Erasmus+

KA220-HED - Cooperation partnerships in higher education

(KA220-HED)

PROJECT NUMBER: 2023-1-EL01-KA220-HED-000164728

Project acronym: **DEMo4PPL**
Project full title: **Digital Education Modules 4 Participatory Planning**

OPT-T3: PARTICIPATORY PLANNING IN THE CONTEXT OF SMART CITIES

1. Short description

The module discusses the concept of smart cities, emphasizing the integration of Information and Communication Technologies (ICT) to enhance urban living and governance. It outlines the evolution of smart city models. The importance of participatory planning is highlighted, advocating for the engagement of various stakeholders, including government, industry, academia, and the public, to create a shared vision for urban development that aligns with the needs of residents.

Furthermore, the module identifies challenges in citizen engagement, such as complexity, inclusivity, and trust issues, which can hinder meaningful participation in smart city initiatives. It emphasizes the necessity of effective communication and transparency in decision-making processes to foster trust among community members. Various participatory planning approaches, including participatory prototyping and co-production, are proposed to enhance community involvement and ensure that urban development reflects the aspirations of all stakeholders. The module ultimately advocates for a balanced integration of technology and active citizen participation to create sustainable and inclusive urban environments

The module is intended to familiarize students with the concept of citizen engagement for smart city development and participatory planning in the context of smart cities in general. In more detail, it aims to help students:

- develop a basic understanding of the role of PPL in smart city development
- familiarize themselves with different approaches of citizen engagement in the smart cities' context, as well as new methods and tools
- Understand the dynamics and challenges of participatory planning in the smart city context

Co-funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

- Identify critical factors for successful citizen engagement (citizen role, level of engagement etc)

2. Keywords

Participatory Planning; Citizen Engagement; Inclusive Participation; Smart Cities, Quadruple Helix

3. Content

3.1. Introduction

Smart cities can be described as urban areas that leverage Information and Communication Technologies (ICT) to address various challenges related to energy, mobility, environment, economy, governance, health, quality of life, and education. The concept of smart cities varies widely, and while citizen engagement is often emphasized, it takes many different forms and approaches. According to Dameri (2013, p. 2549) a smart city can be defined as:

"*… a well-defined geographical area, in which high technologies such as ICT, logistic, energy production, and so on, cooperate to create benefits for citizens in terms of well-being, inclusion and participation, environmental quality, intelligent development; it is governed by a well-defined pool of subjects, able to state the rules and policy for the city government and development*".

Supriyanto et al. (2022) describe the evolution of smart city concepts through three stages: Smart City 1.0, Smart City 2.0, and Smart City 3.0.

- **Smart City 1.0**: This stage is characterized by a heavy reliance on advanced technology, where technology plays a central role in urban management and development.
- **Smart City 2.0**: In this phase, technology is used more selectively to address specific urban challenges, and there is a nascent involvement of citizens in decision-making processes, although their participation may still be limited.
- **Smart City 3.0**: This stage represents a more mature model where community participation is significantly enhanced. Citizens are actively involved in collaborative activities, contributing to social inclusion, improved democracy, and the development of social capital within the community.

Supriyanto et al. (2022) also argue that for a city to be truly "smart," it must prioritize community participation alongside technological advancements, ensuring that urban development aligns with the needs and aspirations of its residents. It should be noted that the recent pandemic has accelerated digital transformation and the implementation of smart city initiatives all over the world, prompting government to enhance electronic-based governance systems and accelerate many relevant technological transitions.

Developing smart cities is complex and requires collaboration among multiple stakeholders, including universities, industries, municipalities, and citizens, both in its planning, due to the multiplicity of possible smart city interventions available as options, and in its implementation, due to its high complexity (Alexopoulos et al., 2021).

Participatory planning is essential for the success of smart city development and involves engaging the so-called quadruple helix (see figure 1) in the design and decision-making processes related to urban development. This approach is crucial for fostering mutual understanding and creating a shared vision for future smart cities, addressing the diverse concerns and values of all stakeholders involved. The quadruple helix model includes government, industry, academia, and the public (van Waart, P., Mulder, I., & de Bont, C., 2016). This model emphasizes the importance of citizen involvement in the innovation process, ensuring that the development of smart cities is not solely driven by technological advancements but also considers the needs and perspectives of the community.

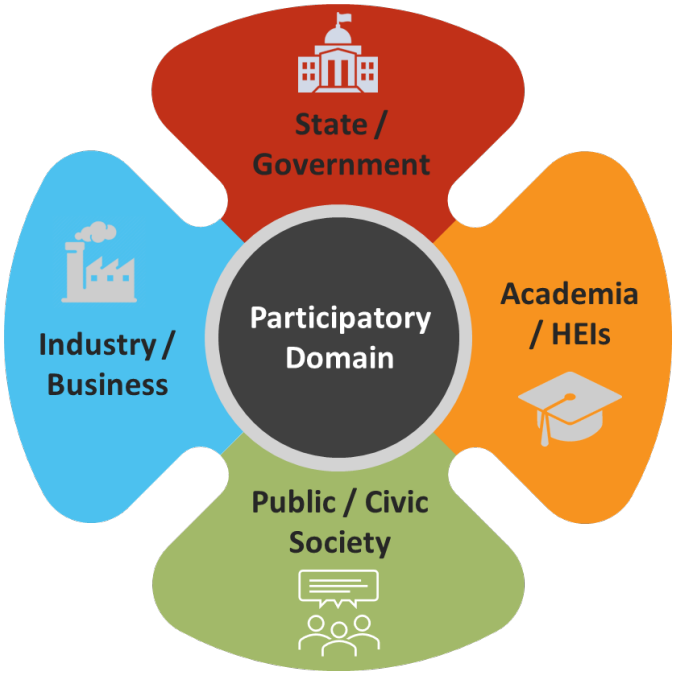

Figure 1: Quadruple helix in the participatory domain (source: (van Waart, P., Mulder, I., & de Bont, C., 2016))

Especially for planning (selecting and prioritizing) specific smart city actions to be implemented it is necessary to combine knowledge: i) on one hand from the university and the industry, concerning the possible smart city interventions, the capabilities they can offer in general, as well their difficulties and challenges; ii) and on the other hand from the municipalities and the citizens, concerning the 'real-life' benefits and value that these possible interventions can actually provide, and their potential for addressing specific challenges, problems and needs of modern cities (Alexopoulos et al., 2021).

3.2. Participatory Planning Approaches

Effective community involvement is essential for fostering innovation and creativity, which are crucial for achieving social sustainability within urban environments. Despite the challenges faced in community engagement, such as distrust in government initiatives, inadequate funding, and social limitations that hinder participation, there are many approaches for improving community engagement practices, advocating for the use of both digital and physical platforms to enhance stakeholder involvement. Community engagement can be effectively integrated into urban planning processes, ultimately supporting the creation of socially inclusive and technologically advanced urban spaces (Anthony, 2024).

The components of smart sustainable cities encompass various dimensions, including social, institutional, economic, technological, and environmental aspects (see figure 2). A smart sustainable city is characterized by its ability to enhance social capital and human resources through the integration of information and communications technology (ICT) to address societal issues and improve the quality of life for its residents. (Anthony, 2024). The social dimension seems to have been less investigated than other dimensions (such as the technological one), but, as it is closely linked to citizen participation, it should be explored more thoroughly.

Participatory planning approaches in the context of smart cities involve actively engaging citizens in the planning and decision-making processes that shape their urban environments, recognising that residents have valuable local knowledge and insights that can enhance the quality, functionality, and sustainability of urban planning outcomes. By involving citizens, cities can tap into a wealth of localized information, uncovering needs and preferences that might otherwise be overlooked, leading to the development of urban spaces that better serve their communities, with improved public amenities, transportation systems, and environmental sustainability. Some of these participatory planning approaches are described in this chapter.

3.3. Participatory Prototyping

This method combines participatory design and prototyping, allowing stakeholders to collaboratively envision and create prototypes of future applications for smart cities. The aim is to improve mutual understanding among stakeholders, develop a shared vision, and strengthen the social fabric of the community, where government, industry, universities, and citizens collaboratively create prototypes and develop a shared vision for future city services (van Waart, P., Mulder, I., & de Bont, C., 2016).

This method ensures that the designs and solutions developed are closely aligned with the actual needs and preferences of the community. It encourages continuous feedback and iteration, leading to more innovative and user-centric outcomes. Participatory prototyping can include the creation of physical models, digital simulations, or even pilot projects that allow stakeholders to experience and evaluate proposed changes. For example, a city might build a small-scale prototype of a new public space or use virtual reality to simulate different traffic scenarios. Citizens can then provide feedback on these prototypes, highlighting potential issues or suggesting improvements. This collaborative process not only enhances the final design but also

builds trust and fosters a sense of ownership among the community, ultimately leading to more successful and widely accepted urban development projects.

The participatory prototyping approach, according to van Waart et al. (2016) for smart cities aims to:

- improve (mutual) understanding between stakeholders (of each other's concerns and values),
- contribute a shared vision among stakeholders of the applications in the future smart city
- which addresses the concerns of all stakeholders as comprehensively as possible,
- strengthen the social fabric of stakeholders in the city, to sustain future collaboration,
- achieve the above through the collective creation of prototypes by stakeholders.

3.4. Smart city actions

This methodology for participatory planning of smart city interventions, proposed by Alexopoulos et al. (2021), is structured to facilitate the integration of knowledge and preferences from both municipalities and citizens. It is based on a detailed taxonomy of possible smart city actions and involves several key steps, which are outlined as follows:

1. **Taxonomy Development**: The methodology begins with the creation of a comprehensive taxonomy of smart city actions, which categorizes 59 specific actions across ten thematic areas, including ICT infrastructure, environment, transportation, health, waste management, energy, tourism, economy, security, and e-government.
2. **Data Collection**: The methodology employs a quantitative approach for data collection through two distinct questionnaires:
    - Municipalities' Questionnaire
    - Citizens' Questionnaire
3. **Data Processing** : The collected data undergoes three layers of processing:
    - **Layer I - Municipalities ' Data**: priority order for municipalities.
    - **Layer II - Citizens ' Data**: priority order for citizens.
    - **Layer III - Comparison of Priorities**: This layer compares the priority orders assigned by municipalities and citizens to identify points of convergence (where both groups agree on the importance of actions) and divergence (where their priorities differ). This comparison is crucial for understanding the differing perspectives of these stakeholders.

4. **Identification of Actions for Planning**: Identification of smart city actions that have high convergence in priority between municipalities and citizens, which can be prioritized for implementation. Conversely, actions with significant divergence require further consultation to understand the reasons behind the differing priorities and to promote mutual understanding.

Table 1: Smart city actions taxonomy (source: (Alexopoulos, C. & Loukis, E. & Charalabidis, Y., 2021)).

Category	Actions
1. ICT Infrastructure	Implementation of free wi-fi in municipal buildings and public areas Implementation of optical fiber network (MAN) Data center infrastructure for collecting and storing data from Internet of Things (IoT) sensors Hardware and software upgrade and lectronic document flow management system in the municipal offices Info-kiosks installation Installation of electronic boards providing information in real time
2. Environment	Installation of: • electromagnetic radiation measurement sensors • noise measurement sensors • air pollution measurement sensors • rain level measurement sensors • atmospheric microparticles measurement sensors • light level measurement sensors
3. Transportation - Mobility	Actions for monitoring and improvement of traffic management in real time Use of intelligent systems at pedestrian crossings Smart bus stops Installation of sensors on vehicles or roads for traffic flow monitoring Smart traffic information signs for traffic management Car parking spaces' sensors
4. Health	Implementation of health care tele-monitoring system to support vulnerable groups of people Implementation of telemedicine system for measurements of key health indica- tors Implementation of applications for remote monitoring of patient progress in remote - isolated areas
5. Waste Management & Water Resources	Online quality measurement system of drinking water Online monitoring system for detecting possible water leaks Actions encouraging - informing citizens about recycling through tele-education Online monitoring and management system of pumping and boring stations End to end irrigation management system Online waste containers' management system and waste collection fleet management

6. Energy – Sustainable development	Installation of photovoltaics in municipal buildings Construction of wind farms Energy savings in municipal buildings - energy consumption monitoring and management system Energy saving in the lighting of municipal streets and public spaces - smart lighting Actions for citizen information and awareness about energy saving Optimal routing and fuel consumption monitoring of municipal transportation vehicles, and fleet management systems, for reducing fuel consumption
7. Tourism - Culture	Development of a system for advertising and promoting local cultural ICT infrastructure and events Development of electronic local tourist guide & touristic content applications for mobiles Protection, promotion and enhancement of museums, galleries, monuments, etc. through virtual tours Digitization of museum content for creating digital cultural footprint
8. Economy – Sustainable Development	Actions for promoting entrepreneurship in municipal websites Actions for the promotion and sale of local products via municipal websites Employment actions via municipal websites Innovative actions for support high technology farming Promotion of innovative technological activities via municipal websites Interactive consulting services for young entrepreneurs in municipal web platforms
9. Security	Fires early warning and response system Systems for citizens' protection in emergencies Using ICT for security and surveillance of public buildings and facilities Weather conditions monitoring and forecast systems for agricultural production
10. E-Government	Electronic voting application (e-voting) Electronic consultation on important municipal decisions and plans Collection of electronic signatures on important municipal issues (e-petitions) Electronic (online) provision of the municipal services through the municipal website Development of applications Online monitoring system for collective bodies Free access to open data for use by individuals or other public agencies Geographic Information Systems (GIS) applications Implementation of e-Government Services provision framework

3.5. Community Participation-Based Smart City Development

Supriyanto, Saputra, Rachmawati, and Nugroho (2022) employ a qualitative methodology with a systematic literature review approach to explore citizen engagement in smart city development. They describe a model of participatory governance where citizens are actively involved in decision-making processes. This model is seen as essential for fostering a sense of community and ensuring that development initiatives are effective and equitable. This approach advocates for a balanced approach that integrates technological advancements with active community participation to create smart cities that truly reflect the needs and aspirations of their residents.

The proposed model consists of three main dimensions: technology, people, and institutions. This model emphasizes the importance of integrating these dimensions to foster effective community involvement in the governance and development processes of smart cities.

1. **Technology**: This dimension focuses on the use of information and communication technology (ICT) to enhance urban living and governance. It includes the development of digital infrastructure that facilitates communication between the government and the community, enabling citizens to provide feedback and participate in decision-making processes.
2. **People**: This aspect highlights the role of the community in the smart city framework. It stresses the need for active participation from citizens, ensuring that their voices are heard in the planning and implementation of urban initiatives. The model advocates for a participatory governance approach where community members are not just passive recipients of services but active contributors to the development process.
3. **Institutions** : The institutional dimension refers to the governance structures that support community participation. It encompasses policies, regulations, and frameworks that encourage citizen involvement in decision-making. Effective institutions are crucial for creating an environment where community participation can thrive, ensuring that the processes are transparent, accountable, and inclusive.

3.6. Public and private sector involvement for smart city development

Iamtrakul, Klaylee, and Ruengratanaumporn (2021), propose a participatory planning approach that involves stakeholders from the public and private sectors to drive smart city development. The approach utilises design thinking processes to identify problems, set goals, and recommend development plans for short, medium, and long-term strategies.

They propose that creating a city database with a visualization system is essential for identifying urban problems and developing sustainable solutions. Effective data management and collaboration between public and private sectors are crucial for successful smart city initiatives, as is the integration of technology and participatory governance to enhance urban living conditions and achieve sustainable development goals (Iamtrakul et al., 2021).

The proposed model includes the following steps/actions:

1. **Stakeholder Engagement**: Collaboration is essential for identifying urban problems and developing innovative solutions that cater to the needs of the community.
2. **Design Thinking Process**: The study employs a design thinking framework, which consists of three main dimensions:

- **Defining Problems**: Stakeholders collaboratively identify and prioritize urban issues, assessing their urgency and importance.
- **Setting Goals**: Clear objectives for smart city development are established, guiding the planning process.
- **Recommending Development Plans**: Participants formulate short-term, medium-term, and long-term strategies, focusing on technology and innovation to address identified problems.

3. **Data-Driven Decision Making**: A significant aspect of the participatory planning approach is the creation of a city database with a visualization system. This database serves as a foundation for identifying urban challenges and developing sustainable solutions. It enables stakeholders to make informed decisions based on data analysis.
4. **Inclusivity and Transparency** : The approach promotes inclusivity by ensuring that all voices are heard in the planning process. Transparency in data sharing and decision-making fosters trust among stakeholders and encourages active participation.
5. **Focus on Sustainability** : The participatory planning approach aligns with the principles of sustainable development, aiming to create urban environments that are economically viable, socially equitable, and environmentally sustainable. This is achieved through collaborative efforts to innovate and implement solutions that enhance the quality of life for residents.

3.7. Co-production

Co-production in smart city development refers to the collaborative process where citizens, government entities, businesses, and other stakeholders work together to design, implement, and manage urban initiatives. This theory emerges from the New Public Management (NPM) framework, which emphasizes customer-oriented and outcome-oriented approaches in public service delivery. Co-production is defined as the collaborative provision of services through long-term relationships between professional service providers and community members, where all parties contribute resources. This approach recognizes citizens not as passive recipients of services but as active participants in both service design and delivery (Granier, B. & Kudo, H., 2016). This approach leverages the collective intelligence, resources, and expertise of all parties involved to create more effective, sustainable, and inclusive urban solutions. While co-production can enhance social inclusion, it does not always guarantee shared decision-making power.

3.8. From technology-driven to application-driven planning

Stratigea et al. (2015) argue that smart city solutions should prioritize the urban context over technology, advocating for a shift from technology-driven to application-driven planning. They outline the challenges contemporary cities face, such as demographic

changes, climate change, and social cohesion issues, and highlight the role of Information and Communication Technologies (ICT) in addressing these challenges. Their proposed framework consists of a structured, participatory approach that integrates Information and Communication Technologies (ICT) to enhance urban sustainability. This framework is designed to guide policy-making and urban planning efforts by focusing on the specific needs of cities and their citizens. It comprises four main stages:

1. Scanning: This initial stage involves a comprehensive review of existing smart city applications and strategies at both global and European levels. The goal is to identify and classify successful smart city initiatives, which can serve as benchmarks for future development. This stage helps in understanding the current state-of-the-art in smart city applications and the challenges faced by various urban environments.
2. Establishment of Tools and Technologies: In the second stage, a pool of tools and technologies is created to support data management and public participation. This includes geo-data collection tools, public engagement technologies, and smart city applications that can effectively communicate the benefits of smart city development. The aim is to provide decision-makers and planners with a range of options that can be tailored to the specific context of their cities.
3. Collaborative Planning Framework: The third stage focuses on structuring and evaluating alternative options for smart city development. This involves a participatory approach that incorporates the unique physical and social realities of each urban environment. The framework encourages the establishment of broad urban coalitions, facilitating cooperation between citizens, local stakeholders, and decision-makers. This collaborative effort aims to create a vision-driven process for urban regeneration that aligns with sustainability goals.
4. Web Platform Development: The final stage involves the creation of a digital platform that integrates the tools and technologies identified in the previous stages. This platform is designed to facilitate online communication and interaction between citizens and planners, enabling co-design and co-decision-making for city-specific policies and smart applications. The platform serves as a foundation for ongoing citizen engagement and supports the implementation of sustainable urban planning options.

3.9. Crowdsourcing

Crowdsourcing is a method that leverages the collective intelligence and participation of a large group of people, often through digital platforms, to gather data, generate ideas, or solve problems. In the context of smart cities and infrastructure systems, crowdsourcing plays a crucial role in enhancing urban living by integrating citizen input into planning and decision-making processes (see figure 3).

Srivastava and Mostafavi (2018) describe various aspects of crowdsourcing, which can be categorized into three main characteristics: human, data, and system characteristics.

1. Human Characteristics:

    - Motivation: Understanding what drives individuals to participate in crowdsourcing initiatives is essential. Motivations can be intrinsic (e.g., contributing to community improvement) or extrinsic (e.g., monetary rewards).
    - Digital Divide: This refers to the disparities in access to technology and the internet, which can affect participation rates.
    - Amateur vs. Professional: The distinction between amateur participants and professionals can impact the quality of contributions. in the data collected.

2. Data Characteristics:

    - Transparency vs. Privacy: Balancing the need for transparency in data collection with the privacy concerns of participants is critical.
    - Reliability: The reliability of data collected through crowdsourcing is paramount. Issues can arise from both non-intentional (e.g., user error) and intentional (e.g., malicious intent) reliability threats
    - Size, Variety, and Granularity: The volume and diversity of data generated through crowdsourcing can be overwhelming.

3. System Characteristics:

    - Cost: Crowdsourcing is often seen as a cost-effective alternative to traditional data collection methods. However, the initial setup costs and ongoing maintenance must be considered.
    - Duration: Longer projects may attract more participants and foster a sense of community engagement.
    - Scalability: The ability to scale crowdsourcing initiatives can enhance the diversity of ideas and solutions generated. Large-scale projects can benefit from shared learning and experiences across different regions.
    - Technical Support: Providing adequate technical support is crucial for both participants and clients to ensure smooth operation and address any issues that arise during the crowdsourcing process.
    - Uncertainty: The unpredictability of outcomes in crowdsourcing initiatives can pose challenges. Factors such as participant motivation and the potential for opportunistic behavior can affect the success of the project.

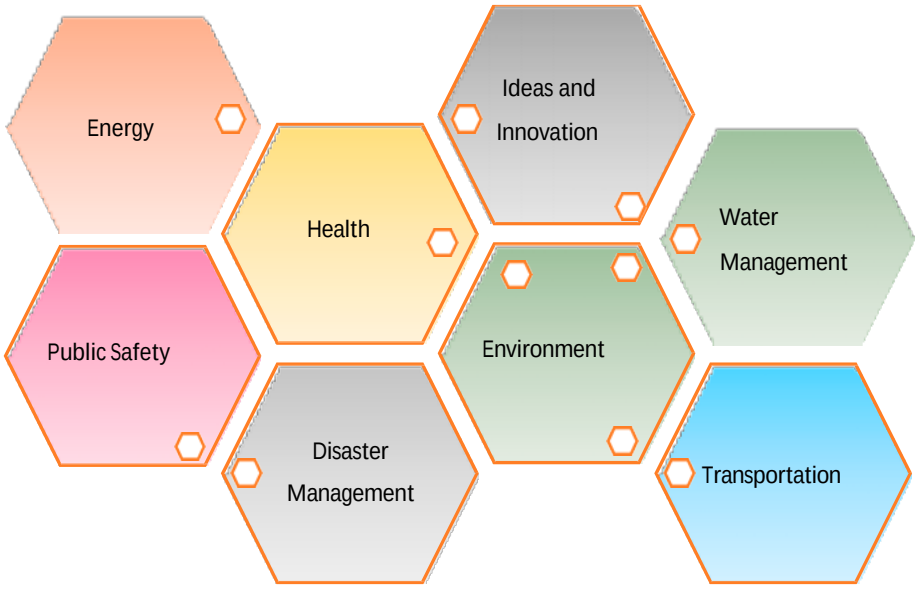

Figure 3: Areas of application of crowdsourcing in the context of smart city planning (source: Adapted from Srivastava, P., & Mostafavi, A., 2018).

3.10. Participatory Sensing

In recent years, the concept of participatory sensing was introduced, which utilizes everyday mobile devices to create interactive sensor networks. This approach enables users to gather, analyse, and share local knowledge across various domains, including urban planning. Kron iris. & Maisonneuve (2011) emphasise the importance of user participation in data collection and the potential for grassroots sensing initiatives[1] that empower communities to address local concerns without waiting for formal projects or funding. Unlike traditional sensor networks that rely on centralized data collection, participatory sensing emphasizes the role of individual users in the data-gathering process. Users can contribute data based on their personal experiences and observations, which enhances the richness and relevance of the information collected.

The evolution of wireless sensor networks and the role of mobile phones in enabling participatory sensing, where users become active data producers, is highlighted by Krontiris & Maisonneuve (2011), as are the privacy concerns associated with sharing personal information, particularly location data, and the need for technical solutions to balance privacy with social visibility. It is proposed that while anonymity can protect user privacy, it complicates accountability and reputation systems, with potential solutions including:

1. Anonymity-Based Approaches
2. Revocation of Misbehaving Users
3. Anonymous Reputation Systems
4. Use of Cryptographic Tools
5. Social Translucence Features

[1] Grassroots sensing initiatives: initiatives where communities can independently gather data on local issues without waiting for formal projects or funding. This democratisation of data collection allows for a more responsive and engaged citizenry.

Participatory sensing represents a shift towards more inclusive and community-driven data collection methods, utilizing the capabilities of mobile technology to empower individuals and enhance collective understanding of local environments (JA B. et all, 2006). Overall, the proposed solutions aim to create a balance between user privacy and the need for social visibility and accountability in participatory sensing environments. Further research is suggested to refine these solutions and enhance their effectiveness in real-world applications.

3.11. Evaluation Framework for citizen participation

Simonofski et al (2017) discuss the critical role of citizen involvement in the development and implementation of smart city initiatives. Aiming to explore how cities can enable citizen participation and evaluate this participation effectively, they identify key sub-questions regarding the means of participation and evaluation methods. Their proposed evaluation framework categorises citizen participation into three main roles:

- Citizens as Democratic Participants: Involvement in decision-making processes.
- Citizens as Co-Creators: Engaging in the design and implementation of smart city projects.
- Citizens as ICT Users: Utilizing technology to enhance their participation and interaction with city services.

The framework is designed to assess how well cities facilitate citizen participation. It can be used both ex-post (to evaluate existing strategies) and ex-ante (as a guideline for future strategies).

3.12. Challenges for citizen engagement in smart cities development

Despite the potential benefits, public participation faces criticisms regarding its relevance and efficacy. Critics argue that participatory mechanisms may suppress dissent and manipulate public opinion rather than genuinely involve citizens in decision-making. Additionally, there are concerns about the representativeness of participation, as certain demographics may be excluded due to time constraints, lack of skills, or discomfort in participatory settings (Granier, B. & Kudo, H., 2016).

The main challenges of engaging citizens in smart city development are described below:

Achieving Meaningful Participation

1. **Complexity and Accessibility** : Urban planning and smart city initiatives often involve technical jargon and complex processes that can be intimidating for average citizens. This complexity can discourage participation, especially among those who feel they lack the expertise to contribute meaningfully.

Unlike many other design challenges, designing a smart city involves large-scale, complex urban innovations that exceed the span of the codesign relationship between designer and end user (van Waart et al., 2016).

2. **Inclusivity** : Ensuring that participation efforts reach a diverse cross-section of the population is challenging. Marginalized groups, including low-income residents, elderly individuals, and those with disabilities, are often underrepresented in public consultations and digital engagement platforms.

   Representation Issues: The article points out that the mechanisms for gathering community input often favour elite groups, which can lead to a skewed representation of community needs and priorities. This issue highlights the importance of ensuring that all community members, especially those from disadvantaged backgrounds, can express their views and contribute to the planning process (Supriyanto et al., 2022).

3. **Inadequate Socialisation** : One of the primary challenges identified is the lack of effective socialisation of programs aimed at increasing community participation. Many community members are not adequately informed about the initiatives available to them, which limits their ability to engage meaningfully in the development processes. This lack of awareness can lead to low participation rates and a disconnect between the government and the community (Supriyanto et al., 2022).

Building Trust and Transparency

1. **Historical Skepticism** : If citizens have experienced situations where their input was ignored or tokenistic, rebuilding trust can be difficult. They may doubt whether their contributions will genuinely impact decision-making processes.
2. **Cultural and Social Barriers**: Cultural attitudes towards participation and governance can also pose challenges. In some communities, there may be a lack of trust in government institutions or a belief that participation will not lead to meaningful change. Overcoming these cultural barriers is essential for fostering a more participatory environment.
3. **Transparency of Processes**: It's crucial to clearly communicate how citizen input will be used and to demonstrate the tangible impact of their contributions. Without transparency, participants may feel that their efforts are futile.
4. **Limited Access to Decision-Making** : The article highlights that lower socio-economic groups often have limited access to decision-making processes. This exclusion can result in the voices of marginalized communities not being heard, which undermines the goal of inclusive governance. The participation of these groups is essential for ensuring that development initiatives address the needs of the entire community (Supriyanto et al., 2022).

Addressing the Digital Divide

1. **Access to Technology**: Not all citizens have equal access to digital tools and the internet. This disparity can exclude significant portions of the population from participating in digital engagement efforts.

2. **Digital Literacy**: Even among those with access to technology, varying levels of digital literacy can affect their ability to engage effectively. Providing support and resources to help citizens use digital platforms is essential.

Sustaining Engagement

1. **Long-Term Commitment**: Citizen engagement requires sustained effort and commitment over time. Short-term initiatives may fail to maintain interest and momentum, leading to disengagement.

   Participatory planning requires systematic changes in the relationships between stakeholders and a focus on addressing real city issues to motivate participation. Additionally, hosting events in locations familiar to citizens may enhance their engagement (van Waart et al., 2016).

2. **Balancing Conflicting Interests**: Urban development projects often involve multiple stakeholders with differing priorities. Managing and balancing these interests to find common ground can be complex and time-consuming.

By addressing these challenges through thoughtful and inclusive strategies, cities can create more effective and meaningful participatory processes that truly reflect the needs and aspirations of their communities.

4. Classroom discussion topics / case studies

Topics that can be discussed in the classroom include:

- The role of technology in urban development (IoT, big data, AI, etc.)
- Key goals of smart cities (sustainability, efficiency, innovation)
- Benefits of participatory planning in smart city development: inclusion, empowerment, and enhanced decision-making
- The role of citizens in shaping the policies and development of their cities
- Digital platforms and tools for citizen engagement (e.g., online surveys, social media, participatory mapping)
- Case studies of successful citizen engagement (e.g., participatory budgeting in Porto Alegre)
- How technology enables citizen engagement in smart cities
- Role of mobile apps, sensors, and data collection tools in gathering public input
- Crowdsourcing solutions to urban challenges (e.g., traffic, waste management, pollution)
- Ensuring equity in participatory planning: addressing marginalized communities
- Strategies to overcome barriers to engagement (digital divide, language, socio-economic factors)
- The importance of representation and diversity in the planning process

- Tools to enhance accessibility and inclusivity (e.g., multilingual platforms, community workshops)
- The concept of smart governance: using technology for better governance and accountability
- How digital tools can help foster transparency in decision-making
- Privacy concerns and data security in citizen engagement platforms
- Managing conflicting interests: balancing technological solutions with local needs
- Overcoming citizen skepticism and distrust in technology and government
- Legal and regulatory challenges in implementing participatory urban planning
- Collaboration between municipal authorities, tech companies, Universities and citizens
- Emerging trends in participatory planning: AI and the future of co-design
- Anticipated innovations in citizen engagement platforms (e.g., VR/AR, blockchain)
- Ethical dilemmas related to data collection and surveillance
- Ensuring informed consent in digital platforms
- Ethical implications of AI in decision-making and urban design
- Measuring social impact, community satisfaction, and long-term outcomes

These topics combine theoretical foundations with practical examples, helping students understand the dynamic intersection of technology, governance, and civic participation in shaping the cities of the future.

5. Assignment

The assignment is to prepare a short presentation on a case study related to participatory planning initiatives in smart cities. Students can use the case studies mentioned below or use any other case study that they can get adequate information for. Students should give some info on the details and context of the case study. The assignment should focus on the approach to participatory planning, the critical factors for success or failure and the main findings. The presentation should mention any unique details that had an impact on the results, as well as the participating stakeholders.

The assignment can be individual or group, depending on the number of students and time availability. In cases where teamwork is selected, the assignment could be altered to include a comparison of two or more case studies.

Case Studies / Examples:

urbanAPI

The urbanAPI case study discusses the urbanAPI project, which focuses on enhancing participatory governance in urban planning through the use of Information and Communication Technologies (ICT).

1. **Project Overview:**

The urbanAPI project, funded by the EU under the FP7 program, aims to improve urban governance by developing three ICT applications: the 3D Scenario Creator (3DSC), the Mobility Explorer (ME), and the Urban Development Simulator (UDS). These tools are designed to facilitate stakeholder engagement and enhance decision-making processes in urban planning across four pilot cities: Vienna, Vitoria-Gasteiz, Bologna, and Ruse.

2. **Applications:**

   - **3D Scenario Creator (3DSC)**: This application allows urban planners to visualize development proposals in 3D, enabling better communication with stakeholders and public participation in the planning process.
   - **Mobility Explorer (ME)**: Utilizes anonymized mobile phone data to analyze population mobility patterns, assisting planners in understanding urban dynamics and improving transport planning.
   - **Urban Development Simulator (UDS)**: Employs agent-based modeling to simulate the socio-economic impacts of planning decisions over time, facilitating long-term urban planning.

3. **Evaluation Methodology:**

   The paper outlines a structured evaluation process for the applications, which included user feedback from stakeholders in the pilot cities. The evaluation focused on usability, functionality, and the overall impact of the tools on urban planning.

4. **Findings:**

   The results indicated that the urbanAPI applications significantly enhance participatory governance by improving stakeholder engagement and providing valuable insights for urban planning. However, challenges such as data quality and the need for comprehensive training were identified.

5. **Conclusions:**

   The paper concludes that the urbanAPI tools are effective in promoting participatory governance and supporting sustainable urban development. They facilitate better communication among stakeholders and provide essential data for informed decision-making in urban planning.

   https://www.inderscienceonline.com/doi/abs/10.1504/IJSTM.2017.088945

Other Case Studies:

- Hackday Data of the Crowds and GovJam, where participatory prototyping was implemented. These events demonstrated how stakeholders could collaboratively explore technological possibilities and improve public services. Participants reported gaining new insights and perspectives on urban challenges, highlighting the effectiveness of participatory planning in fostering

collaboration and innovation. These events brought together diverse stakeholders to collaboratively develop concepts and prototypes for smart city applications. (https://www.researchgate.net/publication/276290920_PARTICIPATORY_PROTOTYPING_FOR_FUTURE_CITIES)

- In Greece, data was collected from 144 municipalities and 500 citizens. The findings highlighted differing priorities between municipalities, which focused on ICT infrastructure and e-government, and citizens, who prioritized health, security, and environmental actions. https://www.researchgate.net/publication/350111618_A_Methodology_for_Participatory_Planning_of_Smart_City_Interventions
- The evaluation framework was applied to evaluate the smart city strategy of Knokke-Heist, Belgium. The analysis revealed several shortcomings in citizen participation, such as a lack of representative citizen involvement and insufficient support for participatory processes. https://www.researchgate.net/publication/341150884_Towards_a_Holistic_Evaluation_of_Citizen_Participation_in_Smart_Cities
- The e-Musrenbang program in cities like Surabaya, which aims to facilitate community input in development planning through ICT. However, it seems that participation levels have not met expectations. https://www.researchgate.net/publication/329966400_State_Sphere_Shift_into_Public_Sphere_E-Musrenbang_Surabaya_City
- Case study of Kitakyushu, one of the Smart Communities, where they find that while citizens are involved in some feedback mechanisms, their role is largely limited to compliance rather than active participation in governance. https://www.researchgate.net/publication/335080852_Smart_community_guideline_case_study_on_the_development_process_of_smart_communities_in_Japan

Other possible assignments:

- Designing a participatory planning exercise using smart technology (e.g., creating a mock digital engagement platform)
- Group discussions or role-playing simulations about potential smart city solutions and how citizens might engage in the planning process

6. Summary of Learning

Q1: What is the significance of participatory planning in the context of smart cities?

A: Participatory planning is significant in the context of smart cities as it involves engaging citizens in the design and decision-making processes, ensuring that urban development aligns with the needs and aspirations of the community, and enhancing the quality and sustainability of urban planning outcomes.

Q2: What is the significance of the quadruple helix model in smart city development?

A: The quadruple helix model is significant in smart city development as it emphasizes the collaboration among government, industry, academia, and the public, ensuring that the development process considers the needs and perspectives of the community alongside technological advancements.

Q3: How the digital divide in the context of citizen engagement in smart cities be addressed?

A: Addressing the digital divide involves ensuring that all citizens, regardless of socio-economic status, have access to digital tools and platforms that facilitate participation in smart city initiatives. This includes providing training and resources to marginalized groups, enhancing digital literacy, and creating inclusive platforms that allow for diverse voices to be heard in the decision-making processes, thereby fostering a more equitable environment for citizen engagement.

Q4: What are the roles that can be identified for citizen participation in smart city development?

A: The roles that can be identified for citizen participation in smart city development are:

- Citizens as Democratic Participants: Involvement in decision-making processes.
- Citizens as Co-Creators: Engaging in the design and implementation of smart city projects.
- Citizens as ICT Users: Utilizing technology to enhance their participation and interaction with city services.

Q5: What challenges are identified for citizen engagement in smart city development?

A: Several challenges for citizen engagement in smart city development are identified, including:

- Complexity and Accessibility
- Inclusivity
- Representation Issues
- Inadequate Socialisation
- Historical Skepticism
- Cultural and Social Barriers
- Transparency of Processes
- Limited Access to Decision-Making
- Access to Technology
- Digital Literacy

- Long-Term Commitment
- Balancing Conflicting Interests

Quiz

Q1: What are smart cities primarily designed to address?

A. Only mobility challenges
B. Environmental issues
C. Various urban challenges including mobility, environment, and governance
D. Economic development alone

A: C

Q2: What is the primary purpose of participatory planning in the development of smart cities?

A. To reduce costs of urban development
B. To engage stakeholders in decision-making processes
C. To streamline government regulations
D. To limit citizen involvement in urban planning

A: B

Q3: What is essential for fostering innovation and creativity in urban environments

A. Increased funding for government programs
B. Effective community involvement
C. Strict regulations on urban development
D. Automated technological systems

A: B

Q4: What is the primary goal of participatory prototyping?

A. To create final products without stakeholder input
B. To improve mutual understanding among stakeholders and develop a shared vision
C. To focus solely on technological advancements
D. To minimize community involvement

A: B

Q5: Which of the following thematic areas is NOT included in the taxonomy of smart city actions?

A. Education

B. Environment
C. Transportation
D. Energy

A: A

Q6: If you were to implement the participatory governance model in your community, which dimension should you prioritize to enhance community involvement?

A. Increasing technology access only
B. Developing strong institutional frameworks alone
C. Integrating technology, people, and institutions
D. Focusing solely on citizen awareness programs

A: C

Q7: Which of the following challenges is NOT mentioned as a contemporary issue faced by cities?

A. Demographic changes
B. Climate change
C. Economic recession
D. Social cohesion issues

A: C

Q8: Which of the following is NOT mentioned as a role for citizen participation in smart city development?

A. Citizens as Democratic Participants
B. Citizens as Co-Creators
C. Citizens as ICT Users
D. Citizens as Planners

A: D

Q9: What is a key factor in understanding why individuals participate in crowdsourcing initiatives?

A. Digital Divide
B. Scalability
C. Motivation
D. Cost

A: C

Q10: What is the primary focus of participatory sensing?

A. Monitoring environmental changes exclusively.
B. Enabling users to gather, analyse, and share local knowledge.
C. Centralized data collection by authorities.
D. Developing new mobile devices for data collection.

A: B

7. Bibliography

Alexopoulos, C. & Loukis, E. & Charalabidis, Y. (2021). A Methodology for Participatory Planning of Smart City Interventions. In Estevez E., Pardo T. A. & Scholl H. J. (Eds), Smart Cities and Smart Governance, Towards the 22nd Century Sustainable City (pp.163-188), Springer. 10.1007/978-3-030-61033-3_8.

Anthony, B. (2024). The Role of Community Engagement in Urban Innovation Towards the Co-Creation of Smart Sustainable Cities. J Knowl Econ 15, 1592-1624. https://doi.org/10.1007/s13132-023-01176-1

Dameri, R. P. (2013). Searching for smart city definition: A comprehensive proposal. *International Journal of Computers & Technology*, 11, 2544-2551.

Granier, B. & Kudo, H. (2016). How are citizens involved in smart cities? Analysing citizen participation in Japanese ``Smart Communities''. *Information Polity*. 21. 61-76. 10.3233/IP-150367.

Iamtrakul, P., Klaylee, J. & Ruengratanaumporn, I. (2021). Participatory Planning Approach Towards Smart Sustainable City Development. *Proceedings of International Structural Engineering and Construction*. 8. 10.14455/ISEC.2021.8(1).SUS-11.

JA B., Estrin D., Hansen M., Parker A., Nithya, R.AA., & Reddy S. & Srivastava M. (2006). Participatory Sensing. Workshop on World-Sensor-Web (WSW): Mobile Device Centric Sensor Networks and Applications.

Khan, Z. & Ludlow, D. & Soomro, K. (2017). Participatory governance in smart cities: The urbanAPI case study. *International Journal of Services Technology and Management*. 23. 419. 10.1504/IJSTM.2017.10009859.

Krontiris, I. & Maisonneuve, N. (2011). Participatory Sensing: The Tension Between Social Translucence and Privacy, in Salgarelli, L., Bianchi, G. & Blefari-Melazzi, N. (Eds), Trustworthy Internet (pp.159-170), Springer. 10.1007/978-88-470-1818-1_12.

Simonofski, A. & Serral, E., De Smedt, J. & Snoeck, M. (2017). Citizen Participation in Smart Cities: Evaluation Framework Proposal. Presented in 19th IEEE Conference on Business Informatics, Thessaloniki, Greece. 10.1109/CBI.2017.21.

Stratigea, A., Papadopoulou, C. A., & Panagiotopoulou, M. (2015). Tools and Technologies for Planning the Development of Smart Cities. Journal of Urban Technology, 22(2), 43-62. https://doi.org/10.1080/10630732.2015.1018725

Srivastava, P., & Mostafavi, A. (2018). Challenges and Opportunities of Crowdsourcing and Participatory Planning in Developing Infrastructure Systems of Smart Cities. Infrastructures. https://doi.org/10.3390/infrastructures3040051

Supriyanto E. E., Saputra J., Rachmawati M. & Nugroho N. J. (2022) Community Participation-Based Smart City Development, Proceedings of the First Multidiscipline International Conference, MIC 2021, October 30, Jakarta, Indonesia. DOI: 10.4108/eai.30-10-2021.2315776.

van Waart, P., Mulder, I., & de Bont, C. (2016). A Participatory Approach for Envisioning a Smart City. *Social Science Computer Review*, 34(6), 708-723. https://doi.org/10.1177/0894439315611099

8. Glossary

Quadruple Helix: The "Quadruple Helix" concept refers to a model of innovation and collaboration that includes four key sectors: academia, industry, government, and civil society.

Stakeholder participation : Stakeholder participation refers to the process of involving individuals, groups, or organizations that have a vested interest or stake in a particular project

1.