking
  - Organization
51. From which devices do you usually access the Internet? never, occasionally, frequently

- Videogame console
- Computer
- Smartphone
- Tablet
- Voice assistant
- Multimedia center
- Smartwatch

52. Select if you use content providers for:

- Movies/TV/Series
- Music
- Shopping
- Books
- Sports Broadcasting

53. Who do you consult to solve a technical problem with a device connected to the Internet? never, occasionally, frequently

- Friends
- Professional
- Internet
- Relative
- Books and manuals

### **Campus websites: Frequency and usefulness**

54. Do you know if the campus has a website? yes/no.

55. Do you know if the campus has a mobile application? Yes/no.

56. How often do you use the websites of the following entities?: never, less than once a week, once a week, two or three times a week, daily

- UPM institutional website
- Campus website
- Workplace website

57. From what devices do you access the above websites?

- None
- Computer
- Smartphone

58. What operating system do you use on your computer?

- Windows
- Apple IOS
- Linux

59. What operating system do you use on your smartphone?: Android/Apple IOS

60. How often do you install new applications on your cell phone?: never/occasionally, frequently

- Free Apps
- Subscription apps

61. Would you like to actively participate in the development of digital applications to improve services on campus and contribute to sustainable development? Yes/no

### 3.2 Survey collection

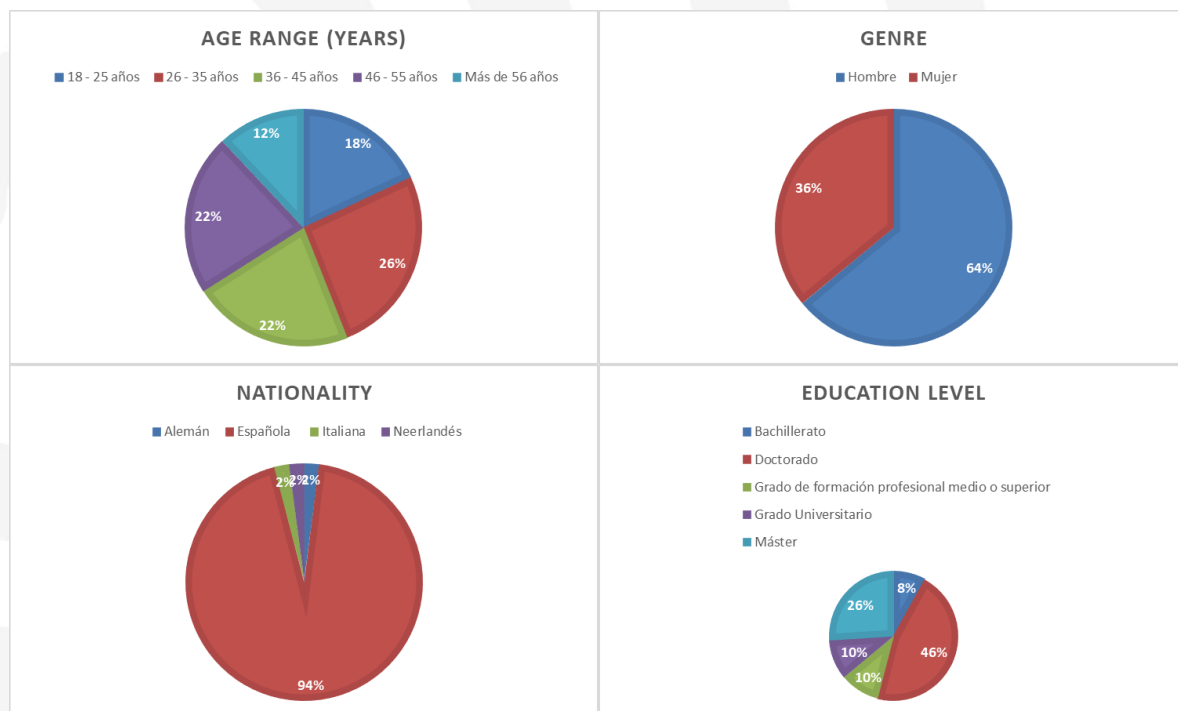
The survey conduction took place during the months of May and June 2021 and was distributed to the campus users via email listing. The campus user includes students, teachers, researchers and other staff.

After this period, just 50 campus users completed the questionnaire. The lack of participation might be a join effect of the Covid-19 and the low attendance to the campus during this period. There was open a second period during December and January 22, but we did not get the expected collaboration from the University institutions.

The online survey has an average time completion of 10-15 minutes and can be accessed in the following link: <https://forms.office.com/r/ymMuQcnpCy>

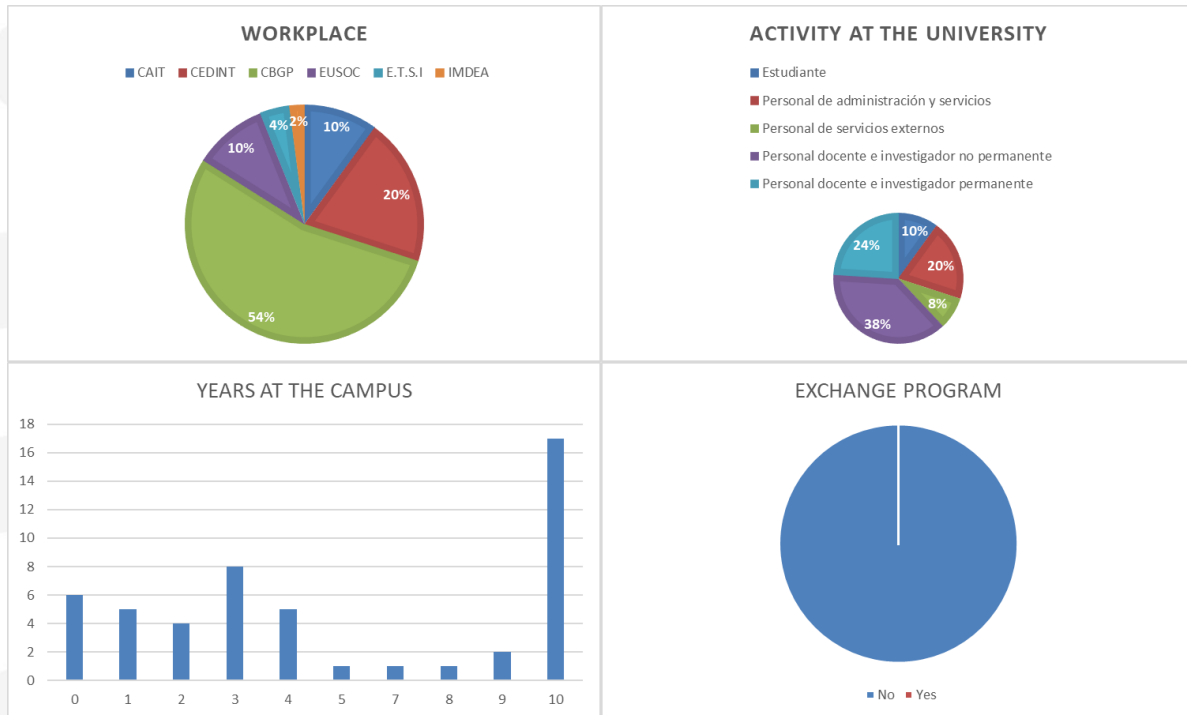
### 3.3 Survey results

#### Personal information



From the results, it can be observed that the personal distribution is coherent with the majority of the campus users (excluding the Computer Science School), with a majority of Spanish PhD men in the range of 26 and 55 years.

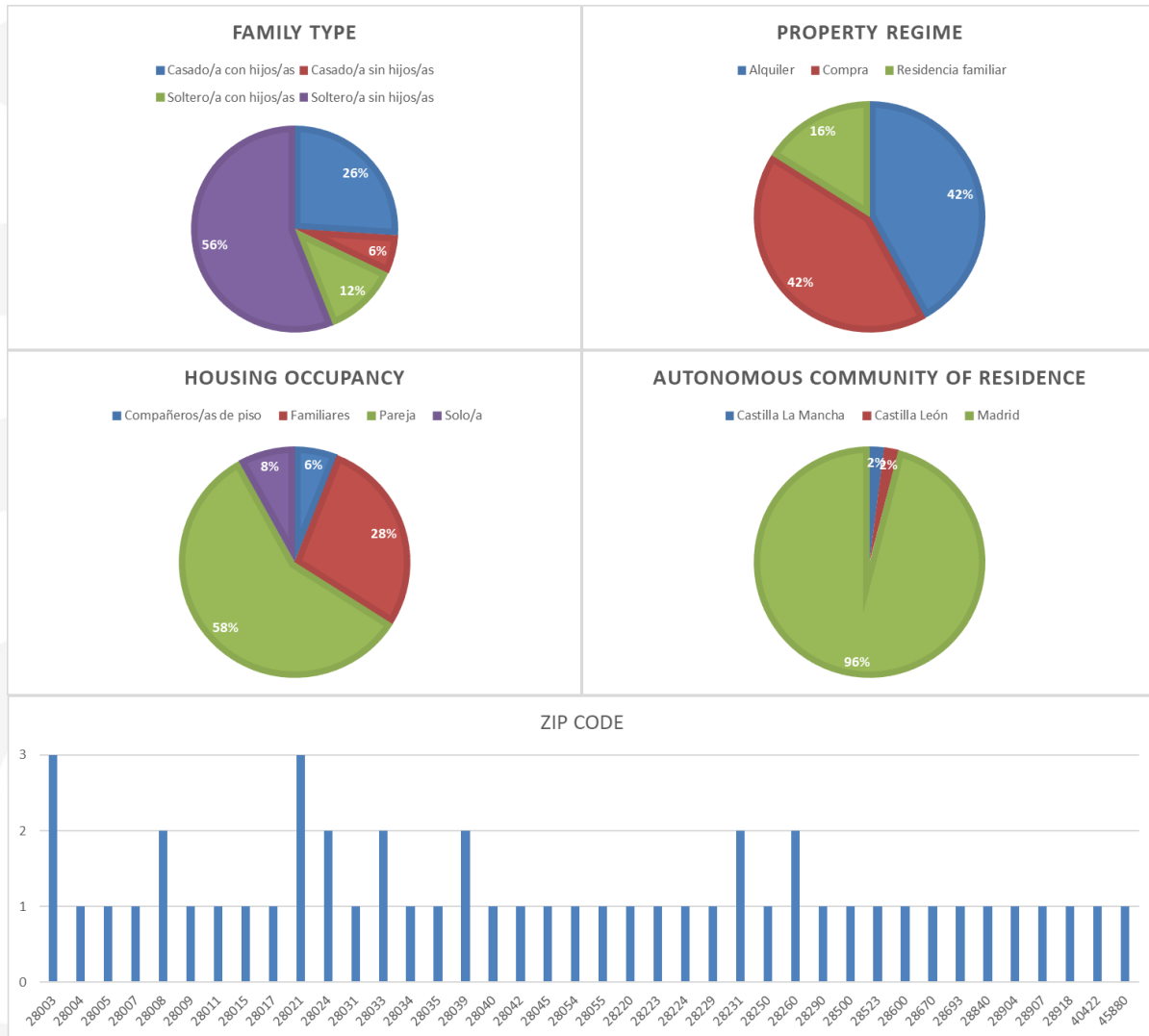
## Workplace information



The results show that most the participants come from two research centres: CBGP (being the largest one) and CEDINT (host the researchers in Tr@nsnet project). On the other hand, more than one third of the respondents correspond the profile of a non-permanent researchers who has been more than 10 years at the campus.

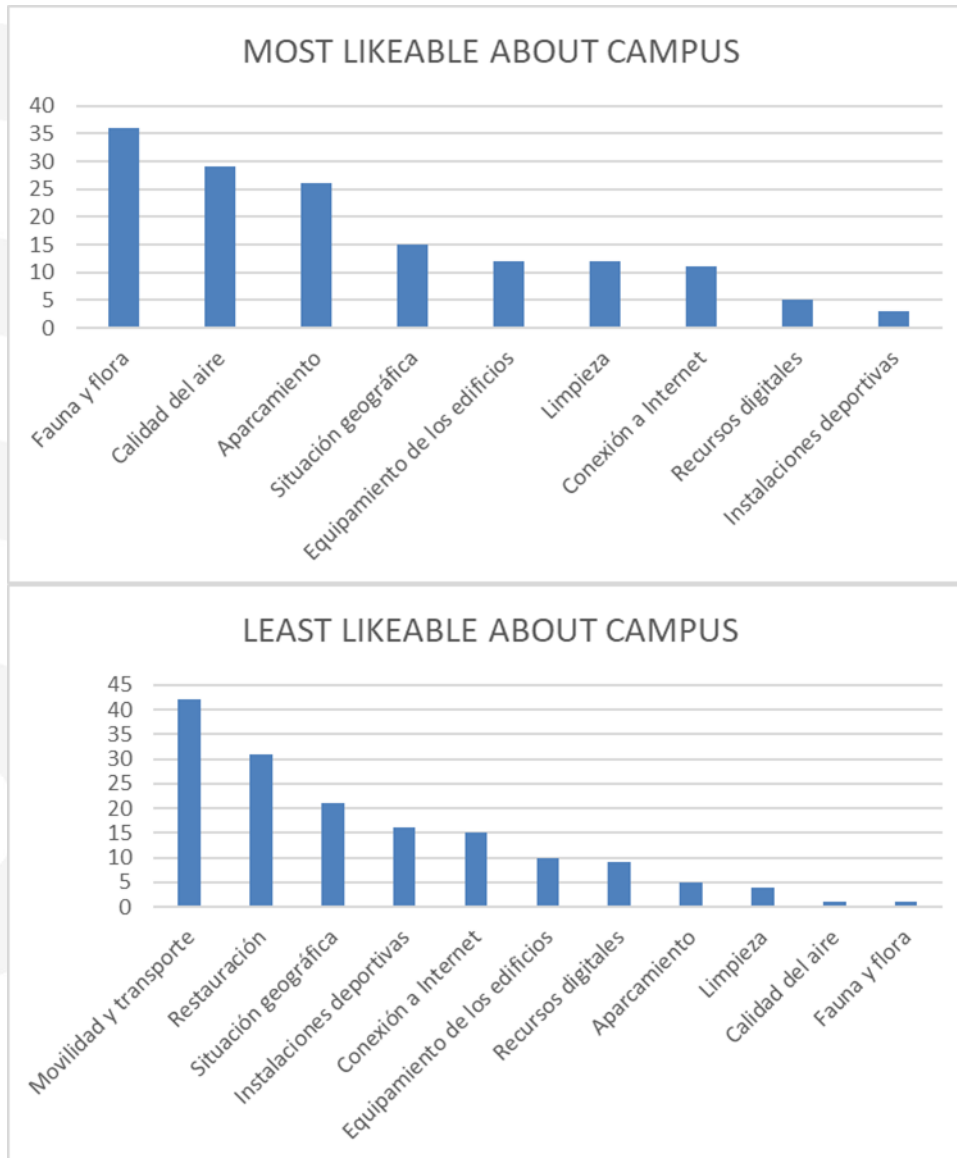


## Residence information



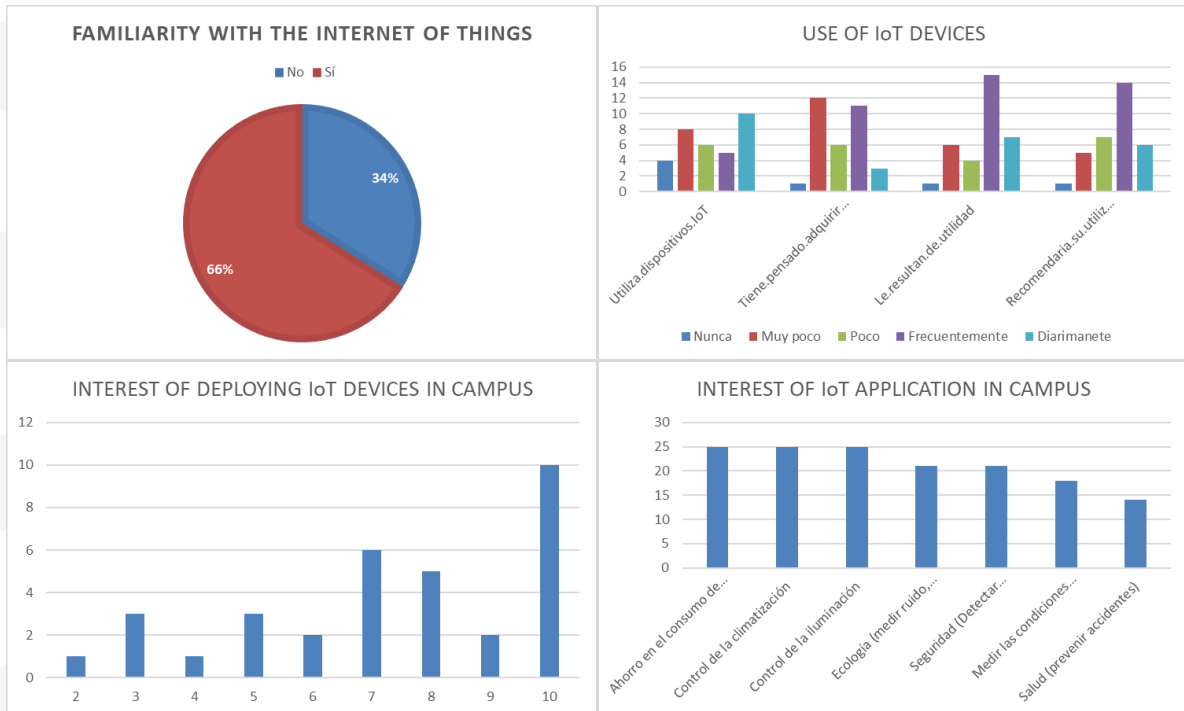
Regarding the residence information, more than the 50% of the participants are single couples without children. There is an equal proportion of users who own their house or pay a rent. As for the residence location, most of them live in the Autonomous Community of Madrid, but with a really heterogeneous distribution, including Madrid city (ZIP codes up to 28055) and surrounding towns.

### Most and least liked aspects about the campus



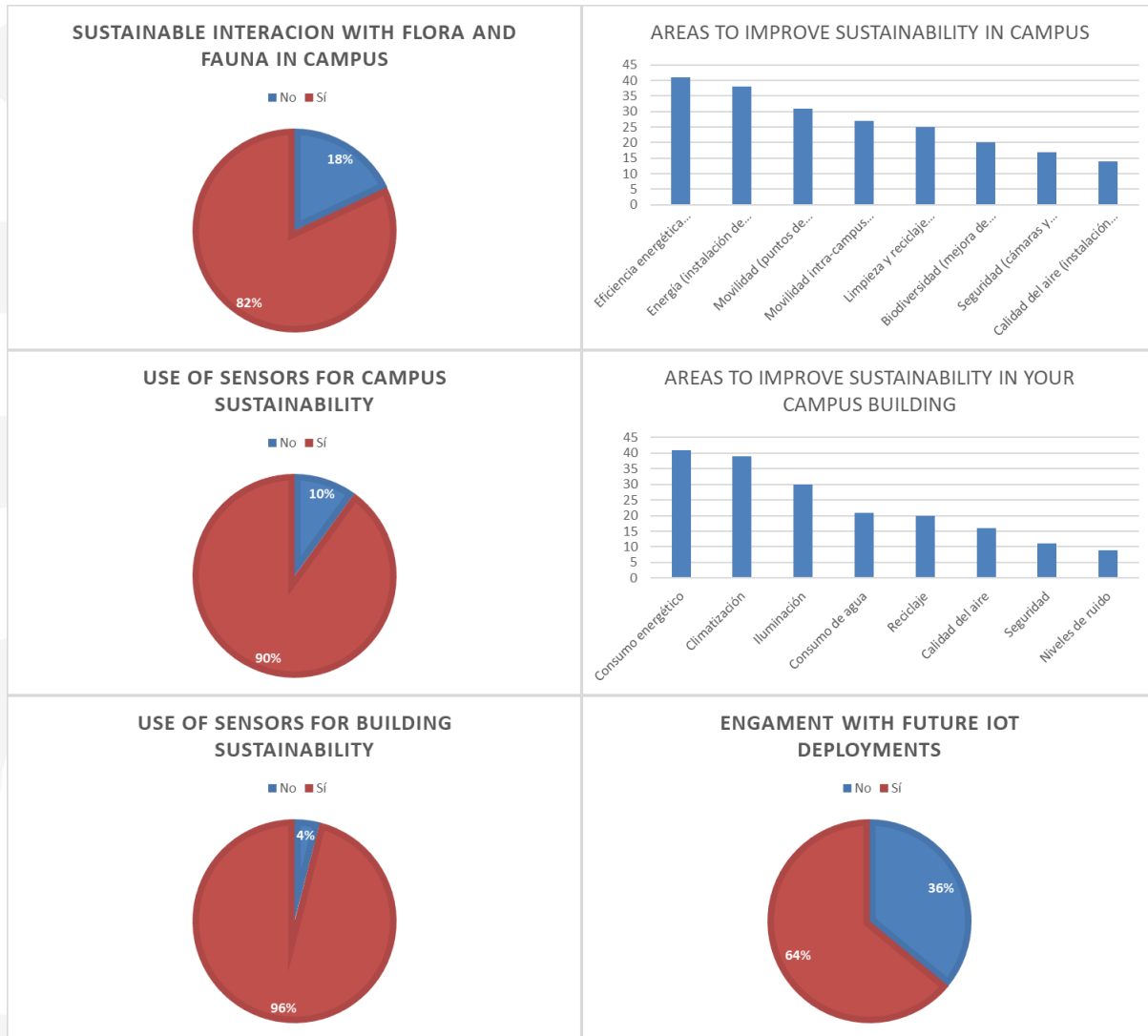
Campus users think that most likeable aspects or working in this campus are the open spaces and natural environment, which results in a wealthy fauna and flora, a high air quality and enough parking spaces. On the other hand, the weak points are the mobility and transport services to the campus and the lack of restauration offer.

## Use of Internet of Things in the campus



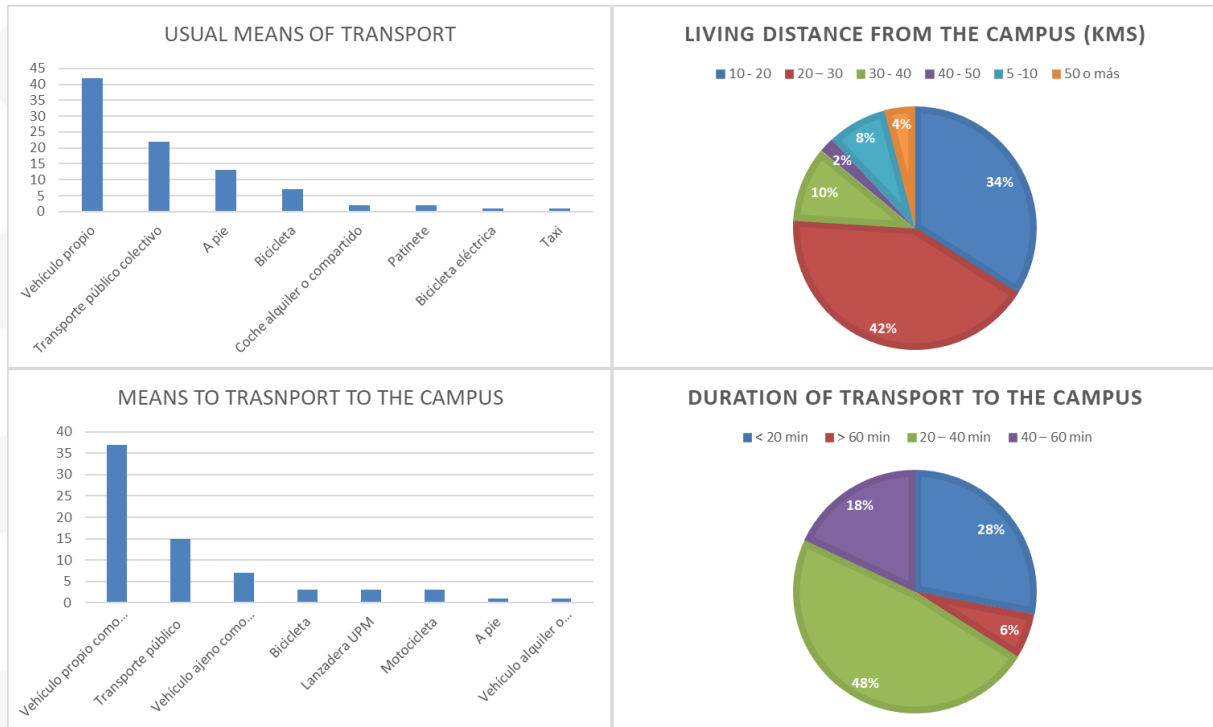
Most of the campus users claim to be familiar with Internet of Things concept. However, just the 25% of them use IoT devices frequently or daily. The majority find that would be interesting to deploy IoT devices in campus, especially to control HVAC and lighting systems and reduce power consumption.

## Environment and sustainability awareness

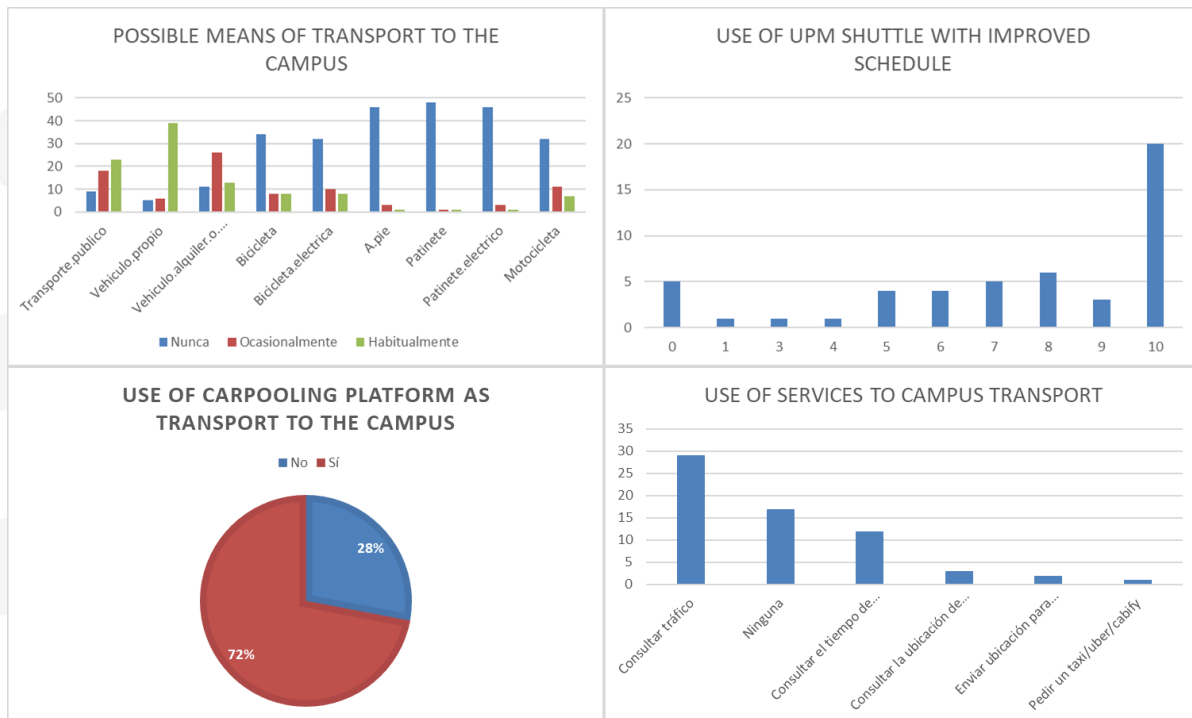


Most of the participants (82%) believe that the campus and its members live in a sustainable way with the environment, respecting the flora and fauna of the surroundings. On the other hand, they think that the most relevant areas to improve sustainability are energy and mobility (campus) and energy, HVAC and lighting (campus buildings). For both campus and buildings, more than the 90% consider useful the use of sensors for monitoring and study sustainability. Finally, while all support the implementation of renewable energy as an energy source for the campus, two thirds would like to actively participate in IoT developments to improve services on campus and contribute to sustainable development.

## Transport: time spent and possibilities



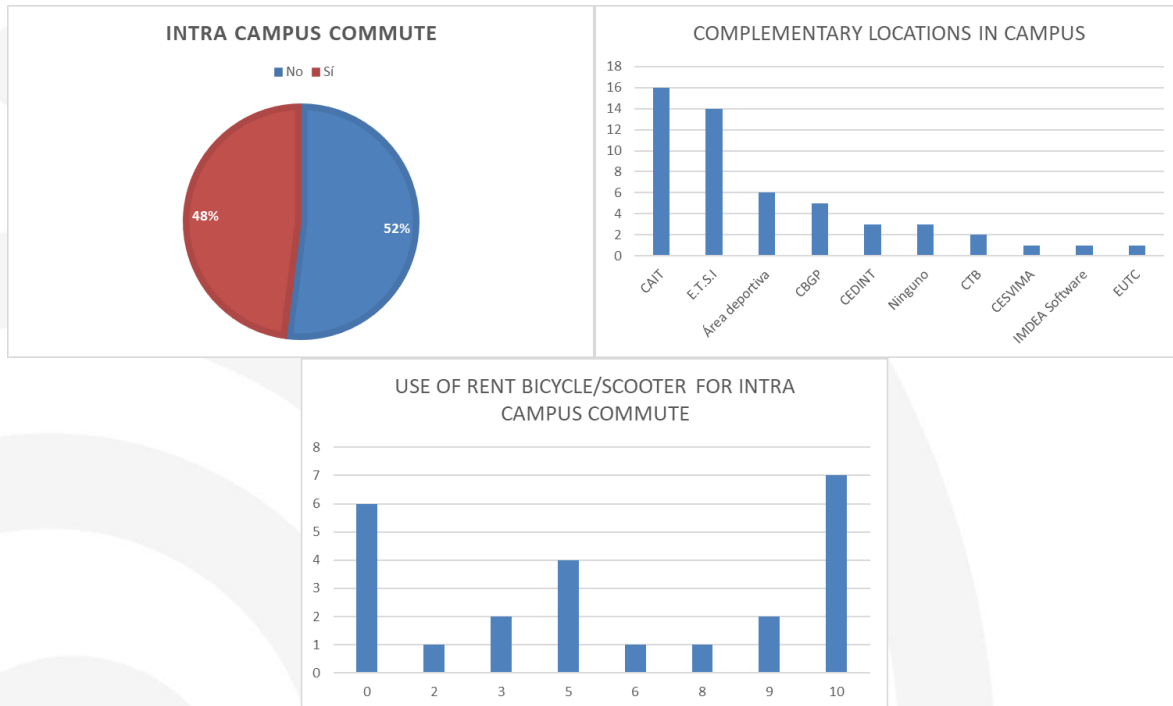
Results show that there is a correlation between the usual means of transport from participants and how they get to the campus. On the other hand, the vast majority live in distance from the campus in the range of 10 and 30 kilometres resulting on a lesser than 40 minutes duration. Most of campus users use their private vehicle as transport mean to the campus, while just the 30% make use of public transport.



Regarding if the participants would consider different means of transport to the campus, most of them prefer their own vehicle, followed by a rental or shared vehicle and public transport. On the other hand, most of the campus users would make use the UPM shuttle service if the schedule was improved. Similarly, the majority is open to use a carpooling platform and share vehicle with other campus users. As for digital transport services, the most common are checking the traffic and arrival time of public transport.

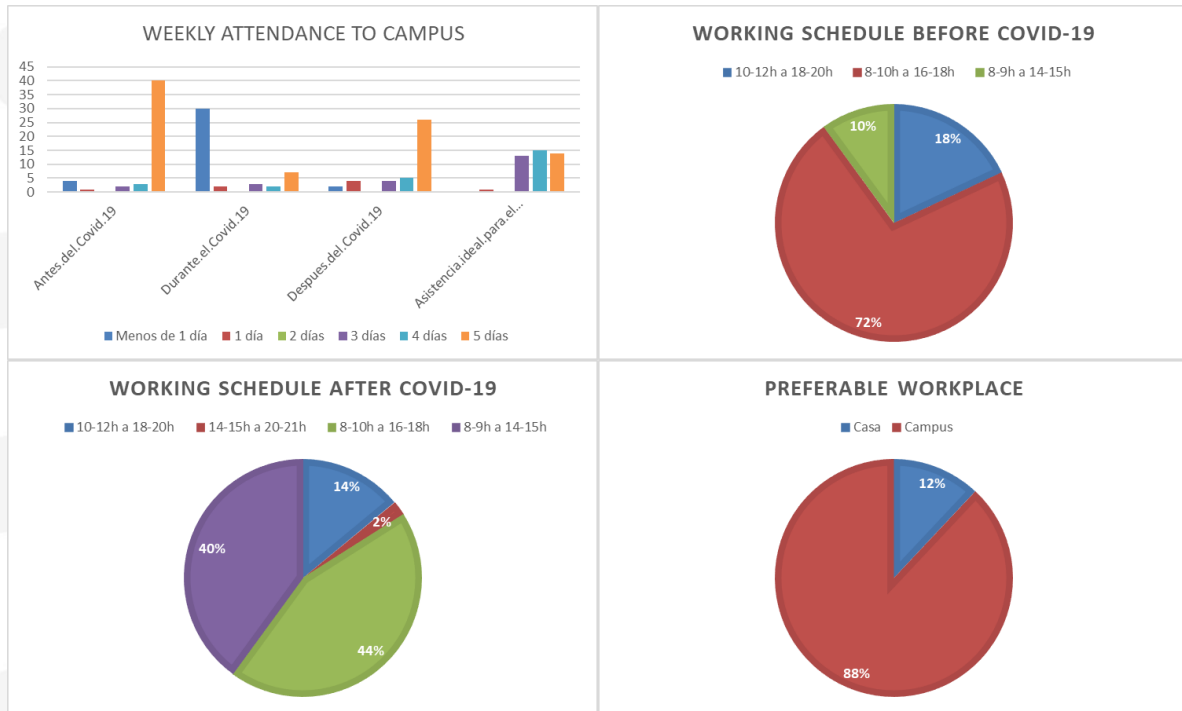


## Mobility: Movement within the campus and electric vehicles



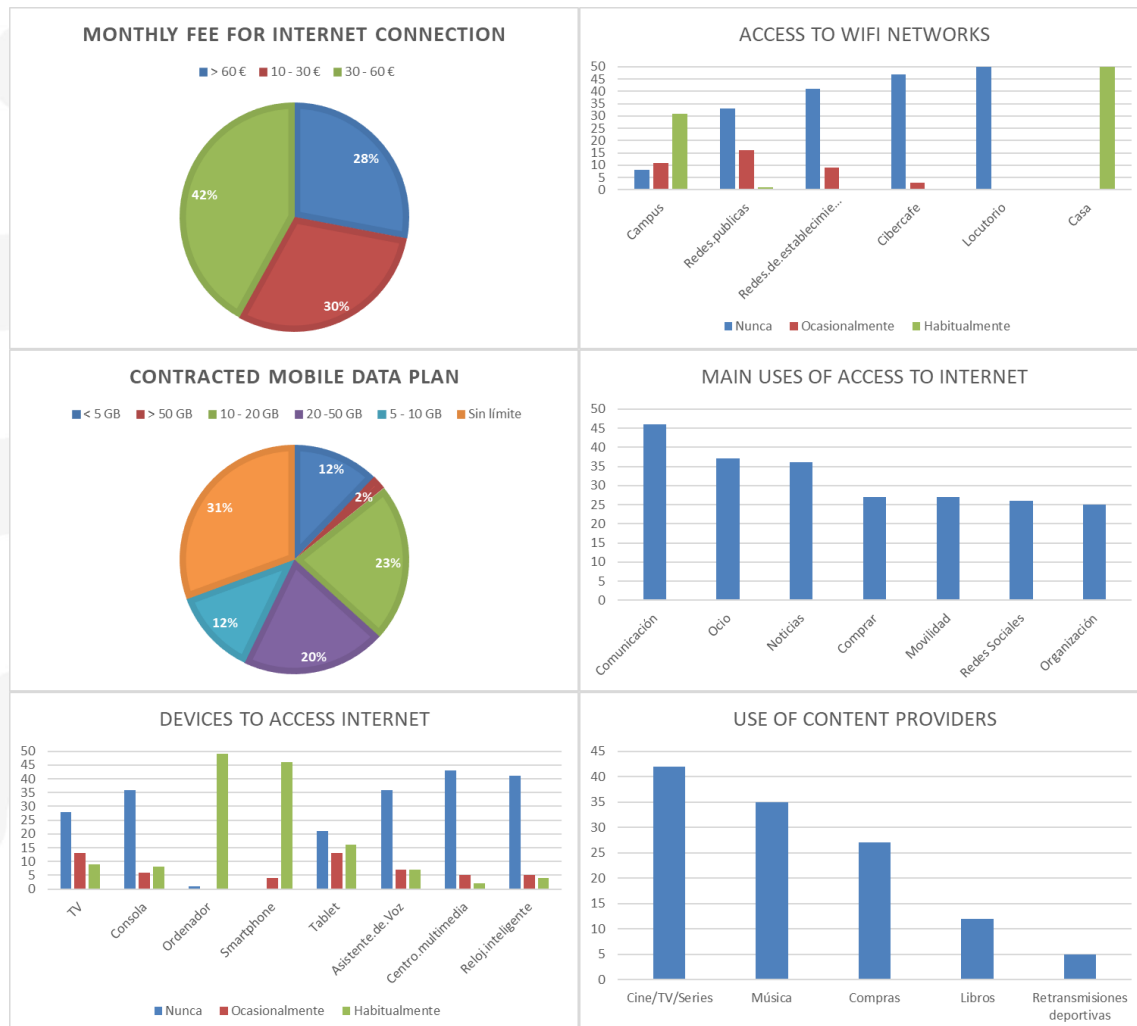
Half of the participants usually commute within the campus, being most common destinations CAIT and Computer Science School, where the restauration services are located. Asked about the possibility of using a bicycle or scooter renting service for intra campus movement, there is a heterogeneous vision.

## Work Schedule: before and after COVID-19



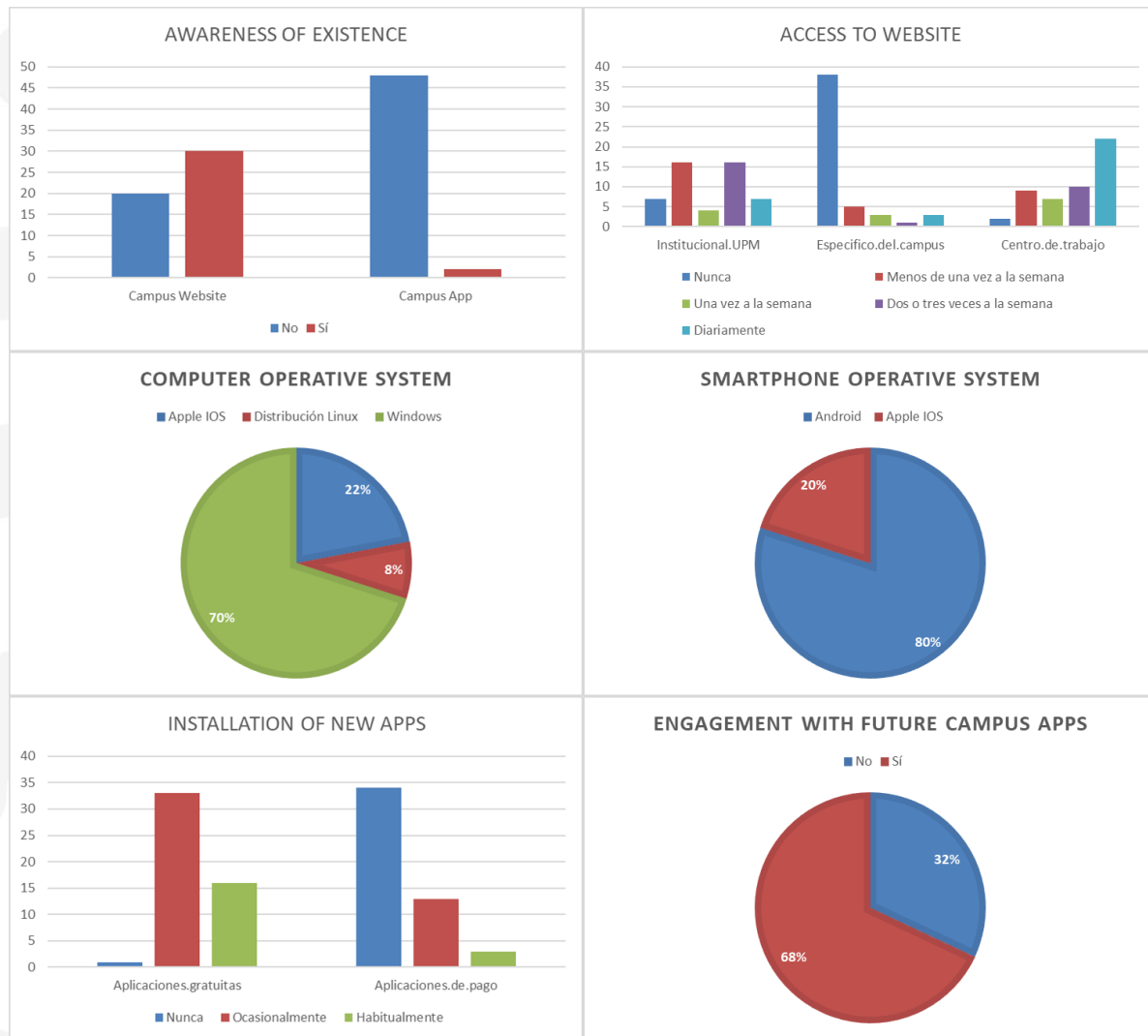
Results show that participants' attendance to the campus profile has not been quite affected by the COVID-19, being the most common a 5-day weekly frequency. However, the desired frequency range between 3 and 5. Meanwhile, the COVID-19 has affected the working schedule of campus users, increasing the number percentage of users with a continuous working day. As for the workplace, the vast majority (88%) prefers campus over home.

## Internet access: devices, applications and platforms



All the participants have internet access at home, with the majority (70%) paying a monthly fee higher than 30€. Most of them just access to WIFI networks either at home or work (campus). As for the mobile data plans, a high percentage have either unlimited or larger than 20GB monthly plans. Almost everyone make use of internet access for communications, leisure and news. Regarding the type of devices used for internet access, the majority use just the computer and the smartphone. Finally, the most common providers for digital content are from multimedia (movies/tv/series) and music.

## Campus websites: Frequency and usefulness



The 60 % of the participants are aware of the existence of the campus website, while just the 5% know if there is a mobile application. The user access on a daily basis to the workplace specific website, weekly to the university website and almost never to the campus website. As for the operative systems, the majority of participants use windows in computer and android in smartphone. Most of them frequently install new apps if they are free and occasionally if they require a payment. Finally, asked about their probable engagement in the development of a new campus mobile app, two out of three confirm their interest.

### 3.4 Conclusions

From the work realized during the adaptation of the questionnaire, the survey conduction and the analysis of results, we highlight the following conclusions:

- The sample of participants of the survey is representative and coherent with the expectations taking into account the majority of profiles within the campus. However, it would have been desirable to have larger amount of participants, especially from the Computer Science School. To do so, it is necessary to get the support from Campus and University management departments.
- The special campus location, being an inter-urban environment close to natural protected area, is the main cause to both most and least likeable aspects: +) flora and fauna, air quality, open spaces and parking; -) transport and access, restauration facilities.
- Campus users know what the Internet of Things is but do not use it on a daily basis. They think that it would be interesting to deploy IoT devices in campus, especially for energy consumption reduction and HVAC/lighting systems optimization.
- Although most of the campus users would like to improve campus sustainability, and think that implementing sensors would help in the process, they feel somehow reluctant to participate actively in such as initiatives.
- Most the campus users utilize their own vehicle or public transport to get to the campus, mainly because they live more than 10kms far. They would make use of the UPM shuttle if the schedule was improved and definitely would share car with other campus users.
- As for intra campus movement, which happens between building workplaces and the buildings with restauration facilities, they do not find necessary to implement a bicycle/scooter rental service.
- The Covid-19 crisis, and the remote working mode implemented during many months, has not resulted on significant working schedules changes.
- Mobile data plans make unnecessary the connection to WIFI spots other than at home and workplace.
- Campus users are not aware of the existence of campus mobile app and do not access the campus website very often.
- Finally, they find interesting the development of a mobile app implementing digital services for the campus, and the majority would like to engage in the testing process.

## 4. Demonstrator replication at ULR

La Rochelle University acted as observer in this task. Indeed, due to the pandemic situation and the numerous surveys already in place at the university to help students and staff, at the slow exit from the pandemic situation time, didn't allowed to push for an additional general survey.

In prevision of the Survey replication, we decided to replicate the one from UPM but either removing some questions that seemed not appropriate culturally in France (cultural perception related to GDPR) and updating some others to adapt to the specificities of La Rochelle Campus. These changes concerned questions 7 (0 to 30 years instead of 0 to 10 years) as well as 14, 15, 38 and 46, where we adapted the names of the internal sites, centers, etc. As per the questions that had been removed, due to the cultural perception related to GDPR in France, those are questions 3, 5, 8, 10, 12 and 45.

Even though, we didn't make the survey live, completing its replication, we had a replication in terms of experience gained from the survey development in UT3 and UPM and its adaptation for La Rochelle University. This experienced drove the creation and deployment of two other specific surveys specifically related to other tasks in the project. These were specific to either "TG2 - Action 2.5 - Users Energy Behaviour", which was scheduled in our Tr@nsNet activities, and "TG2 - Action 2.2 - Mobility Observation", which was a task in which we were supposed to be an observer but at the end had a bit more active role.

Last, but not least, the lesson learned by UPM and UT3, while completing their survey, had been highly beneficial to us in the design of La Rochelle University's Mobile Application for helping users in their energy behaviour within the campus (cf. "TG2 - Action 2.5 - Users Energy Behaviour") as well as the deployment of our IoT infrastructure in Campus (cf. "TG1 - Action 1.2 - Home automation (IoT) in the Gateway network building").

Participating to this task was thus highly beneficial and on multiple point of views.



## 5. Conclusions

The original survey from UT3 proves to be a valid baseline for replication in other university campus, including different countries. Although some questions had to be adapted to the specific characteristics of the UPM campus, the vast majority is reusable. Also the methodology is replicable and scalable to different task that may include a survey conduction among campus users.

This task does not necessary requires experimental or in presence work, however, the impact of the Covid-19 crisis during the hard lockout periods and the later consequences has been notorious.

- On one hand, remote teaching and working has affected the assistance to the campus, and therefore the engagement of campus users in initiatives as the survey.

On the other hand, this virtual framework has boosted the use of online tools, among others, surveys, conducting to the saturation of end-users.

