ITEA Smart Cities customer workshop report

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1. Introduction of the workshop

1.1. Organisation and participants

On 7 June and 8 June 2023, ITEA organised its 9th international customer workshop and this year it focused on Smart Cities, an important challenge of ITEA. The workshop was kindly hosted by Nokia in Antwerp and organised with the help of Esri Canada, Siemens and BABLE .

The event gathered around 35 representatives coming from 10 end users of Smart Cities solutions representing the point of view of the customers and 18 solutions providers - large companies, research organisations and SMEs - with an expertise in the Smart Cities sector. The following organisations took part:

Smart Cities end users / Customers	Industry	SMEs- Research
City of Antwerp (BEL)	Barco (BEL)	Avans University of Applied Scences
City of Brno (CZE)	Bosch (ROU)	BABLE.Digital (GER)
City of Ghent (BEL)	Dassault Systèmes (FRA)	Digital Ubiquity Capital (CAN)
City of Hasselt (BEL)	Esri Canada (CAN)	GIM (BEL)
City of Helmond (NLD)	Nokia Bell Labs (BEL)	Liveable Cities (CAN)
City of Rotterdam (NLD)	Royal HaskoningDHV (NLD)	Macq (BEL)
City of Tampere (FIN)	Siemens (BEL)	Public safety Innovation (NLD)
City of Tartu (EST)		SIRRIS (BEL)
City of Zaragoza (ESP)		Sorama (NLD)
Major Cities of Europe EU (GER)		ViNotion (NLD)
		VTT Technical Research Centre of Finland (FIN)

1.2. Target of the workshop

The target of the workshop is to identify the actual customer needs, in order to create new ITEA projects based on clearly stated customer or end-user requirements. For this we have defined the following steps:

- We invited, for this year's topic, around 10 city representatives, that are potential users of Smart Cities solutions, and around 20 large companies, innovative SMEs or research centres providing solutions to the Smart Cities sector.
- We set up four sequential interactive customer round table sessions, where city representatives expressed the challenges and pain points they experience and why they are key for them. This resulted in a basis of clearly stated customer and end-user requirements.
- We organised four brainstorming parallel sessions gathering each Smart Cities end-users and technology providers to discuss potential ideas to solve the different challenges.
- These ideas may be transformed in project proposals for ITEA Call 2023 that opens in September 2023 in conjunction with the ITEA PO Days that will take place on 12-13 September in Berlin.

2. Smart Cities

This event was the second Smart Cities customer workshop organised by ITEA, the first one being held in Istanbul in September 2015. We decided to address the Smart Cities challenge once more for several reasons.

First, the cities are very important for more and more people. Today worldwide, we have more people living in cities than in rural areas. It is forecast that this will continue to grow with more than 68% of the worldwide population living in cities in 2050. Everyone is interested in the progresses proposed by the smart cities. Even if we do not live in a city, we all visit and access some of them and would like to benefit from new digital solutions to improve these experiences.

Second, City level is the most impactful political level for the daily life of citizens. So, citizens are eager to be in the loop of new digital solution development. This offers at the same time a benefit and a challenge to manage citizen engagement.

Third, it is the right time to discuss how some technological evolutions can impact cities. There are more and more available and affordable sensors delivering new types of data that can be exploitable to better manage the city. Artificial Intelligence is also an impactful technology for Smart City. This technology has already been involved in city solutions for several years, so we can assess the first lessons learnt from the use of AI.

Fourth, the evolution of the city needs the involvement of a lot of stakeholders. To move forward some collaborations must be put in place. This collaborative environment is very similar to ITEA collaborative research projects for which is it very valuable to have a complete value chain working together.

2.1. Topics addressed

For these different reasons, the choice of Smart Cities for the annual customer workshop was natural to ITEA. To set-up this event, we have benefited from discussions with Esri Canada and Siemens. This helps us to select four topics for the workshop. This selection was made knowing that a two-day workshop would be too short to address the whole field of Smart Cities. However, the selected topics

already covered a large spectrum of research challenges for which software innovation can be a game changer.

- ▪ Environmental footprint:
  How to stimulate carbon neutrality, circular economy, sustainability and adaptation to climate change?
- ▪ Mobility:
  How to allow everyone to move from one point of the city to another considering all the mobility modes including walking, bike, trolley, public transportation, motorbike, car etc.?
- ▪ City evolution planning:
  How to plan the expansion of the city or to transform it for more activities or better living experience?
- ▪ Security and crisis management:
  How to ensure that the people will be safe inside the city; how to prepare action plans in case of a disaster like fire, pollution, utilities breakdown, attack, etc.?

It was also decided to put some emphasis during the discussions on how Digital Twins can help to tackle these challenges. Nevertheless, the term 'Digital Twin' is not a clearly defined 'thing' that everyone understands in the same way. It is still surrounded by many questions regarding different aspects, technologically but also application wise:

- ▪ What is the best approach to design the Digital Twins?
- ▪ How to collect the relevant data to design and to feed the Digital Twins?
- ▪ How to connect the Digital Twins to the real systems that they represent?
- ▪ How to interconnect several Digital Twins?
- ▪ How to share Digital Twins between different city stakeholders?

The workshop aimed to exchange between the different participants on these questions and to build a shared vision.

3. Round tables discussions

During the first day of the workshop, one round table has been organised for each topic with end-users presenting their point of view before having a discussion between them and the other workshop participants. These round tables were an opportunity to listen to end-users who have shared their insights on the key challenges and to come up with a common vision of what are the most important problems and issues to solve.

3.1. Environmental footprint

This round table gathered four participants from cities. The panellists presented topics related to the reduction of the environmental footprint of cities.

The first speaker explained the objective of a mid-size city to limit the access of the city centre by motor vehicles. First, there is a challenge in choosing the right access control infrastructure with several options as badges, codes or cameras. But the most important problem is to find the right

balance between limiting access and allowing logistic movements. There is a strong pressure on logistics due to the development of e-commerce delivery and the demand of city centre shops and retailers. To tackle the problem, new sensors could help. A fine grain authorisation management could be put in place, but it would mean collecting personal data with the challenge to comply to GDPR regulation and to address citizen's privacy concerns. It would be good also to share the policy decisions that have been taken by other cities to progress faster.

The second speaker presented the point of view of a large city. There is an initiative to develop a digital twin of this city with several objectives, one being to reduce the environmental footprint. To achieve this goal, one of the issues is the data integration. Currently there is no shared referential of the city data. Each stakeholder has its own way to represent and store its data. The process to integrate all the data sources is long and complex. There is also a demand to share not only the best practices but the worst practices, as it is sometimes easier to learn from errors than just trying to adapt to new environments from something that was successful in another city. One pitfall it that big internet companies proposed interesting pieces of solutions, but they do not allow to interface easily with other solutions. For a city it is mandatory but not easy to avoid vendor lock-in.

The third speaker confirmed that cities have now put in place good strategy to collect data, to propose good visualisation tools and to make them available to stakeholders for them to develop new services. The main data are the geographic data of the city, the meteorologic data and some environmental data. Even if the data are still in silos, they are the basis to work towards a climate neutral city (the goal of most of the cities). One of the issues is to develop a more circular economy transforming elements that are currently considered as waste in something that can be used. Another problem is to simulate the effect of some actions on the climate neutrality. This is quite a complex process, and some new solutions are expected. Regarding the data needed to progress, more data on mobility would help to take into account dynamic elements. Some air quality data are sometimes very sensitive and so not always share to the right extend.

The last panellist presented a collaborative research project called Climaborough. This project involved as partners 14 cities or local territories and has the objective to drive cities towards climate neutrality. The project has defined a process to implement smart technologies that can help to progress towards climate neutrality and to learn from the pilots that will be financed in several cities. There are two focuses for the project: from isolated energy and mobility to integrated services and from waste to circularity. The current bottlenecks for the cities to move towards climate neutrality are the public procurement rules, the lack of skills, the difficulty to communicate and to create ecosystems.

In summary, the round table on Environmental footprint highlighted that some important challenges to progress toward climate neutrality are:

- Data integration
- Sharing not only good practices but also worst practices
- Evaluation of action's impact on climate neutrality
- Access to some dynamic data relevant to control the environmental footprint
- Building the right communities that can have real impact
- Using powerful existing tool without ending in a vendor lock-in
- Shortage of skills

3.2. City evolution planning

The second round table addressed the topic of city evolution planning. There were five panellists to present their views on the subject.

The first panellist explained that his city rather works on the interaction of a triple reality including a physical reality, social reality and digital reality than just a twinning between real and digital worlds. The difference is important and helps to improve the city life. This large city has already put in place some solutions to collect and store data and to use them for different purposes: climate evaluation, energy management, planning of new installations… As there are different purposes, different digital twins are developed. The approach is modular with the objective to keep the control of the different developments and not to be in the hands of big tech companies from US or China. A modular architecture has been put in place with clear APIs that allows the contribution of different stakeholders and the sharing of some modules by different digital twins. The emphasis is on interoperability of the different digital twins and on the definition of the right APIs.

The second speaker started to remind us that space is a very scares resource and so good urban planning is mandatory. He acknowledged that today's data-driven policy decision is not yet implemented. Another challenge is to balance the demand from citizens for more individual mobility solutions and more services while progressing towards city climate neutrality. Digital twins can help to tackle these challenges if there have the right level of details to simulate the impact of future urban development projects and to deliver an accurate visualisation of the results. Their developments could be facilitated by the adoption of an architecture with four layers (discovery of data, simulation, indicators and visualisation). The adoption of the architecture can help to organise the collaboration of many stakeholders and to offer an open access without the control of tech giants.

The third speaker explained that there is still some work to be done to digitalise all the available data related to the city and to the lands surrounding the city. There is information on paper and in many digital formats. It is hard to use this information for city evolution planning. The formats of data and even the semantic of the data are not uniform and the interoperability is a big issue. A second

challenge is to build a decision support system upon the data. For example, a system that can help to choose the path of a new road or the location of a new school or retail spaces. This decision support system also needs to foster the citizen's participation in the decision making allowing the public to see the impact of some changes that could be suggested.

The fourth panellist mentioned that the availability of dynamic data on mobility habits could greatly help the city planners. The information regarding commuters can be used to propose city evolutions that will at the same time reduce carbon gas emission and offer a more pleasant living experience for both the city inhabitants and the people travelling to the city. Planning new usage of green spaces is also a concern for which more modelling tools are welcome. It is difficult nowadays to model the options and to choose the right indicators to drive the planning. Another challenge is to have a good understanding between the 'technical' experts and the politicians who run the city. Several issues can be encountered such as openness of data that is not positive for the city and translation of political objectives into indicators usable by city planners.

The last speaker explained the challenges faced by a medium size city to plan a significant increase of housings and jobs due to the economic growth of the city. In addition to the city growth, there are other goals like climate adaptation and citizen engagement. To progress, the city aims to develop an open platform fed by different data sources that can be used by the city but also other stakeholders as companies, knowledge institutes and citizens. It can be seen as a collection of digital twins that used the digital infrastructure installed in the city (wireless communication networks, sensors on urban equipment…). This open platform must address the privacy and digital inclusion challenges to be widely accepted by the citizens. The platform can provide scenario which can be discussed and help to find a balance between conflicting ambitions. Several initiatives have been set-up to progress on these challenges and also to collaborate either with other cities or organisations interested in the development of the city. Some of them are doing some experiments to test some new solutions and could be associated to future research projects.

In summary, to progress in city evolution planning, the important challenges are:

- Access and interoperability of data
- Citizen engagement management
- Co-creation of a solution by many stakeholders
- Development of indicators translating political ambitions and widely accepted
- Aggregation of conflicting ambitions
- Comprehensive approach of development (ability to plan the development of all the services: job, housing, mobility, health, logistics)

3.3. Mobility

This round table gathered five participants and in addition a recorded testimony from an ITEASmart Cities Advisory Board member who was unable to attend the workshop physically.

The recorded video message focused on the problem of logistics. One of the current findings is that to improve the logistics there are still some data missing or important data not shared. A second one, it that the development of a very accurate digital twin is too complex. It is better to limit the ambition to develop a data space on smart logistics that will enable all the players to share interoperable data. Logistics deals most of the time with private and personal data and it is needed to develop anonymisation methods that could have different levels depending on who will access the data. This concept of differential privacy is to be developed. This is a challenge especially if you want to give the control to the person to whom the data are related.

The first live speaker explained that in most cases city mobility policy aims to have the people leaving their cars outside the city and using either bike, bus or other public transportation means inside the city. The challenge lies in providing reliable public transportation and to be able to plan for the maintenance of road infrastructures. It is important to have some redundancy in the systems as you almost always operate in degraded modes for some parts of your mobility infrastructure. Digital twins can be developed to help to better manage the degraded modes and to provide on demand public transport combining all the available modalities in the city.

The second speaker stressed the question of the integration of mobility services proposed by different providers. It is an open question to transform a competitive situation into more collaborative and mutually beneficial interactions. The advantages could be a more sustainable mobility and also a more robust one with some mobility modes taking over when some others encounter problems. It will also avoid having the hubs of all services just in the centre of the city when the situation could be too crowdy. The use of digital twins is still uncertain as the complete mobility system is too complex to model. It is another concern to identify the good data source to solve the problem of last mile logistics and personalised optimal journeys (considering contextual information related to weather, people capacities, people objectives…). It would be very valuable to share the best practices on these issues. The personal data that need to be used for these questions also trigger the problem of privacy management. Some sensitive data must be protected against misuse.

The third panellist presented an initiative related to a mobility budget provided by the city with the aim to change the mobility habits of the inhabitants. The problem is that there is not enough space in the city centre for the cars that the people own. The city would like to allocate a mobility budget to the citizen to help not to park their car in the city centre. The experiment can also help to gather new types of data that can be useful to launch new mobility services. The initiative has still to answer several questions like what to include in the budget, how to provide it, what is the impact on the environment, can it be sustainable on the long run for the city budget and the mobility service providers.

The fourth speaker presented the situation in a large city with a lot of mobility solutions already deployed. The city benefits from past investments in smart infrastructures and experiences in digital solutions development. One of the results is a multi-modal route planner and navigator available for all the inhabitants and visitors. One of the today's objectives is to change the habits towards more environment friendly solutions with soft measures. For the underlying IT systems, an architecture has

been defined to enable the interoperability of the different modules. From data sources management up to end-user applications some interfaces are set. This architecture enables modular developments by different players and to use components for different applications.

The last panellist stressed the relationship between city growth and mobility planning. The open platform that is being put in place for urban planning can be used for the real-time monitoring of the city traffic. The planning of mobility infrastructures is still a challenge with a lot of uncertainties like the evolution of the house-office commuting after the covid experience or the impact of the environmental concerns on mobility habits. Again, the open platform can help to generate scenarios and to organise discussions around them to build a consensus. Another challenge is to automatise the verification of road signs. All the technology bricks seem to be available (image processing, unmanned vehicles…) but this is still a challenge for many cities.

In summary, mobility is very central for all the cities and important challenges remain:

- Access to the last mile data to improve logistics
- Privacy of personal mobility data
- Robust mobility systems able to adapt to failure of some transportation means
- Conceptual mobility planner
- Incentive policy to reduce car usage and parking in city centre
- Dynamic data for more relevant navigation advice
- Automatic road sign verification

3.4. Security and crisis management

During this round table some of the challenges to increase security and to manage potential crisis situations were discussed. Only two panellists presented but the discussion was very active.

The first speaker came back on a cybersecurity attack on his city's IT systems. The consequences have been very heavy. During several days some services were unable to operate with a lot of impact for the citizens. There was also some financial impact for the city as it was impossible to collect some service fees. The main lesson learned from this story is that current cyber security protection tools are unable to deal with all the potential vulnerabilities. The most interesting direction is to go for more robust and modular systems that can continue to operate in degraded modes even if some components of the IT infrastructures are corrupted.

The second panellist explained that pedestrian security is a high priority in his city and that an important initiative has been put in place to increase it. One of the most challenging situations is the management of events that attract large crowds. These events are difficult to manage because an accurate monitoring and the situation control are more complex. The question of drones was also put on the table. They are interesting new means but there are open questions regarding their use. The coordination of drones with first responders is one of them. The detection of rogue drones is

also a challenge. Finally, the robustness of drone solutions against jamming is an issue (some trucks use jamming of GNSS signals to escape controls creating perturbations for drones).

The presentations and the discussions of the round table 'security and crisis management' stressed some important challenges:

- Sustainable operation of the city under a cyber attack
- Robust IT systems not fully impacted by the corruption of part of the IT infrastructure
- Crowd management
- Drone detection and identification
- Drone solution robust against jamming

4. Brainstorming and ideas

The second day of the workshop was dedicated to brainstorming sessions about potential solutions to solve the challenges that were presented during the round tables. Each group consisted of around 6-10 people with a mix of end-users and technology providers, focused on one of the four topics of the round tables and had the 'mission' to highlight the main problems, to discuss potential solutions and to propose ideas that can become collaborative research projects to be submitted to an ITEA Call for projects. One group brainstormed on two topics: mobility and security and crisis management.

4.1. Environmental footprint

The environmental issues for the cities relate to different dimensions:

- Pollution (air, noise, …)
  - carbon reduction, link to health impact (also noise)
- Energy consumption
  - buildings leaking energy, street lighting control
- Traffic mobility
- Waste
  - collection, treatment, circularity
- Urban heat island
  - not enough greenery, too much concrete
- Water
  - access, soil quality, floods, protection of the infrastructure, quality, toxicity of lakes resulting in air pollution, contamination of urban water systems

Beside these dimensions, there are also organisational and implemental problems:

- Silos of deployed infrastructure (reuse of data sources for multiple challenges): varying levels of security
- Coordination between departments

- Technology acceptance and job evolution
- Data access, ownership, visualisation, cross department integration, standardisation

As elements for potential solutions several technologies were highlighted:

- Remote sensing for urban heat monitoring
- Intelligent street lighting control-based on mobility insights
- Community-based sharing of utilities, sustainable energy sources
- Open data platform for noise monitoring in local communities
- Automated enforcement speed, noise (e.g. loud vehicle detection)
    - requires legislation in place
- Multi-purpose use of data sources from existing infrastructure
- User centred product/service design
- Living lab strategy
    - visit schools, households, …
- Behavioural change (+ user acceptance of technology)
    - energy demand side management
    - water quality
    - waste management
    - decrease in short distance car use

4.1.1. Possible project ideas

The group has proposed four ideas of research projects:

Project idea 1: Intelligent street lighting control-based on mobility insights

The objectives or solution features are:

- to decrease in energy costs
- the integration of multi-modal data sources
- the integration of smart sensors
- a cost-effective technology adoption
- safety & security by design

Project idea 2: Open data platform for noise monitoring in local communities

The project could consider:

- support of cities as facilitators of the platform, public interface for communication
- mutual agreement within community
- living lab: selection of neighbourhoods, stakeholders, defining a model to maximise impact
- acceptance metrics: job evolution, involvement/commitment of right stakeholders

Project idea 3: Remote sensing for urban heat monitoring of buildings
The objective is to lower heat footprint of cities or regions.

Project idea 4: Energy communities (family, neighbourhoods, cities) for sharing renewable energy
The objectives are:

- behavioural change: gamification could be used
- lower energy footprint
- sharing access: factorizing on the human side
- virtual power plants for energy storage, distribution

4.2. City evolution planning

The group has listed several important problems for urban planning:

- Empower citizens with new technology and traditional ways
- Building permit license checking in line with the city plan
    - Predictive city planning
- BIM and GIS integration
    - How to update the city model with construction information
- Fast-moving data and slow-moving (static/historical) data integration
    - AR/VR
    - Traffic
- Evidence-based decision making
    - Requirement analysis
    - Validation, Feedback loop
    - Data integration, simulation, dashboard/visualisation
- Silos vs Connected Digital Twins
    - Different use cases
    - Transversal management
    - Comply with existing standards
- Public value; the GDPR is the minimum
    - Personal data vaults
    - Security, ethics
    - (Mandatory) access to data, open format, data governance
- Interactive and online city management / city control centre with real time data, policy based

To solve some of these open questions three ideas of research projects have been proposed:

4.2.1. Possible project ideas
Project idea 1: BIM and GIS integration / Connected Digital Twins

Project idea 2: City operations management / city control centre with real time data, public policy based
The project could focus on fast-moving data and slow-moving (static, historical) data integration. The project could consider:

- AR/VR
- Multiple digital twins
- Focusing on traffic, waste collection and activities for which the cities are involved

Project idea 3: Data and Model Market places

The project could consider:

- Mindful technology
- Public value; the GDPR is the minimum
- Personal data vaults, allowing individuals to take ownership and control of their data and share them at will
- Security, ethics
- (Mandatory) access to data, open format, data governance

4.3. Mobility

On mobility two groups have contributed to analyse the problems, suggest potential solutions and to propose project ideas. The mentioned problems are:

- Vendor lock-in for mobility applications
- Street parking optimisation
- Automated/passive road feature data collection
- Road wear management (faded markings, distresses, potholes)
- Optimised & integrated public transit (fixed route + on-demand)
- Automated data identification & classification
- Natural language real-time translation for guidance/navigation
- Integration of micro-mobility providers for simplification of use
- Noise analysis & optimisation from speed bumps
- Near real-time insight into pedestrian movement
- Optimisation of facility sharing across travel modes
- Support of multimodal movements and contextual requirements (level of activity, CO_2 emission, calories burned…)
- Long lasting incentives to change the behaviours

In addition to these problems, the discussion led to the following common visions:

- The most discussed problem was 'fear of vendor lock-in' for mobility applications. A proposed solution for this was to avoid procuring single-silo solutions from vendors. Instead, cities should procure technology 'layers' or 'tiers':
    - Data storage (on-premise/cloud): familiar technology providers include SQL, Oracle, AWS, Azure, etc.
    - Information structure eco-system tailored for mobility
    - User applications
- By using this approach, cities would be able to procure a wide variety of independent 'user applications' on the 3rd layer without fear of vendor lock-in because their 'information

- structure eco-system' is provided from a different vendor that would ensure interoperability and unification of the application data sources and consumers.

- There was a strong underlying theme that the concept of a 'digital twin' is commonly misunderstood, especially by elected city officials, who often demand one without understanding why they need one. This led to a strong emphasis on requirements gathering to ensure that the 'digital twin' has practical application and is not just a pretty picture. There was agreement that a digital twin can be extremely effective as a communication tool for the public and a collaboration tool to help keep multiple organisations in sync with each other, specifically when working together on large projects. The key element being that a digital twin, regardless of how many data sources, or perspectives, it represents, is a common representation of the world around us; not different digital variations of the same things, which is far too common with today's 'smart city' applications.

- Smaller cities have budget constraints that hardly allow specific developments to their specific requirements. One-off developments – typically in a consultancy mode – are costly. Companies will only productise solutions when the business case makes sense (read minimum sales volume). Hence the value of having mechanisms to discuss requirements cross-city, leading to innovative product definitions is meaningful for many.

- The digital twin is not the goal. It is just an effective solution philosophy that works well for use cases dealing with data and or use cases where several interdependent systems come together in one city environment.

- A digital twin can be an effective communication tool for policy effects/evaluations. The digital twin models the behaviour, and it comes with a range of (visualisation) applications that bring the data residing in the twin to its users.

- A comprehensive city digital twin can be about more than modelling just technical behaviour. Human response to technical/policy measures in the area of mobility would be a valuable extension.

- Many technologies already used in industrial contexts could be deployed for city applications. There is room for a forum to inform on city-relevant industrial technologies. This would allow policymakers to start brainstorming with a current and up-to-date view of available technologies.

4.3.1. Possible project ideas

The two groups have proposed six ideas for possible research projects:

- Project idea 1: Information structure eco-system software layer/tier/platform
- Project idea 2: X-city requirements gathering/definition tool
- Project idea 3: Human response modelling - real-time situational awareness
- Project idea 4: Visualisation/prediction tools for policy measures
- Project idea 5: Data sources for the last mile planning and multimodal/multiagent/multidata route planning
- Project idea 6: Machine and human readable policy goals to describe mobility solution requirements

4.4. Security and crisis management

The group has identified several problems and, in some cases, potential solutions:

- Building trust
    - Data quality, data availability for emergency services
    - Data, data sharing between organisations, privacy between organisation
    - In emergency situation what data is needed: finding the right data for the right moment
- Cyber security management
    - Needs of the authorities, event security management
- Usage of mobile sensors to security management
    - Drone-based security services for the city e.g. for the first responders; illegal drones, too many drones
    - Drone management, indoor/outdoor
    - Identification of rake drones – should there be closing of the lower airspace
    - Navigation if satellite navigation system is jammed
    - With drones to find abnormalities
    - Audio/sound or cameras for the detection – multipurpose technology needed
    - Solution movement of your phone – detection of traffic flow with cell phone data Use remote sensing – using the radio signal to use it for sensing
    - Solution : 6G to sense the drones
- Safety and security of citizen
    - Safety for pedestrian 24/7 in all situations
    - Building security – citizens need to be asked e.g. changing the lighting according to feeling of security
    - Solution: simulation of the environments using VR/AR – City metaverse
    - Information and communication of the safety and security narrative, relate to the perception
    - Floating pedestrian/car data still missing. The floating data would give background information for the decision. Also gender etc. background is important.
    - Cities experience difficulties to have quality information on how the people are moving (cycling, car driving…)
    - The instructions to the citizen must be harmonised and polite
    - Cameras – also light, noise, temperature, smell. Camera surveillance generates GDPR issues
- Development of Use case library
    - Learning from the previous research; there is a lot of information in different cities
    - Database - Gathering the information from European smart city research
    - Documentation and easy way to find information
- How to have security as an important point in the future smart city development
    - Multifactor analysis in the decision making
- Citizen engagement

4.4.1. Possible project ideas

Project idea 1: Cityverse (metaverse of the city) to gather citizen feedback on security

The project could look at:

- AR/VR to test different lightning, colour, … options
- Integration of citizen security feeling

Project idea 2: Drone for city security management

The project could address:

- Drone for large crowd monitoring
- Drone for emergency management
- Rogue drone detection
- Robustness against jamming

Project idea 3: library of experiences and recommendation system

The project could work on:

- Documentation of experiences and solutions developed by cities
- Capacity to search the library to retrieve advice for a new problem

5. Conclusion

Once again, this international customer workshop reconciliated the customers concerns and the interest of technology providers (large industry, research institutes as well as innovative SMEs). It occurred in a very open manner, thanks to all participants. It has been very fruitful with many challenges shared and 16 project ideas to build.

You are invited to use this valuable input and to create or join a customer-oriented idea for a project proposal in ITEA Call 2023. Remember that ITEA is very open but based on added value of each partner, thus clarify in advance what you offer to the project and to the other partners to join a project.

We look forward to discovering your unique solutions!

In addition to the emergence of these solid ideas and of some collaborations, the workshop has helped to progress towards a shared vision of the research priorities to address the important transformation underway in Smart cities. The participants have developed new connections that will be important as no single player can tackle the current challenges alone. In conclusion, this workshop was very valuable to foster ITEA activity in the smart cities sector.

Again, a big thanks to Nokia for hosting our customer workshop, to the organisations BABLE, Esri Canada and Siemens for helping us with the organisation and to all the participants for their valuable contribution!