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The Wharf Street Smart Park Story: A Guide to Navigating Multi-Stakeholder Innovation in Smart Cities

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Abstract: The challenges of multistakeholder innovation in smart city projects can be navigated through collaboration and a clear understanding of each organisation's values, technology, user groups, and potential policy changes. Increasing technology use in urban development projects brings numerous challenges, such as technology redundancy, varying stakeholder expectations, and the required policy changes. This paper aims to discuss the story of the development of Wharf Street smart park in Western Australia and highlights strategies for overcoming the challenges of multistakeholder innovation in smart city projects. It utilises a democratic collaboration tool to map out each organisation's vision, values, and responsibilities at the initial stage of the project to create an open innovation ecosystem where knowledge can be shared. High collaboration levels using this tool have helped establish common goals, adaptive practices and overcome governance and technical challenges. However, the tool needs further development, as it was found to be insufficient in addressing long-term management issues, risk mapping, and user group identification for big data.

Keywords: adaptive practices; collaboration approaches; democratic collaboration tool; multistakeholder engagement; Wharf Street smart park

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1. Introduction

How do we navigate the challenges of multistakeholder innovation in complex smart city projects that demand collaboration to navigate the unknowns regarding other organizations' values, type of technology and user groups, and impending policy changes?

Technology use in urban development to achieve liveability, economic and environmental sustainability is something that is increasingly becoming prevalent given the projected rapid growth in urban populations over the next few decades [1]. However, this brings numerous challenges regarding technology redundancy, multiple stakeholder engagement, policy changes required for new technological insertions, and big data users. Our story on Wharf Street smart park in Western Australia unfolds some ways of navigating through these challenges—some successes and failures. We present a democratic collaboration tool to be used by government, nongovernment organisations, researchers and practitioners involved in such projects [2].

Innovation has long been a closed process where research and development regarding technology and its use has been seen as being held within a self-contained company environment. Smart city projects, however, require multiple organization collaboration [3].

Here, we present a democratic collaboration tool that maps individual organisations' visions, values, and responsibilities right at the start of the project. This establishes an open innovation ecosystem where knowledge can be shared and cocreated between partners. A high degree of collaboration using the framework helped to establish common goals and adaptive practices towards delivering the project, which helped overcome governance and technical challenges. Project evaluation conducted at the completion stage found that while

the collaboration tool helped in developing a strong shared vision, synergetic values, and evaluation measures amongst the multiple partner organisations, it lacked in responding to long-term management issues, risk mapping, and user group identification for big data.

After setting the context, need, and type of collaboration models, this article discusses the Wharf Street Basin project in the city of Canning, Perth, Australia.

2. Context

The demand for increased public participation and active citizenship is gaining momentum and generating discussions across various sectors of society. This trend is particularly noteworthy due to the flexible nature of the institutional framework in this specific context, which allows for swift adaptations to innovative approaches [4].

Urban areas, serving as the primary settings for human interaction and contemporary development, assume a vital role in this context. Consequently, urban planning emerges as a key focal point in the discourse on using participation to engage in politics. As participation in urban planning increases, the interactions between government, market, and community become more complex, necessitating effective management to achieve long-term societal benefits. Successful collaboration relies on aligning contextual factors and establishing a robust communication network among diverse stakeholders [5]. To successfully implement smart city projects and achieve long-term societal benefits, it is crucial to promote collaboration and establish a robust communication network among diverse stakeholders who can contribute their unique skills, perspectives, and resources to the project. In the following section, we discuss the different collaborative models that incorporate a diverse range of stakeholders, including government bodies, private companies, and community members, as essential for the successful implementation of smart city projects.

3. Collaboration Approaches

Collaborative decision theory, rooted in system science, aims to establish a decision-making mechanism that yields improved results through information exchange, enabling all stakeholders to maximise their benefits. The formulation of urban regeneration plans can be seen as a collaborative decision-making process, where stakeholders work together towards a final decision that seeks to strike a balance between heritage preservation, economic development, and social equality, ultimately benefiting the public [6]. However, achieving this balance is challenging, as it involves seeking an approximate dynamic equilibrium rather than a static and absolute balance. Defining the dynamic equilibrium point is highly complex and varies across different situations. Moreover, urban regeneration is a complex system engineering effort, with interconnected and interactive elements such as stakeholders, capital, materials, policies, and processes. To accommodate the intricate and everchanging nature of the decision-making process, more intentional and flexible strategies or approaches are necessary for urban regeneration. These strategies should ensure a more reasonable and effective mechanism for distributing benefits and sharing responsibilities among different stakeholders [7].

While previous studies have explored the decision-making process involving multiple stakeholders in urban regeneration, they have predominantly been conducted from the perspectives of urban studies and sociology, lacking theoretical foundations from management science that underpin collaborative decision-making issues. Existing research primarily focuses on public participation and the roles of various stakeholders, with some attention given to the sustainability aspect of decision-making in urban regeneration [8]. Traditional decision analysis methods, such as the multicriteria approach, have been applied successfully in a static perspective to support the decision-making process. However, few studies have assessed the quality and performance of decisions from a dynamic perspective inherent in collaborative decision-making. Given the complexity of collaborative decision-making in urban regeneration, a comprehensive understanding necessitates the utilization of advanced theories and methodologies from management and decision science [9–15].

In this context, collaboration arises when major legitimate actors involved in a project, such as the market, government, and community, create platforms for interaction. These platforms facilitate discussions on the interests of each party and ensure that veto power is shared among stakeholders. Strong leadership is crucial in initiating and executing collaboration to safeguard the overarching project objectives. To achieve this goal, scientific collaboration methods can be used to ensure that all stakeholders are involved in the planning process.

3.1. Collaborative Urban Governance (CUG)

An approach that emphasises the active involvement and cooperation of various stakeholders in urban decision-making and management processes [16], it recognises the importance of engaging diverse groups, including government officials, community members, businesses, and organizations, in shaping the development and functioning of cities [17].

In collaborative urban governance, stakeholders work together to identify common goals, share knowledge and resources, and jointly address complex urban challenges. This approach promotes open communication, trust-building, and shared responsibility among participants [18]. Through collaborative urban governance, cities can benefit from inclusive decision-making, innovative solutions, and improved responsiveness to the needs and aspirations of the community. By leveraging the expertise and perspectives of multiple stakeholders, this approach enhances the overall effectiveness and sustainability of urban development, fostering more resilient, equitable, and liveable cities [19].

3.2. The Participatory Action Research (PAR)

Another scientific collaboration method that can be used to involve stallholders in urban projects, this method involves engaging with stakeholders to identify problems and then working together to develop solutions. The process is iterative, with stakeholders involved at every stage of the project, from identifying the problem to implementing the solution [20].

PAR typically begins with a needs assessment, where stakeholders are asked to identify the challenges and opportunities related to the project. Once the needs assessment is complete, stakeholders develop an action plan addressing the identified challenges and opportunities. Stakeholders are involved in all aspects of the project, including data collection, analysis, and interpretation. This helps to ensure that the project is designed to meet the needs and perspectives of all stakeholders, including stallholders [21].

3.3. Community-Based Participatory Research (CBPR)

CBRP is a collaboration method that has been used successfully in urban projects and involves building partnerships between researchers and communities to address social and environmental issues. Stakeholders can be involved in this process, providing valuable input on the impact of the project on their businesses and the community [22]. CBPR typically involves a series of meetings or focus groups where stakeholders are invited to share their perspectives and experiences related to the project. The goal is to build trust and establish a partnership between stakeholders and researchers. Once the partnership is established, stakeholders and researchers work together to develop a research plan that addresses the needs and perspectives of the community. This can involve data collection, analysis, and interpretation, with stakeholders involved in all aspects of the research process [23,24].

3.4. Democratic Collaboration Method

An approach that emphasises equal participation, inclusivity, and shared decision-making within a group or organization, it seeks to empower individuals by giving them a voice in shaping outcomes and fostering a sense of ownership and engagement [25–27]. This method is valuable when diverse perspectives and collective wisdom are essential

for successful decision-making. In a democratic collaboration method, every participant is encouraged to contribute ideas, insights, and opinions. Open and respectful dialogue is promoted, allowing for the exchange of different viewpoints. Consensus-building techniques are often employed to find common ground and reach agreements that accommodate the needs and interests of all stakeholders involved [28,29]. Transparency and accountability are core principles of democratic collaboration. Decision-making processes, discussions, and outcomes are documented and shared with participants. This ensures that everyone understands how decisions were reached and allows for further input and evaluation [30]. Democratic collaboration methods can be facilitated using various tools and techniques. Online platforms enable participants to engage in discussions, vote on proposals, and collectively make decisions. In face-to-face settings, techniques such as facilitated meetings, brainstorming sessions, and structured group processes can be utilised to encourage democratic collaboration [31].

By embracing democratic collaboration, organisations and communities can harness collective intelligence, foster trust, and create a sense of ownership among participants. This approach can be applied using a set of steps found in the following figure (Figure 1).

Figure 1. Steps for applying democratic collaboration effectively. Based on [27].

While the mentioned collaborative approaches share some similarities, the specific emphasis, purpose, and techniques employed distinguish them from one another (see Table 1). It is important to consider the objectives and requirements of a particular project or initiative when selecting the most suitable method.

Table 1. A comparison between different collaborative approaches. Source: authors.

Comparison Points	GUC [17,18]	PAR [20,21]	CBPR [23,24]	Democratic Collaboration Method [26,27,31]
Focus and purpose	Focuses on collaborative decision-making and governance between various stakeholders, including government agencies, community groups, and other actors involved in urban development.	Emphasises engaging stakeholders in the research process, from problem identification to implementation, to address social issues and generate knowledge.	Like PAR but with a stronger emphasis on building equitable partnerships between researchers and community members to address social and environmental issues.	A broader concept that encompasses various approaches, including CUG, PAR, and CBPR. It emphasises inclusive decision-making, equal participation, and transparent processes.
Governance vs. research	Primarily focused on collaborative decision-making and governance in urban development contexts.	Both involve research and aim to generate knowledge to address social issues, with CBPR specifically emphasizing community involvement and partnerships.	Both involve research and aim to generate knowledge to address social issues, with CBPR specifically emphasizing community involvement and partnerships.	Can be applied to both governance and research contexts, focusing on inclusive decision-making and collaboration.
Stakeholder involvement	Involves various stakeholders, including government agencies, community groups, and other actors involved in urban development, in collaborative decision-making and governance.	Engages stakeholders in the research process, including problem identification, data collection, and analysis.	Emphasises the involvement of community members and researchers in all stages of the research process.	Encourages participation and involvement of stakeholders in decision-making processes, regardless of the specific context.

3.5. The Wharf Street Basin Project

Smart Cities and Suburbs projects funded by the Australian Government often have short completion dates (1–2 years) for delivering smart city outcomes. Project objectives generally focus on application and testing smart technologies that have innovative outcomes. To be innovative demands flexibility of time to navigate the unknowns; however, having a flexible timeline increases the risk of technology becoming redundant. How can a balance be maintained in such situations? Yet, another challenge is collaborative working, since projects of such nature require partnerships between multiple organisations that have possibly never worked together and are unaware of each other's process, policy, and constraints. Often, an additional unknown in such projects is the targeted stakeholder group within the community. Here, we discuss ways of walking the tightrope, balancing the unknowns on one hand while delivering innovative outcomes on the other [32].

The Wharf Street Basin project in Canning, Perth, Western Australia, is a prime example of this challenge. The Canning Activity Centre identified that the Wharf Street catchment had the potential to contribute to urban regeneration, improve stormwater drainage, and support water quality management and natural ecology. However, the Smart Cities and Suburbs scheme, a 50 million AUD grant program, provided the catalyst for the Wharf Street Basin project. This program aimed to support projects that apply smart technology, data-driven decision-making, and people-focused design to deliver economic, social, and environmental benefits in metropolitan and regional urban centres [32].

In response to this call for funding, the City of Canning identified the Wharf Street Basin as a Smart Community Park project, which was later successfully awarded AUD 1.09 million. The City of Canning and Urbaqua developed the project proposal with various project partners from organisations such as the Water Corporation; CISCO; Innovation Central Perth;

Curtin University; Department of Water and Environmental Regulation; and Department of Biodiversity, Conservation, and Attractions. Landscape architecture firm Josh Byrne and Associates and landscaping contractor Environmental Industries were also added as project delivery partners [32].

The project progressed as planned despite the COVID-19 pandemic, with a partner working group and design working group formed in early 2019 to progress the park's design and to transform it into a smart technology-enabled community space that would function as a stormwater drain, recreational space, educational resource, and habitat for plant and animal species. The challenge was to involve the seven partners with their individual specific departmental objectives within a restricted deadline of two years. Within this timeframe, tasks like detailed conceptualisation, identifying the right firms and partners, community engagement, researching and deciding appropriate technology and physical infrastructure solutions, developing detailed construction documents, contracting, implementation, and assessment had to be completed.

The Wharf Street Community Park was designed with three central themes in mind: the regenerative city, the water-sensitive city, and the smart city. These themes can be considered urban imaginaries or collective visions that shape actions to transform cities and places. These imaginaries played a vital role in setting the groundwork for the Wharf Street Next-Generation Community Park, bringing together key participants and supporters, and influencing its design and conception.

3.6. Regenerative Cities

Historically, cities have undergone patterns of investment, growth, and development that are cyclical in nature. However, the fast suburbanization seen in many Australian cities during the latter half of the 20th century has presented many challenges to urban sustainability, including land clearing, increased reliance on cars, and increased costs for infrastructure and services. As a result, urban policy in Australia since the 1990s has sought to concentrate new development within existing urban areas. This has been carried out through the urban consolidation agenda, where the Perth Metropolitan Region has set a goal of 47% of new growth within the current city limits [32,33].

However, the changing nature of cities means that existing areas' infrastructure and urban form may no longer suit new residents. Urban regeneration is one solution to this issue, which involves government, private, or community sectors implementing deliberate strategies to rejuvenate, revitalise, or repair existing urban areas [33]. Governments can use various policy tools such as master planning, improved infrastructure, and direct investment to achieve this goal. Additionally, the private sector can play an active role by providing upgrades to public spaces and community benefits, while the community sector can be involved through small-scale initiatives in renewal areas [34].

In the 20th century, urban regeneration was focused on former industrial and waterfront areas in inner cities. However, with time, urban regeneration is increasingly occurring in older middle-ring suburbs. These "grey field sites" are characterised by car parks, road infrastructure, low-density housing, fragmented ownership, and large shopping centres. The typical form of development in these areas involves knocking down and rebuilding houses, which harms the environment [35]. To address this, a proactive local government, long-term planning, and investment in public infrastructure are needed. One investment area is improving community spaces, such as parks, which are under stress from increased demand. This can be achieved through innovations such as verge greening and water-sensitive urban design to enhance the liveability of residents and compensate for any loss of green spaces [34].

3.7. Water Sensitive Cities

The effective planning and management of water resources, including stormwater, wastewater, groundwater, and water supply, is becoming a crucial policy objective for cities worldwide. The increasing urbanization and the effects of climate change put urban rivers

and water systems in danger and increase the risk of floods, droughts, and environmental degradation. The traditional approach to water management in cities, which emphasised the use of technology to control nature and was managed by powerful bureaucracies using a top–down approach, has given way to a more holistic and integrated approach [36]. This new approach recognises water systems as socioecological systems and emphasises the need for adaptive management and resilience [37].

In Australia, the concept of the water-sensitive city has emerged to guide the transition to this new paradigm [38]. The process of transition from a traditional, technology-focused approach to a water-sensitive city involves several stages and is guided by three principles. The first principle involves diverse integrated water sources and infrastructure for water harvesting, treatment, storage, and delivery. The second principle emphasises enhancing ecosystem services by integrating water management goals into urban and landscape design. Finally, cultivating water-sensitive communities is necessary to successfully implement this new approach [39].

Stormwater infrastructure is an essential aspect of the transition to a water-sensitive city. In Perth, stormwater drainage management is a complex issue due to the city's location on the Swan Coastal Plain, which is characterised by highly permeable sands [40]. Traditional solutions, such as filling the land, are becoming increasingly costly, while draining the land using leaky pipes can result in damage to the environment [41]. Over the past two decades, innovative and functional stormwater management practices have been incorporated into public open spaces in Perth [42]. This is part of a broader movement called water-sensitive urban design (WSUD), which integrates all aspects of the urban water cycle, including water supply, wastewater, stormwater, groundwater management, urban design, and environmental protection. WSUD recognises stormwater as a valuable resource that needs to be conserved and can provide various health and community benefits [43]. Integrating stormwater infrastructure into public open spaces should enhance both the environment and liveability outcomes while preserving the landscape's functionality [44].

3.8. Smart Cities

The term "Smart City" refers to integrating digital technologies into managing and operating urban systems and environments. However, there is ongoing debate and confusion regarding what exactly constitutes a smart city. IBM (International Business Machines Corporation) trademarked the term "smarter cities" in 2011, and their definition encompasses three key characteristics: instrumented (real-time data capture through sensors), interconnected (data integration into various platforms), and intelligent (data analysis and visualization) [45,46]. Barns (2020) proposed a different view, defining smart cities as a framework for using data-driven practices for managing and governing urban infrastructure and services [47].

Initially, the concept of smart cities was associated with large-scale, brand-new cities built from the ground up with integrated digital technology, such as Songdo in South Korea and Hudson Yards in Manhattan [48]. However, this perspective is limited, as there are numerous examples of smaller-scale and more incremental investments in digital technology to improve urban services worldwide [49]. In Australia, the Smart Cities and Suburbs program provides a good example, as it received funding through a 50 million AUD grant program to support projects using smart technology, data-driven decision-making, and people-focused design [50].

Smart technology is being used to address various urban issues, including water management, ecological preservation, and community engagement [39]. For example, technological solutions are being used to manage urban water systems, and smart parks and cyberparks are being developed to improve park users' experiences and help local governments manage park services [51]. Studying these technologically mediated public spaces is crucial to guiding future investments in smart city projects.

4. The Project: Methodology

4.1. Study Setting

The Historical Landscape of The Canning City Area

The Wharf Street Basin is linked to the Canning River, a Swan River tributary. The river stretches from the Darling Scarp to Melville Waters, where it connects with the Swan River. The topography of the Canning City region is generally flat, and the soil profile consists of clayey sands overlaid with Bassendean sand. The Wharf Street Basin area has a Guildford vegetation complex, while the Canning River area has Swan vegetation complex [52].

The Canning River is known as Djarlgarra Beeliar in the Aboriginal language, which means a place of abundance. The wetlands in the Canning area were significant (see Figures 2 and 3) areas for the local Beeloo and Beeliar Noongars for ochre, food, and water, before and after colonization [53]. The Waugal, or the Rainbow Serpent, is connected to the Djarlgarra Beeliar, which created the rivers during its journey from the source to the sea. After settlement, the land in the Canning City region was cleared and developed for various industries, including homesteads, agriculture, horticulture, and sawmills. The river was important for transportation and industry, and a six-kilometre area adjacent to the Canning River was designated for public use as the Canning River Regional Park [54].

Figure 2. Canning River Regional Park [32].

Figure 3. Kent Street Weir [32].

The CCC and its surrounding area provide significant regional open space on the bank of the Canning River, offering opportunities for passive recreation and nature-based activities. The Kent Street Weir was constructed in 1927 to separate the salty and freshwater. The introduction of the railway line and the construction of Albany Highway, along with the gold rush in the late nineteenth century, increased housing demand and the subdivision of large land grants in the Canning City region and suburbs such as Queens Park. During the twentieth Century, development continued, and schools and significant sporting facilities were established. In 1957, the first major department store outside of Perth, Boans Waverley (now Westfield Carousel), was established (see Figure 4).

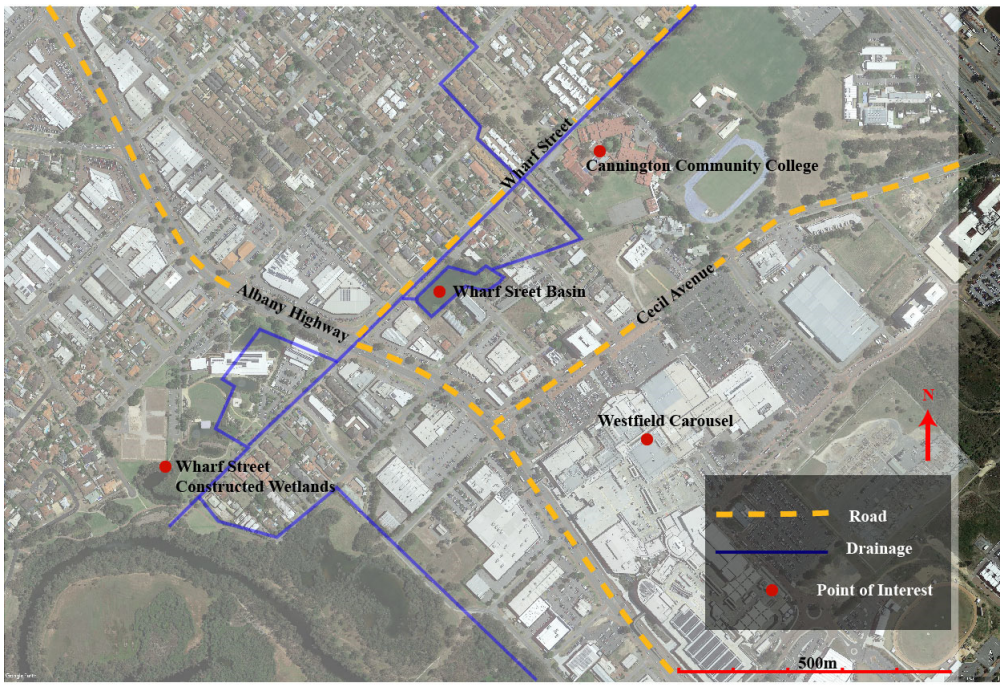

Figure 4. Canning city centre context map [32].

4.2. Methods

The Wharf Street Basin project used the democratic collaborative approach, as its objectives and requirements fit the context of this approach more than other collaborative approaches. The project began with creating a place audit framework that focused on three main objectives: liveability, ecological sustainability, and productivity. The use of a place audit framework as a democratic collaboration tool has been proposed as an effective way to map out different organisations' visions. A place audit framework involves a comprehensive assessment of a specific location, considering various aspects such as physical infrastructure, social dynamics, cultural heritage, and economic opportunities [55].

By employing a place audit framework, organisations can engage in a democratic collaboration process that allows for multiple stakeholders to participate actively. This inclusive approach ensures that diverse perspectives and voices are heard, fostering a sense of ownership and shared responsibility among the participants. The final audit framework for this study was developed collaboratively with the project partners. An initial list of indicators for each domain was established and refined through regular project stakeholder meetings. Project partners were asked to contribute their own unique datasets to supplement the primary data generated by the research team. Following the workshop, a final set of indicators was used to guide the data collection, describe the full context, and inform an evaluation of the overall performance of the project in relation to each objective (liveability, sustainability, and productivity)—see Appendix A.

Audit approaches essentially evaluate how systems or institutions function and perform against expectations or objectives, like other multicriteria evaluations. In urban research, audits have been used to measure the walkability of streets [56], place connectivity [56], road safety [57], and activities in parks [58]. Audit evaluations usually capture quantitative measures of system components but can draw on more qualitative indicators [59,60].

Audits consider multiple indicators rather than just one and allow for examining how different project elements interact, revealing the synergies and conflicts between objectives and providing insight into any necessary trade-offs [61,62]. The place audit methodology used in this study was based on the previous methods employed by the research teams—see [56,63]. An initial framework was established with indicators across three domains: productivity, sustainability, and liveability:

- Productivity: this domain reflects the performance of the park against operations and maintenance, innovation, and activation economics.
- Sustainability: this domain reflects the quality of the park for ecological health and resilience.
- Liveability: this domain reflects the quality of the park for access, community fit, safety, and community health.

The list of indicators was refined through stakeholder meetings and an audit development workshop held at the Canning River Eco Education Centre (see Figure 5). Project partners were asked to provide their data to supplement the primary data collected by the research team.

Figure 5. Place audit development workshop at Canning River Eco Education Centre [32].

Following the workshop, a final set of indicators was established to guide data collection, specify who was responsible for the data, provide context, evaluate the overall project performance, and conduct cross-analysis to identify both supportive and constraining relationships across the three project domains. Table 2 demonstrates the relationship between objectives, values, indicators, and the responsible organisation. An example of how the table works can be demonstrated by discussing one of the values of the project—access. The "indicators" for measuring accessibility as determined through literature review were number of people visiting the park, minimal fencing meterage, universal accessibility elements, signage, and walkability in the surroundings to access the park. Responsibility for collecting data to measure different indicators was assigned to different project partners as per their expertise, organisation's value, and agenda.

How did the audit framework perform while negotiating the unknowns—multiple organisational expectations, policy change requirements, unknown stakeholder for big data, and type of technology and innovation—within the short time and budget constraints?

To answer the above, a project completion workshop was organised with all key stakeholders from the project partner and design working groups approximately one year after the site was opened to the public with an objective to facilitate reflections on the project almost one year after it had opened to the public.

The workshop began with a presentation of the preliminary survey findings from the research team. Small breakout group discussions followed, informing the critical successes of the park and the challenges and lessons learned. The workshop concluded with a plenary discussion with all participants. The next section highlights the key findings after a qualitative data analysis was undertaken of the stakeholders' discussions (see Figures 6 and 7).

Table 2. The relationship between objectives, values, indicators, and the organisation responsible for data collection. Source: authors.

	Value	Indicator	Partner Organisation Responsible for Data Collection
Liveability	Access	People visits	Curtin/Canning
		Minimal barrier fencing	Curtin/Canning
		Universal access	Curtin/Canning/Water Corp.
		Interpretive signage/wayfinding	Curtin/Canning/Water Corp.
	Community fit	Site access/walkability	Curtin
		Interactive natural areas	Curtin
		Digital areas	Canning
		Educational resources and research	Canning
		Diverse community values	Curtin
		Noongar knowledge, values, and stories	Canning
	Activation economics	Crime prevention through environmental design	Curtin
		Lighting	Canning
		CCTV cameras	Canning
		Safety incidents	Canning
	Community health	Physical activity	Canning
		Community wellness	Canning
Sustainability	Health	Healthy Streets Checklist	Curtin
		Physical activity	Curtin
		Community engagement	Canning
	Environment	Semiautonomous testing station	Canning
		Eco-balance (ecosystem health/biodiversity)	Canning
		Replacement of existing vegetation	Canning
		Water quality	Canning
		Microclimate/urban heat	Canning
	Resilience	Investment attraction	Canning
		Land use change	Curtin
		Project investment vs. actual economic investment	Curtin/Canning
		Adaptive management and community understanding to improve catchment management	Curtin
		Links to broader initiatives	Curtin
Productivity	Operation and management	Water quality and maintenance	Canning
		Water quantity	Curtin
		Smart furniture	Canning
		Asset management/maintenance	Canning
		Catchment hydrology (runoff and storage)	Canning
	Innovation	Smart tech	Canning
		Wi-Fi charging options	Canning
		Multipurpose interaction hub	Canning
		Solar panels	Canning
		Datasets	Canning
		Use of IoT devices	Canning
	Activation economics	Business activity	Canning
		Land values	Curtin/Canning

Workshop Exercise 1 Details

Set up room; table with name tags, water and glasses, sign in sheet for COVID-19, hand sanitiser.

There 3 workshop groups, loosely arranged around key stakeholder groups.
Each workshop will have a colour and each name tag will have the corresponding colour so that people know where to go.

Groups will be set up separately, with a table for material, some chairs if anyone needs to sit down, posters for annotating.
Materials:

- **Each table will have an audit diagram, explanation of terms,**
- **Objectives met worksheet; Challenges faced worksheet.**
- **Pens, post it notes,**

Worksheet

	What project objectives were successfully met?	What features of the project supported these values	What were the practices (processes/elements) that made these features successful?
e.g.	Community-fit	Mural wall	• Finding local capacity • Building trust through meetings and workshops

	What project objectives did not reach their full potential	What features of the project challenged this objective?	What were the elements/processes that could be changed to improve this for future projects?

Figure 6. The Wharf Street Basin stakeholders' workshops—Exercise 1. Source: authors.

Workshop Exercise 2:
Stakeholder groups add their responses as below:

1.

What are lessons learnt that have wider applicability, beyond this project	Comments	Vote for ideas you support with your stickers.

2.

What things need to change (Policy/logistical/others) OR how things can be improved?	Comments	Vote for ideas you support with your stickers.

Figure 7. The Wharf Street Basin stakeholders' workshops—Exercise 2. Source: authors.

The place audit framework as a democratic collaboration tool offers different partners a structured approach to map out their vision. This inclusive and comprehensive process fosters dialogue, strengthens relationships, and enhances strategic planning, ultimately leading to more sustainable and impactful outcomes for the project's different partners and the community they serve.

5. Results

This study strongly suggests that the WSNGCP achieved its objective of becoming a "liveable" community park, as demonstrated by the significant number of visitors to the site and its use as a means of access (visitor average is 72.5 people per day, with the most recorded as 123 and the least 28). Although the increase in visitation was anticipated due to the park's previous inaccessibility to the public, the fact that people utilised the park for various recreational and social activities and stayed for extended periods indicates its success. The park's design of activity spaces, the balance between interaction with nature and safety, and its accessibility have resulted in a place that attracts visitors who come to experience a natural space amid a bustling urban centre. Despite the design challenges faced at different stages of the park's development, such as the tension between maintaining stormwater storage capacity and its multiple functions, it is evident one year after the park's opening that it supports various liveability objectives.

5.1. Elements Supporting Planning for Canning City Centre and Building Social and Organizational Capital

The WSNGCP has unlocked a formerly inaccessible asset in a rapidly developing "grey field" activity centre, providing a crucial pedestrian and cyclist access link between the residential area west of the park and the Westfield Carousel Shopping Centre. While it will take several years to assess the park's impact on the development economics of the Canning city centre, similar projects have shown increased activity and value in the surrounding areas. After the park's first year of being open to the public, it is evident that there has been a significant degree of capacity building within social and professional networks due to the park's unique features and the collective experience of partner organisations involved in its planning and delivery. The City of Canning has renewed its commitment to community engagement, engagement with Traditional Owners, and digital technologies. The park's objectives to promote water education and literacy about water-sensitive urban design have largely been achieved, as evidenced by organised site visits and tours; interest from schools and tertiary programs; and connections to nongovernment, community, and professional groups associated with water-sensitive cities. This demonstrates significant interest and suggests that the project enables ongoing institutional learning.

5.2. Lessons Learned and Other Unique Factors Highlighted

The WSNGCP offers both lessons for similar projects and unique features specific to this site. The need to maintain water capacity significantly influenced many aspects of the park, including design interventions to achieve water quality outcomes, activity space availability, and visitor interaction with natural spaces. Balancing these goals with the need to maintain capacity will be relevant to other basins in the Perth metropolitan area due to common site constraints for stormwater infrastructures. WSNGCP balanced these goals with assistance from Smart Cities and Suburbs funding, while other projects will require funding sources to overcome constraints.

For projects seeking to integrate smart technology into park or water-sensitive urban design projects, the WSNGCP offers additional lessons. The steep learning curve that project partners experienced in delivering the technology component of the park highlights the need for existing organizational capacity to guide the successful implementation of technological solutions to provide net benefits. This organisational capacity could be a digital strategy or network to support the planning and administration of smart technology-embedded projects. While there were positive aspects related to integrating smart technologies in WSNGCP, these occurred due to trial and error and innovative individuals working to deliver positive project outcomes in the face of limited institutional support.

6. Challenges

A project completion workshop was organised with all key stakeholders from the project partner and design working groups one year after the site was opened to the public to facilitate reflections on the project almost one year after it had opened to the public.

The workshop began with a presentation of the preliminary survey findings from the research team. Small breakout group discussions followed, aimed at informing the critical successes of the park and the challenges and lessons learned. The workshop concluded with a plenary discussion with all participants. Challenges identified at the project completion workshop are outlined below.

6.1. Multiple Partner Organisations

Overall, there was a sense that there was a strong shared vision among the team. This shared vision was linked to the overall intended goals of the park as a community space and resource for water education. The vision emerged from the goals of related projects such as the Drainage for Liveability program and the Canning Activity Centre Plan. The connection to these broader planning and policy goals—the regenerative and water-sensitive city—helped sustain a strong narrative that brought stakeholders together.

The multidisciplinary nature was also considered very beneficial to the delivery of the project by enabling institutional learning through the project process. A high degree of collaboration using the audit framework helped develop the shared vision and helped establish common goals and adaptive practices for delivering the project, which helped overcome the governance and technical challenges.

There was strong leadership shown by the City of Canning and Water Corporation that helped deliver key project elements. Roles and responsibilities were clearly identified in the audit framework, which aided stakeholder communication.

6.2. Management of Assets, Policy Constraints, and Technology Redundancy

Although organisational responsibility around data collection was identified within the audit framework, the framework made no indication as to the management responsibilities of the asset. This led to a lack of clarity on issues such as who would respond to and maintain the sensors after implementing them. A comment suggested that the project management focused on the delivery of the project and was weak on maintenance and ongoing responsibilities.

Other institutional factors were noted as providing unexpected limitations. For example, stakeholders from the City of Canning expressed frustration that the full potential to maintain public safety, such as using smart lighting and CCTVs, was constrained by existing policies. The local council policy on CCTV camera use restricted the incorporation of AI in cameras due to privacy concerns, contributing to the overall limitations in their operational capabilities.

A potential ongoing risk was recognised in that the high-cost technology delivered as part of this project could become redundant soon due to the advancement in technology. This necessitates an experimental approach to be undertaken for projects of such nature. In this project, working with digital technologies was characterised as "taking a bit of a leap and experimenting with various components", often subject to "the old and not unfamiliar IT curse" (interview with City of Canning representative).

Unknown stakeholder group for big data: The lack of clarity around the user groups for project data—by whom and how these data can be applied to improve the process and what inferences can be drawn from them—was also noted as an unexpected lesson learned. This could have been a focus in the early stages of the project for its inclusion within the audit framework.

6.3. Unknowns and Budget Constraints

Regarding the delivery of the project, budget constraints and unknowns challenged the delivery of project elements, precisely the geotechnical and design challenges raised by the site. Budget contingencies and financial risks were not correctly identified at the start of the project. These could have been discussed within the audit framework against each value. However, the workshop participants recognised that these points were to be expected in a complex project like the WSNGCP.

6.4. Tight Timeline

The tight project timeline was raised as both a challenge and a catalyst for expediency and experimentation. It highlighted deficiencies in standard practice and gaps in internal organisational processes. Examples provided by the workshop participants included engagement with Traditional Owners, responsibilities about management arrangements of the site and of the data generated by the sensors on site, and the mitigation for construction vehicle traffic.

7. Discussion

The development of smart cities through multistakeholder innovation involves a strategic approach that requires more than just basic communication. Successful collaboration necessitates a comprehensive understanding of each organization's technology, user

groups, values, and possible policy changes [64]. Additionally, the adoption of technological advancements for improving urban growth introduces new challenges like handling technological duplication or managing varying interests among stakeholders while considering potential policy implications. However, some argue that requiring a comprehensive understanding of each organization involved in a smart city project is not practical nor efficient [65]. It could lead to delays and complications during the implementation phase. Instead, minimal communication should suffice if each stakeholder understands their roles and responsibilities within the project. This approach would save time and resources while still achieving the overall objective of creating a smarter city environment through collaboration among stakeholders [66,67].

To combat these challenges successfully requires a deeper analysis of effective strategies used by organisations leading this frontier. A case study on Wharf Street Smart Park in Western Australia serves as a prime example of how successful collaborations paved the way towards creating new possibilities within urban communities through overcoming different operational issues brought about by varied stakeholder engagement dilemmas amid constantly evolving policies surrounding modern technologies.

Collaborative decision-making approaches play a crucial role in successfully managing multistakeholder innovation in smart city projects. Collaborative decision theory, rooted in system science, aims to establish a mechanism that allows for stakeholders to exchange information and maximise their benefits. In the context of urban regeneration and planning, collaborative decision-making involves stakeholders working together towards a final decision that balances heritage preservation, economic development, and social equality. The dynamic and complex nature of urban regeneration requires intentional and flexible strategies to accommodate the everchanging decision-making process. Several scientific collaboration methods can be employed to involve stakeholders in urban projects.

With the advancement in technology, smart city projects involve several key stakeholders who must collaborate to deliver innovative solutions that align with urban regeneration and planning. To ensure stakeholder success, a place audit framework was utilised during the Wharf Street smart park project as a democratic collaboration tool to evaluate how various stakeholders could contribute towards creating a smart environment.

The concept of collaborative decision theory rooted in system science allows for informed stakeholders to exchange valuable information while maximising gains for everyone involved [68].

Urban regeneration requires balancing heritage preservation with economic development and social equality, which can be achieved through a process of collaboration between multiple parties engaged in the project's outcome [69,70]. Collaborative strategies promote flexibility by accommodating dynamic changes during the urban renewal process effectively ("Stakeholder Management in Government-Led Urban Regeneration: A Case Study of the Eastern Suburbs in Chengdu, China"). Employing scientific collaboration methods such as participatory action research (PAR) and community-based participatory research (CBPR)-supported multistakeholder approaches enables participation from diverse community groups throughout different stages of sustainable movement towards inclusive urban development goals.

Participatory action research (PAR) and community-based participatory research (CBPR) are two effective methods that engage stakeholders at every stage of the project, from problem identification to solution implementation. These methods ensure that the project is designed to meet the needs and perspectives of all stakeholders involved, including stallholders. However, democratic collaboration is a more holistic approach, which emphasises equal participation, inclusivity, and shared decision-making within a group or organisation. In a democratic collaboration method, every participant is encouraged to contribute ideas, insights, and opinions. Open and respectful dialogue is promoted, allowing for the exchange of different viewpoints. Consensus-building techniques are often employed to find common ground and reach agreements that accommodate the needs and interests of all stakeholders involved. Transparency and accountability are core principles

of democratic collaboration, ensuring that decision-making processes, discussions, and outcomes are documented and shared with participants [71].

The Wharf Street Basin project in Western Australia provides insights into the challenges of multistakeholder innovation in smart city projects. The project aimed to transform a stormwater drain into a next-generation community park, incorporating smart technology. With a limited timeline of two years and multiple organisations involved, collaboration was crucial for successful project delivery. The project embraced the principles of regenerative cities, water-sensitive cities, and smart cities, integrating innovative approaches to urban regeneration, water management, and digital technology.

The project demonstrated the importance of aligning the values, responsibilities, and visions of each organisation involved using a democratic collaboration approach. By mapping out each organisation's interests and responsibilities at the beginning of the project, an open innovation ecosystem was created, allowing for knowledge sharing and establishing common goals. This high level of collaboration helped overcome governance and technical challenges, leading to adaptive practices and successful project outcomes.

However, the project also revealed some limitations of the collaboration approach. It was found to be insufficient in addressing long-term management issues, risk mapping, and identification of user groups for big data. These challenges highlight the need for continuous collaboration and adaptive strategies throughout the project lifecycle.

8. Conclusions

This paper discusses the Wharf Street Smart Park project in Western Australia as a case study for multistakeholder innovation in smart city initiatives. The project's objective was to convert a stormwater drain into a technologically advanced next-generation community park within a tight two-year timeframe, involving multiple organisations. Collaboration emerged as a critical factor for successful project delivery, encompassing regenerative cities, water-sensitive cities, and smart cities principles, thereby integrating innovative approaches to urban regeneration, water management, and digital technology.

The project underscored the significance of aligning the values, responsibilities, and visions of participating organisations through a democratic collaboration approach. Initiating the project with a comprehensive mapping of each organisation's interests and responsibilities created an open innovation ecosystem, fostering knowledge sharing and establishing shared objectives. This high level of collaboration effectively surmounted governance and technical challenges, leading to adaptive practices and ultimately successful project outcomes.

Despite its successes, the project brought to light certain limitations in the collaboration approach, particularly in addressing long-term management issues, risk mapping, and the identification of user groups for big data. These challenges underscore the necessity for continuous collaboration and adaptive strategies throughout the project lifecycle.

In conclusion, the Wharf Street smart park project exemplifies how multistakeholder innovation in smart city projects can thrive through collaboration and a deep understanding of each organisation's values, technology, user groups, and potential policy changes. Collaborative decision-making methodologies, such as democratic collaboration, facilitate knowledge sharing, goal establishment, and overcoming governance and technical hurdles. While the project serves as a success story in urban regeneration, water management, and digital technology integration, the identified challenges emphasise the ongoing need for collaboration and adaptive practices in the realm of smart city projects.

9. Limitations

This study evaluated the performance of a park during the first year of its opening. However, it is expected that some of the indicators in the audit framework will require a longer time horizon to become apparent. For instance, the activation economics subdomain within the productivity domain includes indicators such as land value change and investment attraction, which measure long-term effects. In our written analysis of the

audit findings, we highlighted areas where these limitations are pertinent. The COVID-19 pandemic disrupted the research from March 2020 onwards. The pandemic's initial lockdown in mid-March 2020, followed by subsequent shorter lockdowns and social gathering restrictions outside of lockdown periods, impacted data collection and may have affected some of the site surveys, especially the observation survey. In our written analysis, we pinpointed the research aspects where we considered the potential influence of COVID-19 on the findings.

10. Way Forward

The audit framework is a smart tool that helps negotiate different partner agendas and visions and create a common platform for discussion. If initiated at the start of the project, it works as a collaborative tool. It identifies the organisation responsible for data collection for each indicator. Analysis of datasets helped in understanding which values were achieved successfully and which were still lacking.

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Appendix A

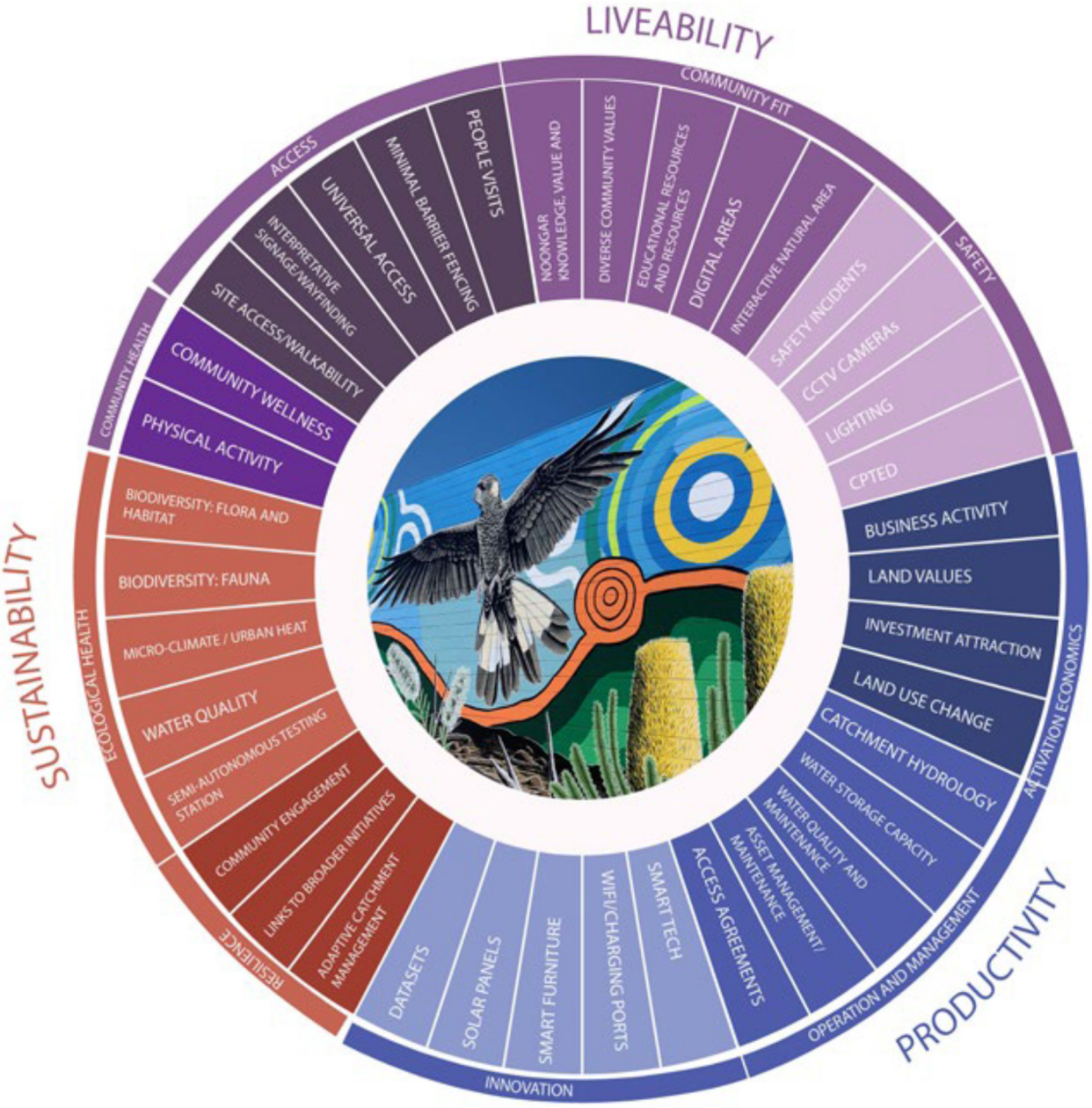

Figure A1. The project final place audit framework [32].

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