To Rotterdam and Beyond: A Stakeholder-Informed Case Study on the United for Smart Sustainable Cities (U4SSC) Working Group 6's Digital Development Goals for Cities

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Table of Contents

Acknowledgements **4**
Disclaimer 5
Executive Summary **6**
Introduction **9**
Digital Development Goals for Cities (DDGs) 9
Rotterdam as an Informative Case 9
Research Questions 10
Analytical Approach 10
Process and Methodology **10**
Background Analysis 10
Figure 1: Breakdown of the Four Clusters *12*
Stakeholder Perspectives 12
Table 1: Directory of 27 Interviewees *13*
Figure 2: Stakeholder Matrix *14*
Limitations 14
Table 2: 16 Interviewees from the U4SSC Client and referrals from those contacts *16*
Table 3: 11 Interviewees from the City of Rotterdam Client and referrals from those contacts *16*
Background & Context **17**
A. Rotterdam's Past: From Smart-City Experimentation to Responsible Digitalization 17
B. Rotterdam's Present Digital Landscape 20
Key Findings & Cross-Cutting Themes **23**
A. The U4SSC Perspective 23
1. Outcome-Driven & Measurable Implementation 23
2. Governance Regulation and Accountability 25
3. Human-Centered Digital Development 27
B. The City of Rotterdam Perspective 29
1. Implementation & Operational Clarity 29
2. Children, Youth & Digital Rights 30
3. Resilience, Safety & Sustainability 31
C. Cross-Cutting Themes 34
1. Interoperability & Public Infrastructure 34
2. Digital Inclusion & Accessibility 37
3. Equity & Bias Prevention 38
4. Data Sovereignty, Consent, and Trust 41
5. Digital Literacy & Upskilling 43
6. Local Context & Co-Creation 44
Implications for the U4SSC Digital Development Goals **46**
A. Lessons Emerging From Rotterdam 46
Table 4: SWOT Analysis From Rotterdam for the U4SSC DDGs *46*

Strengths....47
Weaknesses.... 47
Opportunities....48
Threats....49
B. Broader Relevance for Other Cities....50
C. Considerations for the DDG Framework....52
Recommendations for Rotterdam.... 53
Rotterdam's Future.... 54
Figure 3: Rotterdam's Future Digitalization Recommendations.... 54
Conclusion....55
Team Reflection.... 57
Appendix A: AI Use Disclaimer and Transparency Statement.... 59
Appendix B: AI Prompts Used....60
Prompt 1: Post-Interview Review.... 60
Prompt 2: Quote Location Support....61
Prompt 3: Creation of Figure 3 - Rotterdam's Future Digitalization Recommendations....63
Appendix C: Supporting Visuals.... 65
Exhibit 1: Identifying Shared Priorities Across U4SSC-Oriented and Rotterdam Affiliated Individuals....65
Exhibit 2: Organizing Interview Themes into Four Analytical Frames....66
Exhibit 3: Mapping Four Analytical Frames to U4SSC Working Group 6 DDG Clusters.... 67
Appendix D: Questions to Consider from Interviewees....68
Appendix E: Standardized Interview Questions....70
Appendix F: Interviewee Profile and Interview Summaries.... 71
References.... 99

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Special thanks go to Brenda van Breemen-Olij, our supervisor on the City of Rotterdam side, and to Bas Boorsma, whose guidance was pertinent in bridging the city and the experts from the U4SSC Working Group 6 on Digital Development Goals for Cities shaped this project from its earliest stages.

Last but not least, we'd like to thank Professor David Slocum, our faculty advisor, for his mentorship throughout. This case study reflects a genuinely collaborative effort, and we hope it stands as a shared resource for everyone who helped build it, beyond being a deliverable for the Global Challenge Lab capstone project.

Disclaimer

The following report is based on interviews conducted with representatives and stakeholders from the City of Rotterdam, the U4SSC, and affiliated expert networks, as listed in the report. Interviewees were given the opportunity to review and respond to the quotes, paraphrases, and references attributed to them.

This report was prepared as part of a Thunderbird Global Challenge Lab student project. As such, it is not an official United Nations document, has not been formally approved or endorsed by the United Nations or any of its affiliated entities, and does not necessarily reflect the views, positions, or policies of the United Nations, the ITU, U4SSC, or any participating organization. Any findings, interpretations, recommendations, or conclusions are those of the student research team and are intended for academic and exploratory purposes.

Executive Summary

This case study provides stakeholder-informed empirical evidence to support the emerging Digital Development Goals for Cities (DDGs), using the City of Rotterdam as its primary case. Undertaken as a Global Challenge Lab capstone project in collaboration with the City of Rotterdam and U4SSC Working Group 6 on Digital Development Goals for Cities, the study serves a dual purpose: informing the ongoing development of the DDG framework and offering recommendations for Rotterdam's continued digital transformation. Rotterdam centers this Global Challenge Lab project, not simply as an object of recommendations, but as a practical setting through which to examine how the DDGs could be tested and refined. Its Open Urban Platform, 3D Digital Twin, and emerging Citiverse reflect an ambitious digital vision, while ongoing challenges around inclusion, governance, citizen trust and material infrastructure capacity reveal the implementation questions that any global DDG framework must address.

The research team conducted 27 semi-structured interviews with stakeholders from the City of Rotterdam, the U4SSC Working Group, and referred experts; the U4SSC Working Group 6 contacts alone represented institutions across nine countries (The Netherlands, the United States, the United Kingdom, Ireland, India, South Korea, Dubai, and Finland). Interviews combined standardized and tailored questions and were supplemented by review of Rotterdam's digitalization strategy documents and U4SSC governance materials. AI-assisted tools helped organize 463 pages of transcripts, though all quotes and themes were manually verified by the research team against the source recordings. Findings were organized into U4SSC-perspective themes, Rotterdam-perspective themes, and six cross-cutting themes, each mapped to one of the four emerging DDG clusters: Values, Rights, and Governance; New Societal Outcomes; Comprehensive Interoperability; and Digital Technology Itself.

Across both stakeholder groups, the central finding is that Rotterdam's digital limitations are social and infrastructural. U4SSC-affiliated stakeholders emphasized outcome-driven implementation, governance accountability, and human-centered design, arguing that digital tools must be measured by the value they create rather than by their existence. Rotterdam-affiliated stakeholders emphasized operational clarity and resilience, warning that ambitious goals fail without concrete implementation mechanisms, dedicated funding, and safeguards against the loss of institutional knowledge across election cycles. Six cross-cutting themes: Interoperability and Public Infrastructure, Digital Inclusion and Accessibility, Equity and Bias Prevention, Data Sovereignty and Trust, Digital Literacy & Upskilling, and Local Context and Co-Creation, surfaced independently from both groups, suggesting they represent durable priorities for any DDG framework rather than concerns specific to a single institution.

A SWOT analysis of Rotterdam's position found real strengths: a mature interoperability practice anchored by the Open Urban Platform, a self-developed ethical framework for digital values, and bottom-up initiatives such as the Sociaal AI Lab and youth-led tools. These strengths sit alongside persistent weaknesses, including senior-level governance gaps, the absence of any

city-wide governed digital twin, funding models tied to election cycles, and a lingering trust deficit traced to the 2014 toeslagenaffaire childcare-benefits algorithm-bias scandal. These weaknesses point to clear opportunities, particularly using the DDG framework and related international dialogue to support senior leadership engagement and scaling existing co-created tools as proof points, while threats such as big-tech dependency and the pace of compute growth outstripping governance capacity remain largely outside city-level control.

Building on these findings, the case study offers two sets of recommendations. For Rotterdam, it proposes a recommendation matrix linking nine priority areas, from implementation clarity and resilience to data sovereignty and local co-creation, to existing initiatives and their corresponding DDG cluster, so the city's next phase of digital transformation embeds governance, trust, and inclusion alongside continued technical expansion. For the U4SSC Working Group, the study offers four considerations for the DDG framework: cities must be shown what achieving the goals looks like in practice, not simply given the goals themselves; the framework must address governance gaps between stated principles and tangible action; Rotterdam's quadruple- and quintuple-helix collaboration model offers a transferable template for stakeholder engagement; and the DDGs must account for cities' dependence on private technology providers that sit outside municipal control.

Across both tracks, the following actions translate these findings into concrete next steps:

1. Show cities concrete models of what achieving each DDG looks like in practice, using Rotterdam's own initiatives (Open Urban Platform, Digital Twin, Sociaal AI Lab) as reference examples, rather than issuing goals alone.
2. Assign clear governance ownership over city digital twins, since no city examined – including Rotterdam – has yet resolved who is responsible for overseeing a fully operational one.
3. Move citizen-facing digital initiatives off election-cycle-dependent program funding and onto permanent institutional budgets, so momentum survives political turnover.
4. Design participation and outreach mechanisms to route through trusted community intermediaries in cities with lingering institutional trust deficits, rather than assuming direct municipal engagement will work.
5. Adopt Rotterdam's quadruple- and quintuple-helix collaboration model as a transferable template for structuring government-industry-research-citizen engagement.
6. Reduce big-tech vendor lock-in and invest in transferable interoperability standards – building on Rotterdam's Open Urban Platform and cross-border collaboration practice – so cities can share data and adopt shared infrastructure rather than being tied to one provider's ecosystem.
7. Scale existing youth-led, co-created tools (e.g., Rotterdam Go, the Sociaal AI Lab) as ready-made proof points other cities can reference instead of building inclusion tools from scratch.

8. Require lifecycle and end-of-life planning for digital infrastructure investments up front, so maintenance and environmental costs are designed in rather than addressed reactively.
9. Design DDG guidance to strengthen the structures, partnerships, and programs cities already have in place, rather than requiring conformity to a single model.

Ultimately, this case study demonstrates that even an internationally advanced digital city such as Rotterdam continues to face barriers in citizen engagement, political continuity, public trust, and material infrastructure capacity. Rotterdam is presented not as a baseline for other cities to replicate, but as evidence that a meaningful DDG framework must answer questions of who technology is for, who consents to its use, and what effects it will have on governance and culture beyond digitalization itself.

Introduction

The central challenge for the Digital Development Goals for Cities is translation: how a global digital development framework can remain coherent enough to guide cities while still being flexible enough to reflect local governance structures, institutional capacities, and community needs. Rotterdam provides a useful setting for examining that challenge because its digital agenda is not only conceptual but it is already being tested through platforms, governance experiments, public participation efforts, and debates over inclusion, trust, and accountability.

This introduction situates the DDGs, explains why Rotterdam is an informative case, and sets out the questions that guide the analysis.

Digital Development Goals for Cities (DDGs)

The Digital Development Goals for Cities are being developed through the United for Smart and Sustainable Cities (U4SSC) Working Group 6 as a framework for helping cities assess and advance digital progress while contributing to the broader Sustainable Development Goals. Unlike a purely technical benchmark, the DDGs are intended to address how digitalization affects governance, social outcomes, interoperability, infrastructure, inclusion, rights, and public value.

A central premise of the DDG process is that cities should not simply receive a framework designed elsewhere. The framework is being shaped through city input and real-world application, making city case studies important not only as examples but as tests of whether the goals are understandable, measurable, and useful in practice. In this sense, the Rotterdam case helps examine how DDG priorities appear when placed against the institutional, civic, and technical realities of a city already engaged in advanced digital transformation.

Rotterdam as an Informative Case

Rotterdam is useful for the DDG process because it brings together digital ambition and implementation complexity. The city's Open Urban Platform, 3D Digital Twin, and emerging Citiverse reflect a forward-looking digital agenda, while stakeholder interviews point to unresolved questions around inclusion, citizen engagement, digital skills, data sovereignty, interoperability, trust, and governance.

This combination makes Rotterdam valuable not as a universal model for other cities to copy, but as a grounded case through which the DDGs can be tested against real city conditions. Its experience shows that advanced digital infrastructure does not remove questions of legitimacy, coordination, public confidence, or institutional capacity. Instead, those questions become more visible as digital systems move closer to everyday urban services and decision-making.

Research Questions

This case study is guided by three central questions:

- The City: What do Rotterdam's successes, challenges, and controversies reveal about digital transformation?
- The Reach: Which lessons apply to cities with different governance, resources, and maturity?
- The Framework: How can Rotterdam's experiences shape the emerging global framework?

These questions structure the report's movement from local evidence to broader relevance. The first grounds the analysis in Rotterdam's own digital transformation journey. The second asks which lessons may travel beyond Rotterdam and which remain specific to the city's institutional and political context. The third connects the case study back to the DDG development process by identifying what the framework may need to address to remain useful for cities.

Analytical Approach

The analysis focuses on stakeholder perspectives, governance practices, and selected Rotterdam initiatives that illuminate the practical conditions of digital transformation. It examines how different stakeholders understand the opportunities and risks of digitalization, where Rotterdam's current strengths and limitations lie, and how local experience can inform a broader global framework.

This case study is therefore organized around three analytical movements. First, it describes Rotterdam's digital trajectory and current landscape. Second, it analyzes key findings from U4SSC Working Group 6 stakeholders, Rotterdam stakeholders, and cross-cutting themes that surfaced across both groups. Third, it translates those findings into implications for the DDGs and recommendations for Rotterdam's continued digital transformation.

Process and Methodology

Background Analysis

The research team began by analyzing the documents provided by Bas Boorsma, the Chief Digital Officer of the City of Rotterdam from 2021-2023, the current advisor to the city's Chief Information Officer team, and the Cluster Group leader for the U4SSC Working Group on the Digital Development Goals (DDGs). The three documents from the City of Rotterdam provided context on Rotterdam's urban innovation ecosystem and digitalization strategies. Using this information, the team collected information on the cities' digital offerings, such as:

1. The Open Urban Platform: A digital infrastructure hub that went live in 2025, and allows residents, businesses, and organizations to use, add, and share data (*Rotterdam in Transformation*, 2024).

2. Digital Twin: A concept that aggregates current data into a single, open, and shared location, integrated into Rotterdam's Open Urban Platform (*Rotterdam in Transformation*, 2024).

3. Citiverse: Another concept that illustrates how new technologies not only create new physical objects but also new societal norms and ways of living. For instance, the increased use of generative AI has changed the way humans learn and create (Boorsma et al., 2026). The Citiverse accounts for these intangible changes in behavior beyond the tangible tool itself (*Rotterdam in Transformation*, 2024).

The documents from the U4SSC also illustrated:

1. The purpose of the DDGs: The DDGs were created to address digital acceleration in cities and the broader shift in norms, values, and culture resulting from digital transformation. The DDGs also aim to advance the SDGs and provide a guiding framework for paradigm shifts driven by digital development (Boorsma et al., 2026).

2. The importance of anchoring the DDGs in the realities of urban governance: Without the participation of urban government leaders, the DDGs risk becoming theoretical frameworks rather than practical applications. Thus, Mayors, Deputy Mayors, Chief Digital Officers, Policy-Makers, and other Ecosystem Stakeholders are encouraged to join ("In Pursuit", 2026).

Figure 1: Breakdown of the Four Clusters



Following this document review, the team received a total of 25 stakeholder contacts: 8 from the City of Rotterdam and 17 from the U4SSC Working Group. Three of these contacts were

ultimately unavailable or unresponsive. To ensure robust coverage and as recommended by the project's faculty advisor, the team employed a snowball sampling approach, asking interviewees for recommendations of additional contacts whose expertise would strengthen the research. This process yielded five referrals, four of whom were successfully interviewed, bringing the total to 27 completed interviews across all three groups.

Stakeholder Perspectives

The 27 interviewees are organized across three groups, each representing a distinct institutional perspective on either digital urban development in Rotterdam or guiding factors, practical applications, and desired outcomes for the DDGs.

1. The City of Rotterdam stakeholders offered a ground-level perspective on implementation. This group included Citiverse leaders, Sociaal AI Lab practitioners, an emergency resilience initiative, and a data privacy organization. Their insights spoke directly to the operational realities, community-level gaps, and governance challenges and ongoing developments inherent in managing a city's digital transformation.

2. The U4SSC Working Group 6 participants brought a multilateral and normative framework perspective. This group included cluster leaders, co-chairs, and technical experts involved in the broader DDG Working Group process. There were also institutions across the Netherlands, the United States, the United Kingdom, Ireland, India, South Korea, and Dubai; these stakeholders connected local governance experience to the global implications of the DDGs.

3. The additional experts were reached through referral and supplementary outreach. This group included academics, NGO leaders, and other experts who were not formally affiliated with either the City of Rotterdam or the U4SSC Working Group 6 but whose knowledge of digital governance and urban technology provided an external, critical perspective. These interviewees represented a private building company, a Digital Child Rights Organization, and a Smart City Association.

The table below maps all 27 interviewees by name, position, company, and primary analytical lens. It shows where each contact originated (City of Rotterdam, U4SSC, or Referral) and their affiliation with the U4SSC WG, as some referrals were part of the group, and some contacts from the U4SSC client were not.

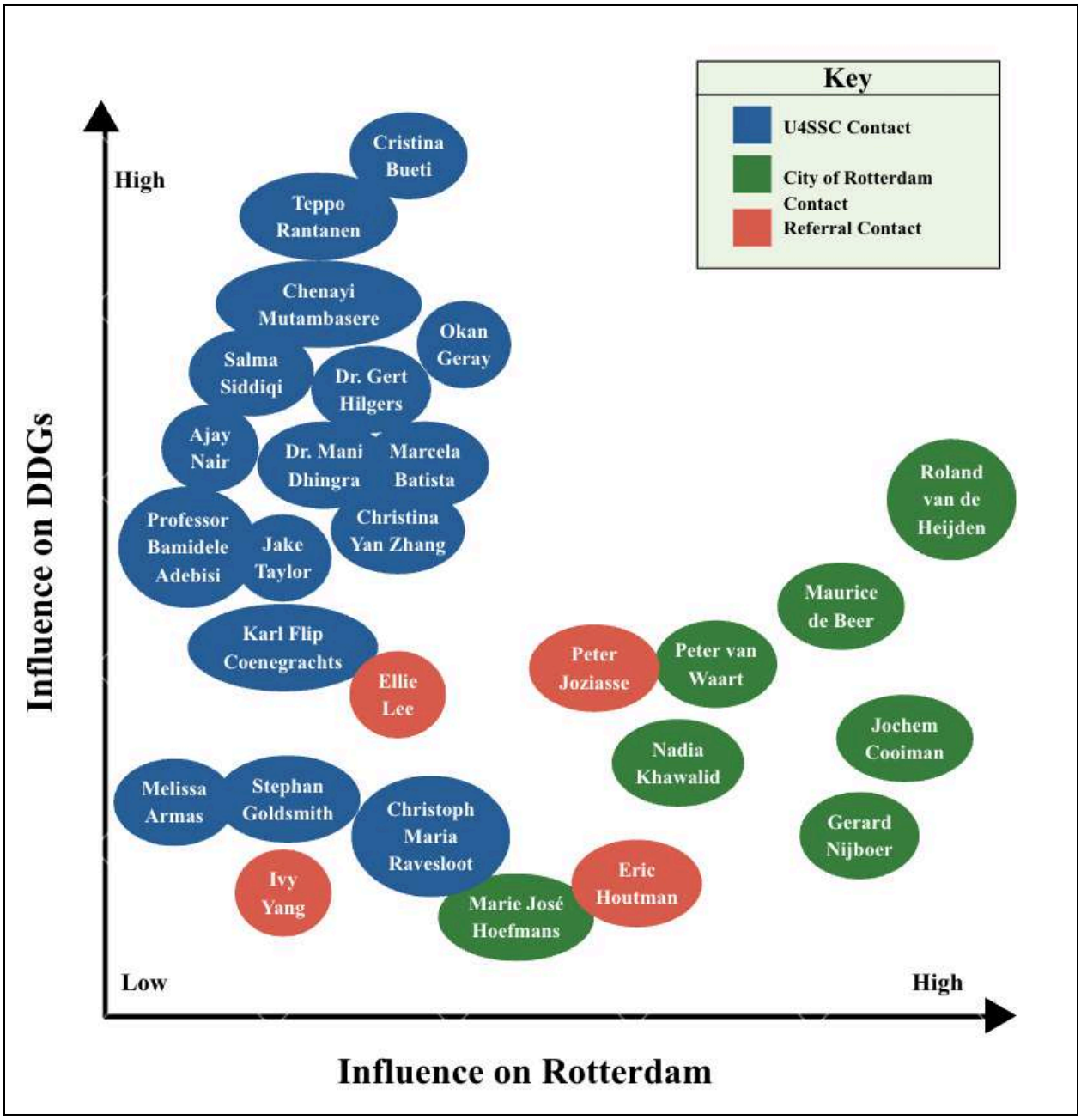
Table 1: Directory of 27 Interviewees

NO.	NAME	POSITION	COMPANY	MEMBER OF U4SSC WORKING GROUP?
1	Marie José Hoefmans	Chief Essential Officer	Schluss	X
2	Gerard Nijboer	Strategist Advisor Innovation	Municipality of Rotterdam (CIO Office)	X
3	Dr. Gert Hilgers	Founder & Principal Adviser	Interveo	Y
4	Salma Siddiqi	Co-Founder & CEO	Natrual You LTD	Y
5	Christoph Maria Ravesloot	Research Professor of Applied Sciences, Professor of Sustainable Building Information Modeling with AI	Rotterdam University of Applied Sciences, Centre of Expertise HRTech	X
6	Melissa Armas	Lead Strategist & Founder	AZ Collab	Y
7	Roland van der Heijden	Chief Citiverse Officer	Municipality of Rotterdam (CIO Office)	X
8	Nadia Khawalid	Project Manager Digitale Inclusive	Municipality of Rotterdam (Sociaal AI Lab Rotterdam)	X
9	Peter van Waart	Coordinator Smart and Social City	Hogeschool Rotterdam	Y
10	Maurice de Beer	Battalion Chief	Fire Dept & Safety Region Rotterdam-Rijnmond	X
11	Dr. Mani Dhingra, Ph.D. (she/her)	ADAPT Digital Twin Research Lead embedded in Dublin City Councel's Smart City Unit	School of Information and Communication Studies, University College Dublin	Y
12	Jochem Cooiman	Digital Innovation Officer	Municipality of Rotterdam (CIO Office)	X
13	Stephen Goldsmith	Derek Bok Professor of the Pracitce of Urban Policy, Director of the Data Smart Cities Program	Bloomberg Center for Cities at Harvard University	X
14	Jake Taylor	Owner, Producer	BNC Design Studios	Y
15	Ajay Nair	Smart Cities & Data Governance Consultant	Nexis Space	Y
16	Ivy Yang	AI//Digital Policy Navigation Specialist	Open & Agile Smart Cities	X
17	Ellie Lee	Manager, Urban Innovation Division (Digitalization & International Cooperation), Smart City Association Member	Korea Smart City Association, UN/U4SSC Working Group (DDGs)	Y
18	Peter Joziasse	Founder	Digital Child Rights	X
19	Eric Houtman	CEO and Founder	InterConcept, PlanGarant Nederland and InterGarant Groep	X
20	Roland van de Heijden	Chief Citiverse Officer	Municipality of Rotterdam (CIO Office)	X
21	Teppo Rantanen	Founder and CEO	TR Citiverse Oy	Y
22	Professor Bamidele Adebisi, MBE	Professor and Director of Smart Infrastructure Research, Director, University Board Member	Manchester Metropolitan University, African Hydrogen Partnership (AHP)	Y
23	Chenayi Mutambasere	Strategic Director	Director for Africa Center for Economic Justice	Y
24	Okan Geray	Digital Dubai, U4SSC Chair	Senior Digital City Strategy Advisor	Y
25	Karl-Filip Coenegrachts	Chair and Executive Director	Open & Agile Smart Cities	X
26	Cristina Bueti	Counsellor on Virtual Worlds and AI	International Telecommunication Union	Y
27	Christina Yan Zhang	CEO	Metaverse Institute	Y



The 27 stakeholder perspectives were also mapped according to their influence on the DDGs and Rotterdam. If an interviewee was part of the U4SSC WG, they had a high level of influence on the DDGs (depending on their level of seniority in the U4SSC); if an interviewee was not part of the WG, they had a low level of influence. If an interviewee did not live in Rotterdam, they had a low proximity to Rotterdam; if they were part of the city government, they had a high proximity (depending on their level of seniority in the municipality or degree of influence on the city if they were from an outside organization located in Rotterdam).

Figure 2: Stakeholder Matrix



Limitations

Several limitations should be noted in interpreting this research. First, while the snowball sampling approach successfully expanded the stakeholder pool beyond the original 25 contacts provided to 27 total interviews, referrals naturally tend to cluster within existing professional circles, which may have introduced a degree of network homogeneity into the findings. Second, the three stakeholder groups were not evenly distributed: the U4SSC Working Group 6 contact list was about twice as large as the City of Rotterdam's, and the additional expert group was

about half the size of the City of Rotterdam's. Furthermore, one contact from each of the two client groups did not respond. This uneven distribution can result in certain institutional perspectives being represented more deeply than others.

Third, several interviewees held several affiliations. For instance, Mani Dhingra is the ADAPT Digital Twin Research Lead embedded in Dublin City Council's Smart City unit, while also being a part of the U4SSC Working Group 6. These overlapping roles complicate clear categorization and may mean that certain interviewees provided perspectives primarily through the lens of their full-time roles rather than their involvement with the U4SSC. On the other hand, some interviewees were not involved with the U4SSC or employed by the City of Rotterdam at all, yet still live and work in Rotterdam or possess expertise pertinent to the case study. These varying affiliations are represented in the Stakeholder Matrix (Figure 1). Thus, these stakeholders do not encapsulate the full breadth of relevant perspectives for Rotterdam's digital future or for the creation of the DDGs, but do provide a snapshot of pertinent qualitative data.

Fourth, one stakeholder, Roland van der Heijden, participated in two separate interviews, reflecting the depth of his role across the Citiverse program. As a result, there is more qualitative data from him, and his insights are more likely to be extensively represented than those of other interviewees. In some cases, relationships are inferred from the views of a limited set of interview excerpts. Determining which quotes to support each theme came at the discretion of the authors.

Finally, as with any qualitative interview-based methodology, response depth varied across participants, and findings reflect views expressed at a particular moment in time. They should not be read as exhaustive or universally representative of each stakeholder group.

Analysis of Stakeholder Interviews

Given the dual-client structure of this engagement and the limitations above, the Key Findings and Cross-Cutting Themes were organized into three total sections:

Section A: Findings from the U4SSC client perspective

Section B: Findings from the City of Rotterdam client perspective

Section C: Overlapping themes from both perspectives

To support this structure, the table of 27 interviewees (Table 1) was divided into two groups: Interviewees from the U4SSC Client and referrals from those contacts (Table 2), and interviewees from the City of Rotterdam Client and referrals from those contacts (Table 3). To ensure analytical depth and consistency within each lens, each group's findings were authored by a dedicated team of three researchers.

Table 2: 16 Interviewees from the U4SSC Client and referrals from those contacts

NO.	NAME	POSITION	COMPANY	MEMBER OF U4SSC WORKING GROUP?
1	Dr. Gert Hilgers	Founder & Principal Adviser	Interveo	Y
2	Salma Siddiqi	Co-Founder & CEO	Natural You LTD	Y
3	Christoph Maria Ravesloot	Research Professor of Applied Sciences, Professor of Sustainable Building Information Modeling with AI	Rotterdam University of Applied Sciences, Centre of Expertise HRTech	X
4	Melissa Armas	Lead Strategist & Founder	AZ Collab	Y
5	Dr. Mani Dhingra, Ph.D. (she/her)	ADAPT Digital Twin Research Lead embedded in Dublin City Councel's Smart City Unit	School of Information and Communication Studies, University College Dublin	Y
6	Stephen Goldsmith	Derek Bok Professor of the Pracitce of Urban Policy, Director of the Data Smart Cities Program	Bloomberg Center for Cities at Harvard University	X
7	Jake Taylor	Owner, Producer	BNC Design Studios	Y
8	Ajay Nair	Smart Cities & Data Governance Consultant	Nexis Space	Y
9	Eric Houtman (Christoph Connection)	CEO and Founder	InterConcept, PlanGarant Nederland and InterGarant Groep	X
10	Teppo Rantanen	Founder and CEO	TR Citiverse Oy	Y
11	Professor Bamidele Adebisi, MBE	Professor and Director of Smart Infrastructure Research, Director, University Board Member	Manchester Metropolitan University, African Hydrogen Partnership (AHP)	Y
12	Chenayi Mutambasere	Strategic Director	Director for Africa Center for Economic Justice	Y
13	Okan Geray	Digital Dubai, U4SSC Chair	Senior Digital City Strategy Advisor	Y
14	Karl-Filip Coenegrachts	Chair and Executive Director	Open & Agile Smart Cities	X
15	Cristina Bueti	Counsellor on Virtual Worlds and AI	International Telecommunication Union	Y
16	Christina Yan Zhang	CEO	Metaverse Institute	Y

Table 3: 11 Interviewees from the City of Rotterdam Client and referrals from those contacts

NO.	NAME	POSITION	COMPANY	MEMBER OF U4SSC WORKING GROUP?
1	Marie José Hoefmans	Chief Essential Officer	Schluss	X
2	Gerard Nijboer	Strategist Advisor Innovation	Municipality of Rotterdam (CIO Office)	X
3	Roland van der Heijden	Chief Citiverse Officer	Municipality of Rotterdam (CIO Office)	X
4	Nadia Khawalid	Project Manager Digitale Inclusive	Municipality of Rotterdam (Sociaal AI Lab	X
5	Peter van Waart	Coordinator Smart and Social City	Hogeschool Rotterdam	Y
6	Maurice de Beer	Battalion Chief	Fire Dept & Safety Region Rotterdam-Rijnmond	X
7	Jochem Cooiman	Digital Innovation Officer	Municipality of Rotterdam (CIO Office)	X
8	Ivy Yang (Gert Connection)	AI//Digital Policy Navigation Specialist	Open & Agile Smart Cities	X
9	Ellie Lee (Gert Connection)	Manager, Urban Innovation Division (Digitalization & International Cooperation), Smart City Association Member	Korea Smart City Association, UN/U4SSC Working Group (DDGs)	Y
10	Chief Citiverse Officer	Municipality of Rotterdam (CIO Office)	Municipality of Rotterdam	X
11	Peter Joziasse (Nadia Connection)	Founder	Digital Child Rights	X

This approach was chosen deliberately over alternative categorization methods. Several contacts provided by the U4SSC client were not formal U4SSC WG members, while several contacts provided by the City of Rotterdam were. The WG is relatively accessible and does not have a time commitment equal to that of a full-time role, so sorting by interviewees' main employment was considered. However, many interviewees held varying positions, e.g., U4SSC contacts also had municipal roles. As a result, neither U4SSC WG membership nor a full-time role cleanly reflected the perspective each interviewee brought. Given these overlaps, the client contact source was used to split the Key Findings section, providing a consistent, traceable basis for

perspectives and ensuring that each client could readily locate the analysis most directly connected to their work.

To generate themes, the three Section A authors analyzed each of the 17 interviewees and independently identified their own key themes. Then, all three authors consolidated the U4SSC themes that occurred most frequently. The Section B authors did the same for their 11 interviewees. Then, all six case-study authors consolidated the six overlapping themes across sections, discussed in Section C. Those that did not overlap are presented in their respective sections, i.e., Section A for three U4SSC themes and Section B for three Rotterdam themes.

Overall, this case study is based on themes gathered from 27 external interviewees, unless otherwise cited. Each interview used a set of standardized questions and a set of three to five tailored questions based on each interviewee's background (See: Appendix C). Interview themes were created based on quotes from transcripts, and tied to their relevant cluster. AI-assisted tools were used to sift through 463 pages of transcripts, and manual review was used to verify that the quotes accurately represented the themes (See: Appendix B). Quotes were reviewed in context by the researchers, and some key insights did not come from a specific quote but rather from a conversation related to a theme; when relevant, interviewees' perspectives are attributed to them in brackets at the end of the sentence.

Background & Context

A. Rotterdam's Past: From Smart-City Experimentation to Responsible Digitalization

Before assessing Rotterdam's current digital landscape and considering where it may go next, it is important to understand how the city's approach to digitalization was developed. Rotterdam's current model did not emerge from a single project, policy, or controversy. It took shape gradually through infrastructure investment, regional planning, smart-city experiments, collaboration, and lessons learned along the way. Early initiatives strengthened the city's capacity and created networks that supported innovation. At the same time, they exposed challenges involving coordination, growth beyond the pilot stage, privacy, transparency, and public trust. Rotterdam's history therefore shows both the value of digital innovation and the responsibilities that arise when technology and data become part of public services and decision-making.

One important contribution to the development of Rotterdam's modern digital capacity was Glass River Maas, a publicly owned fiber optic broadband infrastructure established beginning in 2005 that continues to operate today. The infrastructure was intended to provide reliable information and communications capacity that could support future digital developments. Meijer and Thaens (2021) explain that Glass River Maas created both a technical legacy, through shared digital infrastructure, and a social legacy, through networks of innovators who continued to work together on later smart-city initiatives. Glass River Maas therefore represents one part of the

broader development of Rotterdam's digital transformation, which preceded its current Digital Twin or Open Urban Platform. Those newer developments were made possible in part by the infrastructure, knowledge, and working relationships established through these earlier efforts.

Digitalization became more closely tied to regional economic and social change in 2016 with the publication of the Roadmap Next Economy. The strategy was developed by the Metropoolregio Rotterdam Den Haag, a partnership of 23 municipalities, in response to technological, environmental, economic, and social changes affecting the region. It organized regional priorities around five pathways: Smart Digital Delta, Smart Energy Delta, Circular Economy, Entrepreneurial Region, and Next Society. The strategy also recognized that technology alone would not be enough. It identified weak collaboration among government, businesses, and academic institutions as a regional challenge and called for a more connected approach that could turn innovation into wider economic and social benefits (Metropoolregio Rotterdam Den Haag [MRDH], 2016).

During the same period, Rotterdam became the coordinating city for RUGGEDISED, an EU funded smart-city project that ran from 2016 to 2022. The initiative brought together the lighthouse cities of Rotterdam, Umeå, and Glasgow and the follower cities of Brno, Parma, and Gdańsk. RUGGEDISED tested combinations of clean energy, smart mobility, digital tools, open-data platforms, and Internet of Things (IoT) applications. It also examined the funding models, partnerships, and practical conditions needed to advance successful ideas beyond small pilot projects. Rotterdam's leadership strengthened its experience in cross-sector collaboration and its position within European smart-city networks. The project highlighted an important lesson: individual experiments have limited value if they cannot be connected, expanded, and maintained across the wider city (European Commission, n.d.).

Together, these initiatives expanded Rotterdam's digital capacity, but they also revealed the limits of an approach built mainly around experimentation. Projects were often designed for a particular sector, funding program, and/or policy goal. This gave the city room to test new ideas, but it did not automatically create a connected citywide system. Different projects could rely on separate datasets, technologies, rules, municipal teams, and outside partners. As a result, Rotterdam's challenge gradually shifted from creating more digital tools to deciding how existing tools and information could work together, who would be responsible for them, and how successful projects could continue after their pilot period ended. The Roadmap Next Economy's focus on collaboration and RUGGEDISED's focus on integrated solutions both show that coordination was becoming just as important as innovation itself (European Commission, n.d.; MRDH, 2016).

Rotterdam's digitalization journey also took place within a period of growing attention to the risks that may arise when public agencies use data without sufficient transparency, accountability, or safeguards. A significant example was Rotterdam's involvement with the Dutch government's Systeem Risico Indicatie, commonly known as SyRI. SyRI was a legal tool

intended to identify possible fraud involving social benefits, allowances, and taxes. In Rotterdam, it was used in the neighborhoods of Bloemhof and Hillesluis. The project generated 1,263 risk signals for further investigation, which could have included potential home visits by social investigators (Willen, 2019). Residents and civil-society organizations opposed the project, arguing that it treated benefit recipients and neighborhood residents as suspicious while offering little explanation of how the addresses had been selected. During this time, Rotterdam was faced with questions about the legal process for the operational phase, privacy protections, and information sharing for this tool. These questions arose as participating organizations were adjusting their practices to the introduction of the Algemene Verordening Gegevensbescherming (AVG), which is Dutch for the General Data Protection Regulation (GDPR). Rotterdam postponed the operational phase, sought external legal advice, and information sharing. When an agreement on the legal framework could not be reached, the city concluded that it lacked sufficient confidence that the risk signals could be followed up carefully and ended preparations for the operational phase in July 2019 (Permentier, 2020).

Separately, the legal dispute continued at the national level. In February 2020, the District Court of The Hague concluded that the law governing SyRI did not comply with Article 8 of the European Convention on Human Rights, which protects the right to private and family life. The court found that the law did not strike a fair balance between the public interest in preventing fraud and the privacy rights of the people affected. It also found that the way SyRI operated was not transparent or open enough to meaningful review. The legislation was therefore declared to have no binding effect (Rechtbank Den Haag, 2020). It is important to note that the ruling addressed the national legal framework rather than Rotterdam alone. Rotterdam had already ended preparations for its local operational phase before the national judgement was issued (Permentier, 2020).

The SyRI controversy illustrates why privacy, transparency, accountability, and public trust are important considerations when governments use data in ways that can affect residents. A system may be designed to improve efficiency or identify possible risk, but it can still raise concerns about public trust when residents do not understand how it works, what information it uses, or how they can question its conclusions. The controversy also raised questions about how the effects of digital systems may be experienced by different communities. When data-driven monitoring is concentrated in selected neighborhoods or among people who receive public benefits, privacy concerns are closely linked to fairness, proportionality, and social inclusion. SyRI represents another part of the city’s digital history, unlike Rotterdam’s earlier smart-city initiatives, it draws attention to the governance and public impacts of data use. It also provides context for understanding why trust and transparency remain important considerations in responsible digitalization.

These developments should not be presented as a simple chain in which one controversy directly caused a later program. Instead, they form part of a broader process of institutional learning. Early infrastructure programs gave Rotterdam the ability to experiment, while regional strategies

and European projects showed how difficult it could be to connect and expand digital solutions. The SyRI controversy added another dimension by raising questions about transparency, safeguards, and public accountability. Together, these experiences reinforced the need to govern technology with the same care used to develop it.

Rotterdam's past can therefore be understood as a gradual movement from building infrastructure and testing individual projects toward a more connected and responsible approach to digitalization. Its early initiatives created valuable technical and institutional foundations, but they also revealed problems related to fragmentation and limited oversight. SyRI represents one part of this broader history and provides context for understanding the growing importance of privacy, transparency, accountability, and trust in digital governance. This history provides important context for Rotterdam's present approach, which places greater attention on systems that work together, public values, inclusion, resident participation, and shared responsibility alongside technological innovation.

B. Rotterdam's Present Digital Landscape

Rotterdam's current digital landscape is developing as a connected ecosystem of urban data infrastructure, digital city modeling, citizen-facing platforms, digital inclusion programs, and data governance mechanisms. Rather than being organized around a single smart-city project, the city's present digital direction brings together multiple layers of digital transformation with shared data infrastructure, a 3D Digital Twin, emerging Citiverse experimentation, digital participation tools, inclusion programs, and governance frameworks for privacy, artificial intelligence, algorithms, and interoperability. Within this landscape, the Open Urban Platform, the Digital Twin, and the Citiverse are central to Rotterdam's present digital development direction. Rotterdam's current digital landscape is best understood not only as an ecosystem of digital systems, but as a socio-technical ecosystem shaped by the interaction between technologies, institutions, practitioners, civic organizations, public-sector leaders, and residents. The city's present digital direction brings together multiple layers of transformation, including shared data infrastructure, digital twin and 3D/immersive urban modeling tools, emerging Citiverse experimentation, citizen-facing engagement tools, digital inclusion programs, and governance mechanisms related to privacy, artificial intelligence, algorithms, and interoperability. These initiatives do not operate in isolation as technical projects. Their development depends on stakeholder networks, organizational relationships, public-sector leadership, and citizen engagement practices that determine how digital tools are adopted, governed, trusted, and applied in urban life. Within this landscape, the Open Urban Platform, Digital Twin, and Citiverse remain central reference points for Rotterdam's digital development direction, but their significance lies as much in the ecosystem of actors surrounding them as in the technologies themselves.

The Open Urban Platform is described by the municipality as Rotterdam's digital data-sharing infrastructure. It is intended to enable the municipality, companies, schools, residents, and other

city actors to exchange, use, and add urban data in one shared digital environment. According to municipal and partner sources, the platform went live in January 2025 and is designed to support collaboration across the city by making urban data more accessible for planning, innovation, research, and service development. The platform is also connected to Rotterdam's broader digital city infrastructure, including a data marketplace, real-time data streams, and the 3D Digital Twin. In this sense, the Open Urban Platform functions as a foundational layer for Rotterdam's present digital landscape, providing a shared environment through which different actors can work with urban data.

The Open Urban Platform is closely linked to Rotterdam's 3D Digital Twin. The Digital Twin is described as a digital representation of the city that supports visualization, planning, and the interpretation of urban data. It allows city data to be displayed spatially, helping users understand physical places, urban systems, and possible developments in a more visual and interactive way

Rotterdam's Citiverse is presented as an emerging concept that connects the physical, digital, and social dimensions of the city. It builds on the Open Urban Platform and Digital Twin by extending digital city infrastructure toward more interactive and citizen-facing applications. The Citiverse concept includes attention to digital identity, cybersecurity, citizen-centered services, public spaces, sustainable urban development, digital inclusion, and an application ecosystem that can reuse data through the Open Urban Platform. The Citiverse should therefore be understood as both a current direction of experimentation and a future-facing digital urban concept. Some parts of this landscape are already active, such as the Open Urban Platform and digital twin infrastructure, while other components are being developed through pilots, labs, and application experiments.

One important example of Citiverse-related experimentation is the x-CITE project. The Rotterdam pilot within x-CITE focuses on citizen engagement in urban planning through interactive 3D and XR-based tools. The project describes an approach in which residents can visualize urban projects, provide feedback, and access city services through immersive or interactive digital environments. Related x-CITE technical documentation also emphasizes a reusable and interoperable architecture for connecting XR tools with Local Digital Twins across European city contexts. In Rotterdam, this positions Citiverse work as part of a wider European experimentation space around digital twins, immersive participation, and interoperable urban platforms.

Alongside its data and visualization infrastructure, Rotterdam has developed several digital inclusion initiatives aimed at helping residents participate in an increasingly digital city. The municipality's Digitaal Meedoen program provides a central entry point for residents with digital questions and connects them to support services. Within this landscape, the Schakelpunt functions as a referral system that helps match residents to appropriate digital support providers, while the DigiHulplijn offers assistance for people who need help with digital tools or online services. Rotterdam also works through the Netwerk Digitale Inclusie Rotterdam, a network of

organizations focused on digital skills, knowledge sharing, and connecting residents to local forms of support.

Rotterdam's digital inclusion landscape also includes programs related to device access, training, safe connectivity, and applied research. Municipal budget documents describe plans to provide refurbished laptops to residents without safe working devices, combined with in-person digital skills training and access to online learning resources (Municipality of Rotterdam, 2026). The city also refers to safe Wi-Fi and support for digital skills initiatives as part of its digital inclusion work. The Rotterdam Sociaal AI Lab is connected to this broader inclusion landscape, focusing on the relationship between artificial intelligence, social issues, and residents' ability to participate in a digital society (Municipality of Rotterdam, 2026). Together, these initiatives show that Rotterdam's present digital landscape includes not only advanced data infrastructure, but also programs designed to support resident access, skills, and participation.

Public participation is another visible part of Rotterdam's current digital landscape. Mijn Rotterdam is the municipality's digital participation platform, where residents can think along, respond to municipal plans, submit initiatives, and participate in neighborhood-level decision-making processes.

Rotterdam's digital landscape also includes governance mechanisms related to privacy, data use, responsible AI, and algorithm transparency. Municipal reporting refers to privacy and AVG/GDPR compliance as part of the city's data governance environment. Rotterdam has also developed algorithm governance connected to the EU AI Act and a broader privacy framework for processing large amounts of personal data for research, policy, and algorithmic applications (Municipality of Rotterdam, 2025b). These governance activities are part of the city's current institutional response to increasing data use, digital services, and AI-enabled systems in municipal operations.

The Dutch Algorithm Register is another part of this governance landscape. Rotterdam's entries in the national register include systems such as virtual assistants, meeting transcription, crowd monitoring, social-security-related systems, parking control, tax-related tools, and other municipal applications.

Rotterdam's present digital landscape can therefore be understood as a layered and interconnected ecosystem. At the infrastructure level, the Open Urban Platform provides a foundation for data sharing and interoperability. At the visualization and planning level, the 3D Digital Twin helps represent the city and connect urban data to real-world systems. At the experimentation level, the Citiverse and x-CITE pilots explore more interactive and immersive ways of connecting residents, institutions, and urban environments. At the socio-digital level, Rotterdam's work extends beyond digital inclusion alone. Programs such as Digitaal Meedoen, DigiHulplijn, laptop access, training, and the Sociaal AI Lab support participation in the digital city, while broader initiatives point toward the digitalization of citizen services, more

citizen-centered forms of participation, learning, and decision-making, and the reimagining of public space in the urban digital realm. At the governance level, privacy frameworks, algorithm governance, the Dutch Algorithm Register, digital rights networks, and emerging approaches to data autonomy form part of Rotterdam's effort to align digital development with public trust and citizen agency. Together, these layers describe Rotterdam's present digital landscape as a data-enabled, interoperable, and citizen-facing urban digital ecosystem shaped by both technical infrastructure and social participation.

The present landscape described above maps the visible architecture of Rotterdam's digital transformation. However, this descriptive mapping does not by itself explain how these initiatives work in practice, or what conditions determine whether they generate public value. The stakeholder interviews therefore provide the analytical layer that follows. They reveal the ongoing challenges and developments beneath Rotterdam's digital ecosystem, including questions of coordination, trust, inclusion, interoperability, rights, institutional capacity, and accountability. These themes help move the analysis from what Rotterdam is building to how its digital transformation is experienced, governed, and contested by different actors.

Key Findings & Cross-Cutting Themes

Below are the 12 most important themes identified across the interviews and supporting research, organized by the U4SSC-Oriented Perspective (based on Table 2), the Rotterdam Affiliated Perspective (based on Table 3) and the themes reflected by both perspectives (based on Table 1), all connected to the four emerging DDG clusters: Values, Rights and Governance; New Societal Outcomes; Comprehensive Interoperability; and Digital Technology Itself.

A. The U4SSC-Oriented Perspective

1. Outcome-Driven & Measurable Implementation

Across the U4SSC Working Group (WGs) interviews, a consistent theme was that digital technology should not be treated as evidence of progress in itself. Interviewees repeatedly challenged the assumption that building, launching, or deploying a tool is the same as achieving impact. Instead, successful digital development was framed through the measurable value that technology creates for residents, institutions, and city systems. In this sense, Cluster 4 is not only about the technology itself, but about the conditions under which technology can be considered useful, accountable, and worth sustaining.

A shared point across the interviews was that cities should not confuse activity with impact. Digital projects need to begin with a clear understanding of why they are being created, what problem they are meant to address, and what outcome they are expected to produce

[Mutambasere][1]. Establishing a "golden thread" [1] between a goal and its intended outcome helps answer a central question for digital development: how will this tool create meaningful value for citizens? At the same time, cities may need to invest in digital infrastructure based on reasonable assumptions about its future value, even when the full impact is difficult to measure or may only become evident over time. Without a clear connection to an intended outcome, however, technology risks becoming a completed product rather than a sign of actual progress.

This distinction between outputs and outcomes was echoed by multiple interviewees. The creation of a digital tool, whether an AI system, platform, or digital twin, may be an output, but the outcome is what that tool changes: how it improves everyday life, supports institutions, strengthens service delivery, or reduces harm [Armas; Taylor][2] [3]. From this perspective, the end goal is not the finished product itself, but the value that product creates for the people and systems it is meant to serve [Armas]. This insight points toward a broader principle of intentional innovation. From the beginning of development, cities should be asking who the tool is for, who is affected by it, and what will change as a result. These questions cannot be added after implementation; they have to shape the design and evaluation of the project from the start.

Interviewees broadly agreed that digital technology should be measured against outcomes and they provided some of their own ideas on how those outcomes should be operationalized. Some framed measurability as an institutional challenge, requiring cities to define outcome parameters and translate broad goals into department-level indicators and KPIs [Nair][4]. In this view, measurement is not simply about collecting more data. It is about helping departments understand what they are responsible for improving and how progress can be tracked over time. Others approached measurability as a systems-design issue, where data becomes useful only when it moves through a feedback loop: it is collected, analyzed, interpreted, and then used to determine whether action is needed [Adebisi]. These perspectives suggest that measurable implementation requires both institutional and technical mechanisms. Cities need KPIs that connect digital tools to public outcomes, and they also need feedback loops that prevent data collection from becoming an end in itself.

For the U4SSC-affiliated interviewees, measurement also depends on accountability. Cities need to know who benefits from a digital tool, who may be most affected by it, who is responsible for

[1] Chenayi Mutambasere, "We need to be very outcome focused. So why are we doing this? What are we trying to achieve? And then have that golden thread between the goal and the outcome… Because your outcome as well are more measurable."
[2] Melissa Armas, "As humans, we tend to confuse output with outcome… technology really has to help us with the how, but humans need to be in charge of the what and the why."
[3] Jake Taylor, "Can you articulate in succinct terms the degree to which this will impact the everyday resident at an individual level?… How will this change the way I behave from day-to-day? Because if you can't answer that, you haven't changed anything."
[4] Ajay Nair, "There are systems currently available… which will allow you to digitize all these environmental quality parameters, which are outcome parameters, and work backwards… so that individual departments and agencies within the cities, they get proper KPIs and measurements… to continuously improve their outcome."

maintaining it, and who is accountable when the system fails [Armas][5]. A tool may function well from a technical standpoint, but if no one is responsible for its long-term use, public effects, or unintended consequences, it cannot be considered fully successful. Outcome-driven implementation therefore requires transparency, ownership, and a clear understanding of who the technology is meant to serve.

This theme closely aligns with Cluster 4 because it identifies a central condition for digital technology itself: technology is not the outcome, it is the output. The outcome is the measurable benefit that technology creates for residents, institutions, and city systems. From the U4SSC perspective, the DDGs should therefore push cities beyond innovation for its own sake and toward digital tools that are designed, implemented, and evaluated according to clear, human-centered, and measurable public value.

2. Governance Regulation and Accountability

Throughout our interviews with the U4SSC Working Group 6 members, we noticed a key emphasis on maintaining a strict governance structure around digitalization tools and systems. These structures are to be maintained through a number of methods from clear accountability mechanisms to regulatory guardrails. Enacted as a means to ensure defined responsibility when these digital systems cause harm or disrupt essential services, which can undermine public trust and institutional integrity. Across these diverse conversations, a similar set of questions surfaced repeatedly. Who is responsible for these systems? What exactly should or should not be regulated? And how can responsibility be allocated once a system is in use?

As we delve through the data, it is evident that the tricky part is getting people on board and allocating individual(s) to manage the infrastructure [Coenegrachts][6]. The relationship between governance and the buy-in phase is not only about encouraging technological adoption. More importantly, governance needs to center around establishing and maintaining trust between the governing body and its citizens. While a governance toolkit does already exist, both within the working group and in civil practice, what remains unresolved is not whether to govern but how to make governance agile enough to keep pace with the rapid digital transformation taking place [Boorsma]. Rotterdam, for example, already offers such an instrument through their Open Urban Platform which is overseen by a governance Board of societal stakeholders that can intervene when necessary [Boorsma]. In turn, this raises the question of whether this marks a start of a Trias Politica “type” of approach of governing the future digital domain [Boorsma]. Although today’s tools make transformative governance possible, it takes a conscious effort [Goldsmith] to establish and maintain governance boards that oversee the digital ecosystem.

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[5] Melissa Armas, “Everything starts with questions… understanding who is using it, right? Who is your end user? Who is this going to serve?… who is responsible for keeping this going? Like who is accountable for the processes?”

[6] Karl-Filip Coenegrachts, “It is the governance… that is quite crucial. Who is actually going to set this up?”

As we continue to consider the accountability aspects of governance, we are truly considering *who* is held accountable and by what *mechanism* of evaluation. No single person can speak for every part within a city and, in turn, this structural ambiguity removes accountability [Hilgers]. As a result mechanisms such as standard operation procedures (SOPs) are often called for as they can be measured/monitored and validated against written procedures [Ajay Nair][7]. A city council for example, can use SOP's and can be held accountable, carrying the institutional weight and responsibility [Adebisi] of the effect of technological advancements on a society and the environment [Bueti]. Auditing these SOPs acts as a checks and balances system where accountability can be reported to keep powerful institutions in line [Dhingra].

Establishing who is answerable does not by itself determine what they should govern; however, this should not be framed as a binary choice between regulating the technology itself and regulating the *use* cases of technology [Armas; Boorsma][8] [9]. Instead, effective digital governance requires orchestration across technologies, use cases, desired interoperability, IP and ownership, data reuse and destruction beyond the original purpose, roles and mandates of leaders, practitioners, and organizations involved, public-private partnerships, investments and procurement, and rights in the digital era where existing rules may not be sufficient at the frontier of innovation [Boorsma]. One of these instances can be exemplified in the United States by the cities of Tempe and Mesa, in Arizona, where each revealed unique AI policies. Tempe created a list of "do-nots," while Mesa formulated a sandbox of specific tools for employees and officials to use. While Tempe officials were forced to find workarounds, Mesa's officials were provided a safer set of tools that would not compromise data safety or institutional trust [Taylor]. While this instance specifically relates to two cities within Arizona, its lessons may still be relevant beyond that context. Use-case regulation can therefore be useful, but governance is "not binary"; it must be orchestrated across technologies, use cases, interoperability, IP and ownership, data reuse and destruction, institutional roles and mandates, public-private partnerships, procurement, and rights in the digital era [Boorsma][10].

Yet even with a well-targeted regulatory approach, long-term success still depends on the architecture beneath it. On this topic, our interviewees overlapped on a common design principle: design a governance framework built to last. This framework should centralize its shared foundations, such as services like digital identity, payments, and authentication. While at the same time, leaving individual agencies free to innovate on their own [Geray]. It was even suggested that these agencies might be coordinated through a protocol manager modeled on the

[7] Ajay Nair, "You need to have proper data governance procedures and SOPs…"

[8] Melissa Armas, I'm not saying no to policies. I'm saying yes to policies, but the policy is regulating, not the tech, but the use cases."

[9] Bas Boorsma,"It's not binary. One has to orchestrate governance on technologies, use cases, desired interoperability, IP and ownership, data reuse and destruction, roles and mandates, PPPs, investments and procurement, and rights in the digital era."

[10] Bas Boorsma, ""It's not binary. One has to orchestrate governance on technologies, use cases, desired interoperability, IP and ownership, data reuse and destruction, roles and mandates, PPPs, investments and procurement, and rights in the digital era."

BIM standard, proceeding by consent rather than consensus [Ravesloot]. To evaluate the applications it governs, the framework must also define a clear set of guiding principles, chief among them transparency [Goldsmith], so that emerging tools are held to a consistent standard rather than judged case by case. Above all, it is a misconception to assume that a governance structure, once established, will continue to enrich itself through its own internal mechanisms [Nair]; instead it must remain transformational and adaptable, so that the governance guiding today's technology does not become the constraint of tomorrow[11]. Under this paradigm it is imperative that governance, as a whole, remains both adaptable and durable. In short, governance must remain firm on its core principles but must adapt as the environment around it's governance evolves.

What has been synthesized here directly relates to Cluster 4 as it demonstrates how clear governance, regulation, and accountability are necessary for digitalization implementation moving forward. As responsibility for these systems are assigned to specific institutions, we begin to address the ambiguity that exists when these systems fail and cause real-world harm. Meanwhile, SOP's and auditing emphasize measurable impacts that can be used to maintain institutional accountability. Through effective implementation initiatives and measurable impacts we can build trust while maintaining steady innovation. Ultimately, digital progress cannot be separated from the systems used to govern it. These frameworks must remain adaptable so they can protect the public while responding to future technological change.

3. Human-Centered Digital Development

Digital development is dependent on human concepts. When asked about the DDGs, across 17 interviews with U4SSC client contacts, seven used a phrase such as 'people or human-centric', demonstrating the importance of the people behind and in front of technological advancement. The 17 interviewees possessed a wealth of knowledge not only on the U4SSC ecosystem but also on the public, private, and academic sectors, which are all both future catalysts and users of the DDGs. Across these interviews, citizen engagement and measurability emerged as requirements for Human-Centered Digital Development. This theme is directly tied to Cluster 1, as it provides a framework for discerning values, rights, and governance mechanisms for digitalization on the ground.

First, citizen engagement is required to understand what people on the ground actually desire. This process emphasizes the citizens themselves, as their feedback will demonstrate what they need better than any municipality or conglomerate could ever discern on its own [Taylor][12]. Interviewees stressed the importance of starting these processes at the ground level and building

[11] Stephen Goldsmith, "look at a set of values and principles that should guide the development of applications. How much transparency… how much auditing…"

[12] Jake Taylor, "No one will ever understand citizens need better than citizens. You can't have a global corporate conglomerate coming in and trying to solve everyday Joe problems. They're just too far removed. So the challenges need to derive at the ground level"

up to include them in major governance discussions [Nair][13]. This type of engagement is crucial, as any decision made by a major organization will impact people's personal and professional lives [Nair][6]. Furthermore, without human oversight, digital development is at risk of excluding and harming the people it is meant to serve [Dhingra][14]. When applied to the DDGs, this engagement must operate on a global scale across multiple governments and even generations [Mutambasere][15].

Thus, the DDGs must ensure that they have a mechanism for feedback from people at the ground level, but how? One interviewee recommended a ladder of participation with four steps: inform, consult, engage, and participate, and acknowledged that one of their digital offerings to citizens, the Digital Twin, is still in the inform stage [Dhingra][7]. Applied to the DDGs, this framework illustrates the starting point for meaningful transformation. Before people can advance these goals, they must be informed. This can look like hosting webinars, public showcases [Dhingra][16] or community events [Geray][17]. Another way to bring a human-centered perspective is for decision-makers to step out of their organizational perspective and into their personal one, i.e., to think like an ordinary person who lives and works in the city they are affecting [Taylor][18].

Lastly, for Human-Centered Digital Development to work, it must be measurable. Thus, the DDGs must be able to track the inclusion of people in digitalization. When people are not incorporated in the process, digitalization will focus on the tools themselves rather than their impact on users [Hilgers][19]. The DDGs and city leaders can do this by asking questions about the intended outcome of digitalization and setting clear goals [Bueti][20]. International standards can also help harmonize measurement across cities, while responsible innovation can guide how digital development is designed and implemented [Bueti][21]. Through this theme and its emphasis on measurability, Cluster 1 will have meaningful mechanisms for understanding and

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[13] Ajay Nair, "it is going to impact somebody's life, somebody's business, somebody's education, somebody's healthcare, actually. So the citizen needs to be participating in the governance discussions, actually. They need to be part of the discourses, not on a daily basis, but at least in the beginning stages."
[14] Mani Dhingra, "There's a ladder of participation we always study. So inform, consult, and then engage and participate. So we are still like in that low thing where we are talking about inform and do some consultation…"
[15] Chenayi Mutambasere, "Will this work for everyone?… it's got to transcend time, it's got to transcend different governments… because it's got to still find itself relevant… long after us."
[16] Mani Dhingra, "But as a researcher, we do a lot of public engagement. So I was up on webinar last year. So I was generally talking to people, talking to city folks and all."
[17] Dr. Okan Geray, "We have community places in Dubai where they go… we visited those places and tried to show them how to do things in digital… It's not necessarily training… but rather sitting with them, showing them things."
[18] Jake Taylor, "the whole challenge is just taking off your city hat and putting on your person hat."
[19] Gert Hilgers, "In the past when you were thinking about smart cities, you thought about, oh, we will have a digital tool, we will have, somehow we will digitalize something, or maybe digitally transform something. But the humans, the citizens, the people, the residents, they were never actually in the centre of these activities. And the idea of the city versus, as you well know, is about really putting them in the center."
[20] Cristina Bueti,"If you don't set clear goals in your city, in your country, it will become extremely difficult… to measure the effort that you are putting in place. Is it successful? Is it improving the quality of life?"
[21] Cristina Bueti, "Standards give us that common terminology, that common understanding. It gives you ways and means on how you can harmonise measurement."

implementing the values, rights, and preferred governance structures of the people who develop and use digital technology.

B. The City of Rotterdam Affiliated Perspective

Having outlined how the U4SSC Working Group 6 oriented interviewees envision these priorities in principle, Rotterdam provides a single, operating city against which that framework can be examined in practice. Its evidence shows where that ambition translates cleanly into action and where it doesn't.

1. Implementation & Operational Clarity

A pronounced and consistent concern to emerge from Rotterdam's interviewee batch was not the absence of digital ambition, but rather, the absence of mechanisms through which ambition could be acted upon. Across perspectives, the priority was framed not as generating additional goals but as rendering existing ones practical, clear, transparent, and capable of being put into action [Yang]. This diagnosis was further reinforced from different institutional vantage points. From a public safety standpoint, the concern was that DDGs must constitute genuinely attainable goals, ones with enough grounding to begin implementation immediately, rather than aspirational declarations that remain inert at the level of policy [de Beer][22]. This concern extended further still, with warnings that DDGs risk becoming yet another inert document unless accompanied by concrete implementation mechanisms or legislative backing [van Waart][23].

The interviewees were equally specific about what operational clarity would require in practice. A sharp framing of this gap came through the question of what is supposed to follow once DDGs are established, the implication being that a framework alone is insufficient without concrete tools to accompany it [Joziasse][24]. Reinforcing this, goals were described as needing to be clearly defined and measurable, rather than left open to interpretation across different cultural and professional contexts [Khawalid]. Furthermore, a structural challenge with broader implications was also raised. If the added value of DDGs over the existing SDG framework cannot be clearly articulated, cities will have little incentive to integrate them into their planning processes [Cooiman]. A further layer of complexity concerns shared terminology, with words like "inclusivity," "trustworthiness," or "sustainability" that can mask entirely divergent meanings across institutions and actors, making definitional discipline not a semantic preference but a prerequisite for effective implementation [Yang][25].

This theme connects directly to Cluster 4 of the DDG framework, which concerns how to shape, define, and set conditions on technology development in order to optimize its outputs for cities. Rotterdam's evidence reframes that ambition as a governance challenge as much as a design one.

[22] Maurice de Beer, "real attainable goals" / "could start tomorrow"
[23] Peter van Waart, "another document"
[24] Peter Joziasse, "DDGs and then what next?"
[25] Ivy Yang, "practical, clear, transparent, and implementable"

If Cluster 4 DDGs remain at the level of principle, without specifying who holds responsibility, what is measurable, or even how individual cities are expected to apply them, they risk reproducing the very abstraction that Rotterdam's interviewees identified as the central problem. An important extension of this argument comes through the lens of lifecycle management, emphasizing the fact that DDGs should address what occurs after digital infrastructure has been built, and not only the conditions under which it is developed [Lee]. For Cluster 4 to carry operational relevance at the city level, it requires not only a framework for shaping technology development, but a closing of the loop between goal-setting and the practical instruments cities can deploy.

2. Children, Youth & Digital Rights

Children, youth, and digital rights emerged as a distinct governance issue rather than a small subcategory of digital inclusion. The interviews suggest that young people are already living inside digital environments that adults, institutions, and city governments may not fully understand. This creates a tension between access and protection: children have a right to participate in digital environments, but that participation must be age-appropriate, safe, and guided by the best interests of the child [Joziasse][26] The issue is especially relevant as Rotterdam develops a more integrated social, physical, and digital city through its Citiverse work. Children are growing up in a world that will become increasingly digital, and the city must make that world safer without treating digital life as separate from children's everyday reality [van der Heijden].[27] In this sense, the challenge is not whether children should be included in digital transformation, but how their rights, safety, privacy, and participation are built into the systems shaping their daily lives.

The interviews also suggest that children's digital rights cannot be addressed through restriction alone. Digital harms such as algorithmic bubbles, sexting, bullying, discrimination, misinformation, and platform-driven risks are shaped largely by private technology environments that cities do not fully control [Joziasse][28]. At the same time, adults cannot effectively govern or guide young people's digital lives if they do not understand the environments young people already occupy [van der Heijden][29]. This is why guidance, co-creation, and local support systems become central to the theme. Rather than relying only on rules for a world adults do not fully understand, Rotterdam's approach would need to involve young people directly and support

[26] Peter Joziasse, "Adults don't understand the digital world… young people must play an important role… children have the right to access a digital environment… but it must be age appropriate… and based on the best interest of a child."
[27]Roland van der Heijden, "we also need to understand that children are living and growing up in a world that we maybe not understand anymore, but that's still their world. and that will become more digital. We need to make it safe, but we also need to respect or understand that it will become more digital".
[28]Peter Joziasse, "The big tech owns the platform, and they do not take care enough to do more on algorithm, bubble, safety, sexting, bullying, discrimination, fake news… But it starts with the family and the parents."
[29] Roland van der Heijden,"We need to guide much more than make rules for a world we don't understand."

them through trusted institutions such as parents, mentors, librarians, and youth workers [Joziasse][30].

The work of the Digital Child Rights Foundation gives this theme a practical frame beyond the interview itself. Its mission links children's digital rights to the Sustainable Development Goals by emphasizing reduced inequality in the digital environment, digitally inclusive sustainable cities and communities, and the principle of leaving no child or young person behind in the digital world (Digital Child Rights Foundation, n.d.). The foundation's public mission also connects digital child rights to safety, resilience, digital skills, youth empowerment, digital economy participation, and the need for adults to listen more carefully to children's online problems, wishes, and ideas. This reinforces the interview evidence: children's digital rights are not limited to screen time or online safety, but include access, participation, literacy, empowerment, protection, and institutional responsibility.

For Rotterdam, the most concrete implication is that youth digital rights should be designed into digital transformation from the beginning, especially as the city expands its Citiverse thinking. A gamified environment developed by children and young people offers one example of how digital participation can move from consultation to co-creation [Joziasse][31]. This matters for the DDGs because a global digital governance framework that treats children only as future users or vulnerable beneficiaries would miss the reality that they are already active digital citizens. This theme fits most clearly under Cluster 1 because it asks whose rights and values are protected when cities become more digital. The DDGs should therefore recognize children and youth as a distinct rights-bearing group, with attention to age-appropriate access, platform accountability, digital literacy, youth participation, and the local support systems needed to make digital protection and empowerment real.

3. Resilience, Safety & Sustainability

For Rotterdam's interviewees, resilience is not a single technical property but a structural concern that unfolds across four interdependent, non-hierarchical questions: safety, or what resilience must protect; sustainability, or the material realities on which it rests; preparedness, whether it happens before or after the crisis; and social resilience, or the human foundation without which the other three cannot hold.

The first question is safety, which resilience must protect. From the vantage of frontline public-safety practice, public safety was framed as largely absent from existing smart-city frameworks, and identified as an absence the DDGs must correct [de Beer][32]. Resilience, it was further argued, cannot be imagined as a centrally directed crisis response; in an actual

[30]Peter Joziasse, "You have to create a world based on gamification, developed by children, young people. And at once, they can ask for support or help to a mentor, a parent, or a librarian, or a youth worker. So that's the way to go."
[31]Peter Joziasse, "You have to create a world based on gamification.."
[32] Maurice de Beer, "Public safety is largely absent from smart city frameworks."

catastrophic event, first responders cannot arrive within the initial 48 hours, and therefore resilience must be distributed across individuals, groups, and organizations at every level [de Beer][33]. This position on distributed resilience extended to a critique of the institutional architecture around safety itself: safety and security are routinely separated into two silos, when in practice one cannot exist without the other [de Beer][34]. Drawing on the ongoing war in Ukraine, the standing of civil protection as critical infrastructure was further highlighted, with the argument that fire brigades, ambulance services, and civilian protection systems sit alongside the military as among the most vital organizations for sustaining the functioning of a society [de Beer][35]. Taken together, these perspectives reframe resilience as distributed preparedness rather than centralized crisis response, with public safety serving as its most concrete test.

The second question is sustainability, which resilience rests upon. Interviewees' articulation of sustainability was equally specific, pointing directly to the fact that digitalization is not, as often assumed, immaterial. From Rotterdam's operational reality, a contradiction rarely made public surfaced: digital infrastructure is not merely an instrument for solving the city's problems, but part of the problem itself. The Netherlands is currently experiencing severe net congestion, with data centres and housing construction competing directly for the same finite electricity-grid capacity. If the available capacity is consumed by a data center, roughly a thousand houses cannot be built on the other side [van der Heijden][36]. The proliferation of AI has further intensified electricity demand, and the constraint lies not only in generation but in the fact that the network itself cannot handle it [van der Heijden]. Within this tension, Rotterdam recognizes the need to address the energy, water, and space demands that data centres impose, though this remains an ongoing challenge rather than a resolved one. A separate initiative, wastewater-based city heating, illustrates the city's broader energy-mitigation efforts, though it is not tied specifically to data centres [van der Heijden]. A further blind spot was added from a comparative international perspective, framing the challenge as one of lifecycle management: a material once regarded as one of humanity's greatest inventions is now generating a waste crisis one generation later, and digital infrastructure will produce the same predicament unless end-of-life planning is designed in from the outset [Lee][37]. Eliminating data centers is unlikely to be the preferred response; the practical priority is reducing their energy use and operating costs; the pragmatic question is how their operating cost and environmental footprint can be reduced [Lee][38]. What

[33] Maurice de Beer, “The first 48 hours, no first response can even arrive to the scene… we have to build up on the resilience of people individually, groups individually, organisations individually.”
[34] Maurice de Beer, “without safety and without security, one or the other can't exist.”
[35] Maurice de Beer, “The whole civil protection, the fire brigade, the ambulance services are, next to the military, the most important part of the organisation, in obtaining vital infrastructure.”
[36] Roland van der Heijden, “using wastewater for city heating and that kind of things to make it as climate friendly as possible.”
[37] Ellie Lee, “Digital infrastructure could create similar end-of-life waste challenges unless lifecycle planning is included from the outset.”
[38] Ellie Lee, “more people are going to go through the option of trying to think of another way to reduce energy and money to run the data centre.”

emerges is a lifecycle gap in DDG design: the framework should not only focus on how technology is built, but also on what happens after it has been deployed.

The third question is preparedness, when resilience happens. Preparedness must occur before the crisis, not after. A distinct reformulation of digital rights framed the right to be offline as itself part of that set of rights; not the counterpart to digital inclusion, but a necessary condition of digital resilience [Cooiman][39]. The logic of daily preparation also runs through the operational experience of the Rotterdam-Rijnmond Safety Region, where every incident is treated as an experiment [de Beer][40]; day-to-day events serve as the routine training that accumulates the organizational and civic capacity required to respond to a major disaster. The 72-hour blackout drill is the concrete expression of this thinking, treating the possibility that the digital system may fail as a baseline scenario rather than an exceptional one. The same temporal reasoning was extended from another angle, noting that digital solutions fail not at the moment of deployment but afterwards, and that one of the questions the DDGs must incorporate is who maintains this solution, how it is updated, and when it is retired [Lee][41]. Taken together, these perspectives converge on preparedness as habitual practice; resilience is not the response plan activated after a crisis, but the everyday capacity that prevents cascading failure in the first place.

The fourth question is social resilience, or the human foundation on which the other three rest. Even where safety is distributed, sustainability is designed in, and preparedness is habitual, the resilience of a city ultimately rests on the vitality of the people who live in it. A recurring concern raised by Rotterdam's interviewees was social inequality, particularly in Rotterdam South, framed as the structural condition that determines whether the city's digital transformation reaches everyone or hardens existing divides [van Waart][42]. Digital literacy was framed not as an individual deficit but as an educational and civic infrastructure problem: if primary and secondary education pay little attention to digital issues, the population that emerges will not be equipped to participate in the future economy, and this gap will directly constrain the city's capacity to build a functioning digital industry [van Waart][43]. The point was reinforced with a comparative reference to Barcelona, where becoming a smart city was understood to require first cultivating smart citizens through active digital education [van Waart][44]. Taken together, these perspectives frame social resilience as the substrate on which safety, sustainability, and preparedness all depend; a city cannot be resilient in the technical sense if its population is

[39] Jochem Cooiman, “online and offline should both be a right. The right to be offline, and functioning normally in society.”
[40] Maurice de Beer, “every incident is an experiment. That's the benefit of having a first responder organisation.”
[41] Ellie Lee, “when something is initiated, it's always the problem [that] comes when the time comes to update that solution… how do we manage this digital solution afterwards.”
[42] Peter van Waart, “A big issue is this social inequality. Especially the South Rotterdam is known for an area that we go with lowering, going through individual levels. “It's even a local issue became an national issue”
[43] Peter van Waart, “Why is it that people have difficulties with all those digital interfaces? Because we are not paying attention to that in our education. For me, primary schools, secondary schools… it's hardly about digital issues.”
[44] Peter van Waart, “I find Barcelona very smart, because they have… in becoming a smart city, you need smart citizens. What I think they've done is that they really help people out to get more digital literate.”

systematically excluded from the skills, opportunities, and civic infrastructure that resilience presupposes.

This theme connects directly to the Governance & Implementation frame, which concerns how the DDGs are steered and translated into practice at the city level. Rotterdam's evidence expands the operational scope of this frame from the question of how to govern the technology itself to a cradle-to-grave view of governance: how to govern the material, temporal, and safety consequences of the technology across its full lifecycle. Read against the report's broader framing, the evidence in this section also shows that Rotterdam's limitations are not purely social in character: electricity-grid capacity, the lifecycle burden of data-centre infrastructure, and the absence of governed integration between the digital twin and operational systems are equally material and infrastructural constraints. The sharpest tension surfacing from Rotterdam's interviews is precisely this: a structural conflict exists between the optimization logic of smart-city design and the demands of resilience. Every digitalization move that renders public services more convenient, faster, and seamless simultaneously deepens dependence on electricity, connectivity, devices, and platforms, and dependence itself is the greatest threat to resilience. Similarly, digital-first service design and the argument for a right to be offline together form a value conflict that the Governance & Implementation frame must explicitly hold. For this frame to carry operational relevance at the city level, safety, sustainability, preparedness, and social resilience cannot be treated as separate line-items; they must be built together into its operational definition of a technology that is not merely well developed, but safe to keep, sustainable to run, and prepared to fail. And underlying all three, a population equipped by education, opportunity, and inclusion to make use of it.

C. Cross-Cutting Themes

The U4SSC Working Group 6 oriented individual's global vantage point and Rotterdam's city-level experience each surfaced their own set of themes. While the former centered on measurability, governance and human-centered design, the latter focused on operational clarity, rights and resilience. Read together, though, several concerns show up independently in both bodies of evidence rather than belonging to just one perspective or the other. The themes that follow trace that overlap, beginning with interoperability and public infrastructure.

1. Interoperability & Public Infrastructure

Across both the WG's and the City of Rotterdam, interoperability is not simply treated as a technical feature, but as a cornerstone for global digitalization transformation. Throughout the interviews we noticed how the experts from the U4SSC Working group, typically, approach this subject from a global perspective (top-down). Meanwhile the City of Rotterdam interviewees, more often, are focused on building and operating tangible tools/platforms. Although each of these groups may approach the subject from a different perspective with sometimes alternate nomenclature, they both converge on the same conclusion.

From the top layer, interviewees commonly identified the same four main layers of interoperability required for success, these include, technical, semantic, organizational, and legal. Once applied and working down to the micro level there are clear cultural aspects that, for example, Rotterdam itself has introduced their local context to the Open and Agile Smart Cities (OASC's) framework [Coenegrachts]. Minimal interoperability mechanisms (MIM's), such as shared application programming interfaces (API's) or data models, operationalize the technical and semantic layers by isolating the lowest level components that cities can universally reuse [Hilgers][45]. However, sharing these MIM's in regard to specific cities requires open standards, and it is up to the organization to both introduce and champion those open standards to achieve interoperability [van der Heijden][46].

This shared nomenclature and understanding only delivers effective interoperability if the city's investment decision focuses inward. Interviewees revealed how interoperability can be lost if the procurement of new technologies prioritizes big tech solutions rather than domestic ones. Especially in the early days of digitalization, many cities signed long-term tech-suit contracts that made incorporating new local solutions [Hilgers][47]. Moreover, if a new administration chooses to change vendors, the transition can cost taxpayers millions of euros that could otherwise be spent elsewhere, highlighting the importance of long-term governance, continuity, and careful procurement decisions [Bueti]. What is the remedy to this? Create comprehensive, integrated life-cycle contracts that focus on long-term effective implementation of the entire city rather than a cheaper short-term solution catered to a specific department within the municipality's offices [Ravesloot][48]. This provides municipalities with more propriety over their own systems allowing them to develop an intercity, and eventually international ecosystem where cities retain control over their systems and collaborate more effectively across borders.

In order to achieve such a multi-cultural mission stakeholders need to share a common language. Throughout our interviews, participants consistently pointed to international standards as the shared vocabulary that create conditions, allowing ideas and strategies to be transferable across borders [Ellie Lee]. Transnational standard-setting bodies such as the International Telecommunication Union (ITU), the International Organization for Standardization (ISO), and the International Electrotechnical Commission (IEC) provide a shared vocabulary for cross-border digital development because their standards are recognized by the World Trade Organization and move through formal intergovernmental approval processes.[Bueti]. By

[45] Gert Hilgers, "this European interoperability framework actually defines interoperability by having five different layers"
[46] Roland van der Heijden, "Open standards, does it work? Yes, it does work. But that's still technique and semantics. Are we willing and able to use open standards and to adjust our organizations to it? The essence of that is trust."
[47] Gert Hilgers, "often … have these long service contracts with one company, Microsoft, for instance, that will sell their complete suites … but it's very difficult to actually bring in other products, other services, and therefore other digital solutions."
[48] Christoph Ravesloot, "If you keep your contracting based on low price only, you will fail… the government takes the lead in forbidding low price procurement… into integrated contracts, life cycle contracts, service contracts."

working with these organizations individual countries can align to international standards that already exist instead of reinventing the same concept in varying ways. However, once international standards are widely accepted outstanding countries will risk operating in isolation [Geray]. Firmly note, that aligning to common standards does not require the centralization of their implementation, in this collaboration cities can decentralize innovation while still adheres to a set of common documents and philosophy [Geray]. This same logic takes physical form through digital public infrastructure (DPI) where a society's shared foundations, such as digital identity, payments, and authentication, can be built upon by individual agencies [Geray][49]. Dubai exemplifies this model and Rotterdam, pursuing a similar design, with its Open Urban platform, each provide a publicly governed foundation on which the city builds and maintains the shared layer while every stakeholder remains free to operate their own ecosystem on top of it [de Beer]. Although, we must be careful not to assume these rails already exist, as across much of the Global South, the capital and infrastructure required to support such systems is simply not yet in place [Mutambasere][50]. In short, an interoperable public framework that is built to last, must also be designed for those still laying its foundations.

Despite its evident value, interoperability is neither a solved problem or a universally embraced one. Several interviewees cautioned that interoperability remains chronically under-prioritized, this is in large because those who champion it are so often the same actors selling a competing solution of their own [Adebisi]. As a result public stakeholders are introduced to a number of systems that have little proof of concept. When asked to name a single city that had moved from a siloed system to complete interoperability and flourishing results, Ellie Lee was not aware of an example of a city that had completed this transition [Lee]. Even the most celebrated models can promise more than they deliver as no city today, even Rotterdam, actually runs a working digital twin the way the ITU defines it, no matter how impressive the visuals on top may look [Coenegrachts][51]. However, none of this information diminishes the ambitions set upon or impact already made. Instead it clarifies the work that still remains for municipalities. These contexts exemplify interoperability as a foundational layer still being forged rather than a finished cornerstone, whose success will be defined and measured by how faithfully and widely they are adopted and built upon.

To achieve a truly "comprehensive" interoperable approach municipalities must make many alignments as interoperability is a foundational layer for innovators and stakeholders to build upon. This can, in sum, be outlined through six different facets; technology, regulations, operations, organizations, domains, and industries. Technology focuses on the shared technical

[49] Dr. Okan Geray, "Otherwise, cities are on their own… and everyone reinvents the wheel"
[50] Chenayi Mutambasere, "there's not even the service to host that, all that data and the capital and the infrastructure to support it does not exist."
[51] Karl-Filip Coenegrachts, "there is no operational local digital twin as it is defined in the work, for instance, in ITU anywhere, not even in Singapore. not in Rotterdam, not in any city at this moment. What you have is visualization layers on top of data, but actually the full suite of, for instance, a predictive digital twin that actually allows you, based on all the data that you can gather, to take decisions based on scenarios and AI based predictions that does not exist."

grammar and system layers involved, regulations identify the legal and procurement guardrails present, and operations centralize the common ideals and decentralize innovation. While organizations center around organizational and cultural alignment/openness, domains integrate various city sectors from energy to welfare, and industries focus on cross-sector/border collaboration. Working in just one of these facets is not enough to achieve true interoperability; a comprehensive, foundational approach relies on all of them to ensure inclusion, sovereignty, and governance actually interconnect.

2. Digital Inclusion & Accessibility

Across the interviews, stakeholders treated "digital access" and "digital inclusion" as related but not identical. Access refers to whether infrastructure, devices, and digital services exist, while inclusion asks whether residents can actually afford, understand, trust, and use those systems in daily life. The interviews suggest that access without meaningful inclusion risks reproducing the same inequalities that digital development is supposed to address.

One of the clearest findings across the interviews is that digital infrastructure can exist while residents remain excluded from its benefits. Several interviewees challenged the assumption that connectivity automatically creates accessibility. Connectivity alone does not guarantee meaningful access when residents still cannot afford the phones, data plans, or related services needed to participate fully [Mutambasere][52]. This same access-inclusion gap appears in Rotterdam, where some residents, particularly in South Rotterdam, lack Wi-Fi, devices, or the skills to use digital tools beyond basic communication such as WhatsApp [van der Heijden][53]. Together, these examples show that the gap between access and inclusion is not limited to one region or income context. It appears in both a Global South national context and a European city context, suggesting that digital exclusion is a structural issue rather than a location-specific one.

A second barrier is the mismatch between digital systems and residents' real capabilities. A tool is not accessible simply because it exists online. As more everyday services move behind screens, residents are increasingly expected to use digital systems to access healthcare, banking, education, employment, and government services. Digital literacy depends on more foundational skills, including the ability to read, navigate instructions, manage passwords, and complete multi-step login processes – it also depends on the trust and confidence to engage with these systems in the first place [Khawalid]. Residents who lack literacy skills, language support, updated devices, or confidence with technology may therefore be excluded from critical parts of society [Khawalid][54]. Older residents and people with lower levels of formal education can be

[52] Chenayi Mutambasere, "Connectivity doesn't mean accessibility… in spite of the fact that connectivity exists, there's still, I think it's almost 70% that have got no access to the internet in Zimbabwe."
[53] Roland van der Heijden, "More or less 30% of the people of Rotterdam in the south don't have... wifi or they don't have the devices or they don't know how to use devices. Or they can only WhatsApp with their children…"
[54] Nadia Khawalid, "If you're not able to do that, because you don't have the tools or you don't have internet, or your internet is too slow, or your phone is too old… It means you're being excluded from critical parts of society."

especially vulnerable when digital systems become the default channel for essential services. In this sense, usability matters just as much as availability.

Affordability also emerged as a central condition of digital inclusion. Obtaining a device is only one part of access. Residents may also need reliable internet, data plans, electricity, updated software, and ongoing technical support. Without these enabling conditions, a device can quickly become unusable or limited to only the most basic functions. Inclusion planning therefore has to account for residents who may not have money for phone credit [Adebisi][55], electricity to charge their devices, or consistent internet access [Mutambasere; Armas]. Cities can respond to these barriers by using existing public infrastructure to reduce access gaps, such as New York City's reuse of old payphone infrastructure to provide free street-level wireless access [Goldsmith][56]. This example shows that accessibility is not only a household-level issue, but also a public infrastructure question.

Representation also emerged as an important part of digital inclusion, though it overlaps with the broader co-creation theme addressed elsewhere in this case study. For this section, representation matters because it shapes whether digital systems reflect the realities of the residents expected to use them. When tools are designed around the assumptions of highly educated, digitally confident users, residents facing barriers related to age, language, income, literacy, or device quality can be left out [Khawalid; Armas]. In this way, representation is also an accessibility issue. If certain groups are not considered during design and implementation, access alone does not guarantee inclusion.

All things considered, the interviews suggest that Digital Development Goals should not measure digital access only by infrastructure, connectivity, or service availability. A more meaningful Cluster 1 approach would ask whether residents can afford, understand, trust, and use the digital systems they are expected to rely on. This access-inclusion gap also has implications for the other clusters, but it begins as a governance issue because exclusion is shaped by the choices cities make before a tool is ever deployed.

3. Equity & Bias Prevention

For Rotterdam's interviewees, bias is not an abstract issue but a concrete institutional memory. Similar to the SyRI controversy, the Dutch *toeslagenaffaire* (Dutch childcare benefits scandal) surfaced as the founding reference point. Between 2013 and 2019, the Dutch Tax and Customs Administration wrongly accused around 26,000 parents of fraudulent childcare-benefit claims and demanded full repayment, often reaching tens of thousands of euros per family; enforcement hardened nationally on January 1, 2014, when the Wet aanpak fraude toeslagen en fiscaliteit took effect, mandating full clawbacks even for administrative errors (Eerste Kamer der

[55] Bamidele Adebisi, "We forget these people don't have money to even buy credits on their phone. They don't have electricity to charge the phone."
[56] Stephen Goldsmith, "How can city assets help close the data gap, the availability gap, because even when people have connectivity, they can't afford a data plan."

Staten-Generaal, 2013). Rotterdam was the most affected city, with the algorithm systematically flagging vulnerable communities as benefit abusers, and public trust has not yet been repaired [Khawalid][57]. This history was one of several factors that shaped Rotterdam's institutional response. A three-layer architecture emerged: first, a SPIDER unit (Security, Privacy, Information, Data, Ethics, Rotterdam) that brings ethical and public-value considerations to the start of policy processes and treats them coherently rather than as separate pieces of advice; second, an Algorithm Advisory Board and a public Algorithm Register, which together assess whether algorithm-driven applications align with public values; and third, a Governance Board, which safeguards public values within Rotterdam's digital ecosystem and Open Urban Platform (OUP), and can request Algorithm Advisory Board advice on AI-driven OUP applications [van der Heijden][58]. But institutional architecture does not guarantee representation or real voice. A pointed question was raised regarding whether the institutions meant to represent communities, such as public libraries and elderly organizations, actually do so or exist merely on paper [Nijboer][59]. If that question is the right one, what would authentic representation look like? Drawing on the Belgian political philosopher Chantal Mouffe's critique of Jürgen Habermas, democratic representation was framed as requiring plural voices and standpoints rather than manufactured consensus: difference does not need to be eliminated, only lived with [van Waart][60]. The argument was pushed one layer deeper: even with institutional goodwill, individual data sovereignty must remain the last line, "not just privacy, but data sovereignty," and digital governance must be "for and from people," not merely delivered to them [Hoefmans][61]. And taken to its logical conclusion, that sovereignty extends to the right to remain analog altogether; protecting those who choose not to be digitized is itself part of inclusion [Yang][62]. Rotterdam's position therefore forms a descending stack: concrete disaster, institutional architecture, representation questioned, and individual sovereignty as the floor.

From the U4SSC side, the problem lies not in intention but in the structure of the goal-setting process itself. The argument begins with a foundational claim: fairness is not equality. That claim

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[57] Nadia Khawalid, on the Dutch toeslagenaffaire childcare-benefits algorithm-bias scandal and its disproportionate impact on Rotterdam's vulnerable communities.

[58] Roland van der Heijden, on Rotterdam's three-layer institutional response: SPIDER, Algorithm Advisory Board, and public Algorithm Register — with compliance embedded at the start of policy-making.

[59] Gerard Nijboer, “are the institutions meant to represent communities actually doing so or merely appear to on paper?”

[60] Peter van Waart, “...and the other thing, I think it's a very important issue, what you could call plural voices, plural standpoints. And in recent years, I got to understand that you have this philosopher, Habermas, about democracy, right? And he's very aiming for consensus — that we have to agree, we have dialogues, agree, what we can do for the best of us all. And then they have, yeah, compromise, right? So, the best deal for all.
But recently I learned to work from Chantal Mouffe, who is another scientist, who said, well, maybe that's an illusion. We would not have any conflict anymore, or just one force of the people. So we have this plural society. There's all different backgrounds, standpoints, and that's good. We do not have to get it away. It can stay, but of course, we need to find ways to live with each other, but we do not necessarily have to agree with each other. And that's, I find that very interesting to figure out how we can match that in cities also.”

[61] Marie Josè Hoefmans, “digital sovereignty, moving beyond privacy”; “for and from people.”

[62] Ivy Yang, “how can we protect those who also may just want to keep their analog services — that's an aspect of inclusivity too.”

was stated plainly: this is "pure equity, justice," not equality, and fairness does not mean that everyone needs the same thing [Adebisi][63]. That foundational claim demands active intervention, not neutral treatment. It was extended into an operational strategy of positive bias for women: structurally disadvantaged groups require active inclusion rather than neutrality [Siddiqi][64]. Extending this logic, gender must be treated as a non-negotiable part of the equation rather than an option, and the global North-South divide and the gender divide are intersecting, not separate, problems. But active intervention presupposes that the table itself is representative and the U4SSC interviewees were skeptical about this. The skepticism was voiced directly, questioning whether those currently at the table creating the DDGs truly reflect the society the goals are meant to serve [Adebisi][65]. The sharpest diagnosis framed public-sector work as suffering from an "I know better than you" mindset because "I was elected," producing decisions that are non-representative of everyone else in the room [Taylor][66]. Even where the table is representative, bias's deepest home is in the data itself. An observation surfaced that data itself carries its own biases, accompanied by the argument that governance must embed four principles: privacy, security, equity, and social inclusion, alongside forensic auditing and ongoing monitoring [Goldsmith][67]. A concrete example was offered: a housing-allocation model trained on old data becomes "discriminatory in design," and the result is not just unequal societies but unjust societies [Dhingra][68]. That structural absence has a name, data poverty: "if your image is not in the mirror, we cannot build models that are relevant to yourself," with the remedy being direct community participation in creating the use case [Mutambasere][69]. The same absence was placed on a map: while access is increasing globally, progress remains concentrated in the northern half of the world and continues to be a substantial challenge in other regions [Coenegrachts][70]. Finally, a design-level tension in the framework itself was surfaced: the DDGs must "deliberately remain generic" so cities can implement in their own context, but that same generic quality means the DDGs cannot themselves specify how bias should be addressed; that gap must be filled by cities [Geray][71]. The U4SSC-side position therefore forms a descent from

[63] Bamidele Adebisi, “I’'m not talking about equality here. I'm talking about pure equity, justice — fairness does not mean we all need the same thing.”
[64] Salma Siddiqi, “There has to be almost sort of like a positive bias… implementing strategies where there is positive bias or inclusion for women.”
[65] Bamidele Adebisi, “are we satisfied with whom we have at the table creating these digital development goals that is truly reflective of the society we are creating the goals for?”
[66] Jake Taylor, “we really have a problem with 'I know better than you. That's why I was elected.' And that leads to a mindset that is non-representative of everyone else in the room.”
[67] Stephen Goldsmith, “Data have their own embedded biases and need to be measured against the principles of privacy, security, equity, and social inclusion enforced by careful governance systems that incorporate forensic auditing and ongoing monitoring.”
[68] Mani Dhingra, “that model can also be biased. It can be discriminatory in design… instead of just societies, you're going for unjust societies.”
[69] Chenayi Mutambasere, “if your image is not in the mirror, then we don't know about you… we cannot build models that are relevant to yourself"; "the communities have to be part of creating that use case.”
[70] Karl-Filip Coenegrachts, “access is increasing, but especially in the northern half of this world. So that is still a huge challenge in other global regions.”
[71] Dr. Okan Geray, “we're trying to make it generic because each and every city has a different context… intentionally, deliberately.”

abstract to concrete: it moves from foundational principles about the meaning of fairness, to strengthening who sits at the decision-making table, to correction at the level of data itself, and finally to reconciling the framework's deliberate generality with cities' need for local specificity.

The two sides converge and diverge in patterned ways. Both refuse to treat bias as a technical bug; it is the signature of who designed the system. Both hold that fairness is not equality, and that active intervention rather than neutral treatment is required. This shared position surfaced through calls for positive bias, pure equity, and specific concern for vulnerable communities. And both agree that representation must be structural, not consultative. That concern surfaced through questions of who sits at the table, whether existing institutions truly represent their communities, and whether communities co-create their own use cases. Where the sides diverge is equally patterned. First, on generic versus specific: the DDGs must be deliberately generic so cities can adapt them, but Rotterdam's lesson from the toeslagenaffaire is that accountability requires specificity down to which algorithm, which department, and which act of discrimination. Second, on principles-first versus architecture-first: the U4SSC tends to lead with principles, Rotterdam with institutions and principles; these are complementary but not substitutable, one building shared language while the other builds accountability. Third, and most sharply, on institutional goodwill versus individual sovereignty: the U4SSC side largely assumes that better governance is the solution, while the counter-position holds that no matter how well-intentioned governance becomes, individual digital sovereignty must remain the last line of defense.

Ultimately, the evidence pushes the "Equity, Fairness, and Bias Prevention" language from an aspirational value into a governance-design question: whose humanity, whose values, whose access conditions are treated as default. Equity, fairness, and bias prevention cannot be treated as separate line-items; they must be built together into governance architecture that can hold both the framework's generic universality and the city's specific accountability, both institutional response and individual sovereignty. The evidence suggests that a meaningful DDG must answer three questions at once: whose humanity is at the center, who defines that humanity, and when that human is allowed to say no.

4. Data Sovereignty, Consent, and Trust

Behind all digital development is data, and behind that, people. This theme encapsulates three key factors for digital development: sovereignty, consent, and trust. The term “digital sovereignty" means that individuals have full control over their data, not only deciding who gets to use it but also determining the level of disclosure [Hoefmans][72]. When applied to communities, it gives those groups of individuals a say in the equitable use of their data

[72] Marie Josè Hoefmans, “We need to take our own control from governmental, organisational, municipalities perspective… from individual perspective, we need to be able to act sovereign with our personal data on the internet… go for digital sovereignty, moving beyond privacy… each individual should be able to take their data back and act sovereign with it.”

[Mutambasere][73]. Consent plays a large role in the effectiveness of sovereignty as well. Individuals must be able to freely give permission for their data to be used, reverse their decision, be informed about its use, be enthusiastic about the process, and understand the specifics of their data collection. Lastly, trust is the fabric that ties all these factors together. At the individual level, people must have both sovereignty and consent mechanisms to trust the digital development they participate in. At the local, national, and global levels, trust is how organizations receive buy-in.

A champion for data sovereignty was Marie Josè Hoefmans, the founder of Schluss, an application in development that will allow users to store all their data in a private vault, and select who they want to share it with. This selection process perfectly illustrated a key component of consent: the ability to change your mind. True data sovereignty allows a user to share all their data with an entity and then retrieve it one month later [Hoefmans][74]. In this founder's eyes, a user who compromises the amount of control eliminates data sovereignty. If a user can only partially consent to a single use of their data, they do not have full data sovereignty [Hoefmans][75].

Consent was also a recurring topic in these conversations, not only for future goal-setting but also for current concerns. One interviewee emphasized that big tech already owns citizen data and questioned what cities will do and how consent will ultimately function within the DDGs [Siddiqi][76]. Another interviewee explained how 80% of African data is already stored in America, effectively cutting those communities off from the ability to consent to that data use [Mutambasere][77]. These individuals are often uninformed about how organizations use their data, and even when information is provided, privacy policies are difficult to understand given their dense legal language. This dynamic underscores a central concern raised throughout the interviews: the need for big tech and other large institutions to clearly inform users of the specific uses of their data and for users to be able to decide whether to grant permission for those uses.

The pace of digitalization also raised concerns about individuals who may not wish to participate in digital development. Since everyday functions such as purchasing train tickets, ordering food, or even unlocking doors are becoming digitalized, a concern is how to upskill people, but one interviewee illustrated how services for people should not require upskilling, especially if those

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[73] Chenayi Mutambasere, "It's not sovereignty in the way that we've traditionally defined it, but it's communities, the owners of the data, giving them a stake in the equitable use of that data and ownership"
[74] Marie Josè Hoefmans, "At any time, you're able to decide for yourself… if you decide, okay, I want to disclose all my data, I don't care. And if you decide next month, next year… not such a good idea, then you can take it back."
[75] Marie Josè Hoefmans,"You have control, or not… You can't compromise."
[76] Salma Siddiqi, "They're already collecting our data… what are the cities especially going to do about consent? … are we going to be consenting in? Is it an opt in kind of already? You already opted in, so you have to opt out?"
[77] Chenayi Mutambasere, "80% of African Data is not hosted in Africa."

people may not want to participate in digitalization in the first place [Cooiman][78]. In these cases, digital development must consider those who do not wish to, or are not enthusiastic about, engaging with these tools. Protecting users' right to decline participation in digital systems is an essential part of this theme. Moreover, embedding this language of consent into digital protocols and immersive city initiatives allows users to trust the digitalization occurring around them [Ravesloot][79]. This trust must be established not only between users in the ecosystem but also between the infrastructure itself that connects them to other users [van der Heijden][80].

5. Digital Literacy & Upskilling

Across the interviews, digital literacy and upskilling emerged as the human-capacity dimension of digital transformation. Stakeholders did not treat digital literacy as simply knowing how to use a device. Instead, the theme included residents' ability to understand data, navigate online services, assess AI-generated outputs, trust or question digital systems, and adapt to changing education and work environments. The interviews suggest that digital transformation can remain incomplete even when infrastructure and tools are available, because meaningful participation depends on whether people can actually understand and use those systems in daily life. In this sense, digital literacy sits between access and inclusion: it is one of the conditions that determines whether digital services become empowering or exclusionary.

In Rotterdam, this gap appears first at the level of everyday residents. Some participants in data-awareness work initially understood the internet through familiar applications such as WhatsApp, only later becoming aware of the wider ecosystem of personal digital data [Hoefmans][81]. This suggests that digital literacy includes more than operational skill, it also requires awareness of how data circulates, how digital systems collect information, and what personal control means in practice. A similar access-capability gap appears in South Rotterdam, where residents were described as lacking not only Wi-Fi and devices, but also the knowledge needed to use digital tools [van der Heijden][82]. These examples show that digital literacy cannot be separated from socioeconomic conditions. Residents may technically live in a highly digitalized city, but still remain unable to benefit from digital transformation if they lack the skills, confidence, or resources to engage with it meaningfully.

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[78] Jochem Cooiman, "So, usually, we develop public service, and then we say, well, how do we skill the people to use the public service as well? You know, designing it wrong."
[79] Christoph Ravesloot, "I'm making it clear that's a boundary…this insight would be nice to be used in digital forms, in digital protocols, in digital environments, in immersive cities"
[80] Roland van der Heijden, "By building an ecosystem trust that needs to be trust between the participants of that ecosystem amongst the participants and also the participants need to trust the infrastructure that connects them with each other. So if they don't trust infrastructure or they don't trust each other that ecosystem won't fly. So trust is always a very important thing"
[81] Marie Josè Hoefmans,"Some were, some grew more aware… especially those who thought internet ended at WhatsApp."
[82] Roland van der Heijden,"More or less 30% of the people of Rotterdam in the south don't have… they don't have wifi or they don't have the devices or they don't know how to use devices."

The theme also extends beyond residents to professionals and public institutions. AI adoption was described as a people-centered challenge, especially in specialist work where professionals may not immediately trust AI outputs or know how to integrate them into existing workflows [Houtman][83].In practice, AI can require more professional judgment, not less, because users must understand when to trust the system, when to question it, and how to interpret its results. Rotterdam's own framing of digital transformation around health care, spatial development, future education, and working skills points in the same direction that technology is not the center of the agenda, but a tool that must be connected to concrete social outcomes [van der Heijden][84]. Upskilling, therefore, is not only about training residents to use services; it is also about preparing workers, specialists, and municipal actors to operate responsibly in AI-enabled environments.

Digital literacy was distinguished from access to digital tools, while AI literacy was described as a separate and more advanced layer of capability shaped by socioeconomic background, device quality, internet speed, and the ability to participate in critical parts of society [Khawalid][85]. Youth education adds another dimension, since digital literacy cannot depend only on informal learning if teachers lack methods, confidence, or curriculum support [Joziasse][86]. At the level of government, the issue becomes even more institutional: digital literacy inside public administration was framed not as ordinary comfort with phones, but as the capacity to use advanced AI tools for public good, reorganize work, and retrain people whose roles are changing [Goldsmith][87]. Across these perspectives, digital literacy becomes both an individual and institutional capacity issue. Residents need the skills to participate, but governments and local institutions also need the capacity to guide, teach, and adapt.

Digital literacy and upskilling fit under Cluster 2, as the interviews frame skills, confidence, and institutional learning as conditions for whether digital transformation actually produces social benefit. Across the evidence, digital literacy is not treated as a narrow technical competency, but as the capacity to participate in everyday systems of education, work, public services, data use, and AI-enabled decision-making. For the DDGs, the design challenge is therefore not simply to promote digital skills as an add-on, but to define upskilling as part of what a successful digital society must achieve.

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[83] Eric Houtman,"People are the big challenge here… they don't believe immediately... what the AI is coming out, the outcome of AI... it takes a long time before they sort of trust the AI enough. for working with it."

[84] Roland van der Heijden, "We're focusing on health care and spatial development and the future of education and working skills. And in those topics, of course, you talk about AI, but you not put it in central

[85]Nadia Khawalid,"we see that there is a difference between the people's social economic backgrounds… if you don't have the tools or you don't have internet, or your internet is too slow, or your phone is too old, it means you are being excluded from critical parts of society."

[86] Peter Joziasse This literacy must be formally integrated in the curriculum… teachers don't know how. There is no methods. They don't feel confident about this…

[87]Stephen Goldsmith,"We need more leadership in terms of governmental digital literacy inside the government including in both the technical skills and in terms of reorganizing work and then the retraining of the individuals for their new tasks."

6. Local Context & Co-Creation

The sixth and final cross-cutting theme is also the clearest point of convergence between the Rotterdam and U4SSC sides: digital development goals fail not at the level of intention, but rather, at the level of translation, in the gap between global or institutional goal setting and the specific, uneven texture of a neighborhood, a rural municipality, or a civic organization's daily work. On the Rotterdam side, this shows up as doubt over whether the institutions meant to represent communities, such as libraries or elder organizations, actually do so or merely appear to on paper [Nijboer][88]. Furthermore, as a structural mismatch between departments organized around functional silos, like green space, traffic, and welfare, and the integrated way a single resident actually experiences the city [van Waart][89]. At least one civic AI initiative, the Sociaal AI Lab, built its mandate around correcting for this by inverting the standard planning question, asking not what the municipality needs but what Rotterdam's different communities need, treating co-creation as a starting point rather than a downstream consultation step [Khawalid][90].

The same problem runs through the U4SSC side, in what collaboration and cross-sector coordination actually looks like in practice. DDG development tables have skewed toward government and private sector actors while civic society organizations, which work closest to the grassroots, are structurally left out, and data poverty specifically cannot be closed by external design at all, only by communities co-creating the use cases that concern them [Mutambasere][91]. At the institutional level, this has been framed as a missing layer of interoperability altogether, distinct from the technical and semantic layers, that a cultural layer built on collaboration with actors outside government, mapped onto the quadruple and quintuple helix model of government, industry, research, civil society, and citizens [Coenegrachts][92]. Rotterdam supplies concrete instances of what closing that gap looks like, from social designers, anthropologists, and theatre-based methods used to surface collective emotion as a legitimate planning input [Nijboer][93], to a gamified city platform built by and for the young people it serves rather than marketed at them [Joziasse][94]. But the internal incentive structure still cuts the other way: individuals remain accountable only to their own remit and see no payoff in crossing

[88] Gerard Nijboer, "it's a representation issue. So what are the societal institutions, like a library, like a an elderly organisation, and figure out if those institutions really represent the communities, or is it just on paper"
[89] Peter van Waart, "it's difficult for a large organisation from all those silos to get all those things integrated in such a way that it fits the experience of this individual person."
[90] Nadia Khawalid, "Our question is not, what does the municipality need? But what do the different groups in Rotterdam need, which civic questions are there?"
[91] Chenayi Mutambasere, "Civic society organizations... have been left out. And yet they're the ones that are working with the communities. They're the ones that are closer to the grassroots."; "Communities have to be part of creating that use case... they should be able to benefit because it's their data."
[92] Karl Filip Coenegrachts, "There's the technical interoperability... the semantic interoperability... organizational interoperability... And then there's cultural interoperability… all about collaboration with the outside world."
[93] Gerard Nijboer, "We are in the business of finding emotions. Just what is the emotion? What is the collective emotion? What is the community emotion?"
[94] Peter Joziasse, "You have to create a world based on gamification, developed by children, young people. And at once, they can ask for support or help to a mentor, a parent, or a librarian, or a youth worker."

organizational boundaries [Coolman][95], which is the same failure the U4SSC side names when it asks who actually gets a seat at the table. Both point to collaboration breaking down not for lack of goodwill, but for lack of structure that rewards or enables it.

This theme sits most naturally under Cluster 1, since both sides are ultimately describing a governance question about whose values count and who is authorized to define them. Organizational values are routinely mistaken for community values, and DDGs risk reproducing that substitution at the global scale unless local and community actors are structurally written into the goal-setting process rather than consulted after the fact [Nijboer][96]. Civic society inclusion, quadruple helix participation, and explicit intermediary roles are not soft additions to Cluster 1 but its operational content, the actual answer to whose rights and values govern this. The tension between standardization and local specificity, since DDGs need enough consistency to travel while resisting one-size-fits-all models that cannot simply be generalized across situations, is therefore not a flaw to be engineered away but the central design constraint Cluster 1 has to hold: a values and governance framework is only legitimate globally if it remains re-authorable locally [Nijboer][97].

Implications for the Digital Development Goals

A. Lessons Emerging From Rotterdam

Rotterdam's 2025 digital transformation assessment already frames the city's position in terms of both strengths and ongoing challenges. The interviews conducted for this case study appear to reinforce and add further detail to that picture, rather than fundamentally contradicting it. Taken together, the assessment and interview evidence suggest a set of lessons that may be useful for the U4SSC Working Group 6 oriented individuals as they continue shaping the DDGs. These lessons should not be read as a definitive verdict on Rotterdam, but as stakeholder-informed evidence from one advanced city case that illustrates the kinds of governance, implementation, and capacity gaps that can remain even in digitally ambitious urban contexts.

Table 4: SWOT Analysis From Rotterdam for the U4SSC DDGs

STRENGTHS	WEAKNESSES
1. Strong standards and interoperability practice, anchored by the Open Urban Platform 2. Self-developed ethical framework on digital values	1. Leadership engagement gaps at senior levels of city government, fragmented mandates 2. No city, including Rotterdam, yet operates a governed digital twin, only visualization layers

[95] Jochem Cooiman, "we're all sitting behind tables and this is my table and that's your table."
[96] Gerard Nijboer, "There is not a community in my world that wants to be efficient."
[97] Gerard Nijboer, "Great intentions… help state and help everyone," but "too many specific situations to grasp" and they "never can [be] generalise[d]."

3. Mature, well-institutionalized design and service design capability 4. Existing bottom-up infrastructure, Sociaal AI Lab, youth hubs, library reinvention	3. Programme dependency, initiatives are time-bound and election-contingent 4. Lingering trust deficit from the 2014 toeslagenaffaire childcare-benefits algorithm-bias scandal
OPPORTUNITIES	**THREATS**
1. Lead on transferable interoperability standards rather than one-off solutions 2. Use U4SSC endorsement to secure senior-level buy-in currently missing internally 3. Scale existing youth-led, co-created tools as proof points for Clusters 1 and 2	1. Big tech dependency and jurisdiction limits sit outside city-level control 2. Political cycles threaten the continuity of programme-funded initiatives 3. Governance capacity risks falling behind the speed of compute and platform growth

Strengths

Rotterdam's technical foundation is real. Its standards and interoperability practice, anchored by the Open Urban Platform, ranks among the strongest globally, and its experimentation with emerging technology, digital twins, AI, XR, sits close to the leading edge for European cities. Internal cyber security practice is similarly mature, benchmarking well against global peers and standing as one of Rotterdam's top-rated practices in the assessment alongside its ethics work, a pairing worth noting since the two are often treated separately, resilient infrastructure and responsible governance of that infrastructure are not the same achievement, and the City of Rotterdam has made real progress on both.

What stands out more than the technology itself is that Rotterdam built its own ethical framework on digital values rather than adopting a generic international charter, a genuine differentiator and one of the city's top-rated practices in the assessment. Service design and design thinking are similarly mature and well institutionalized, giving the city a real ability to produce working proofs of value. Underneath the formal assessment, the interview evidence adds something the document itself does not capture well, a layer of existing bottom-up infrastructure that already does some of what the DDGs are trying to encourage. The Sociaal AI Lab's citizen-first mandate, the network of youth hubs, and libraries actively reinventing their civic role are functioning practices the DDGs could point to as replicable patterns.

Weaknesses

The recurring failure across both the assessment and the interviews is not only technical; it is also structural. Leadership and governance gaps sit specifically at the senior level, mandates are fragmented, procurement is poorly aligned with innovation goals, and risk-taking culture varies sharply by department. That same governance gap surfaces in the city's own most advanced

infrastructure project. Despite Rotterdam's international standing in digital twin development, no city anywhere, including Rotterdam and Singapore, yet operates a genuinely governed digital twin, only visualization layers built on top of data, and basic questions about who is responsible for setting up and overseeing that governance remain unresolved (Karl Filip Coenegrachts)[98].

A related weakness that the city's own 2025 assessment does not capture is that Rotterdam's most citizen-facing initiatives are structurally temporary, dependent on program funding cycles and election outcomes rather than being permanent municipal functions. Initiatives like Digital Inclusion and the Sociaal AI Lab are time-bound and contingent on election outcomes, meaning institutional knowledge can be preserved even when the institution producing it cannot be guaranteed to survive. Underneath all of this sits a trust deficit shaped by more than one episode, from the SyRI controversy to the toeslagenaffaire childcare-benefits scandal, still alive enough that civil society organizations, not the municipality directly, remain the primary channel for reaching several communities. That workaround functions, but it is a symptom being managed, not a problem that has been solved, and it carries a direct cost for the DDGs specifically. Any participation mechanism the framework proposes for Rotterdam has to be designed to route through those intermediaries rather than assume direct municipal engagement will be trusted or effective on its own.

Opportunities

Rotterdam's port city heritage and established practice of cross-border collaboration position it to lead on transferable interoperability standards rather than isolated local fixes, a strength that already exists in working form rather than as potential. Rotterdam has contributed a specific piece of that work, the cultural interoperability layer within the wider quadruple and quintuple helix model of collaboration between government, industry, research, civil society, and citizens, developed alongside existing minimal interoperability mechanism efforts, which shows the city operating at the standard setting level rather than only the implementation level, a distinction the Working Group should want more cities to reach.

Moreover, Rotterdam's own 2025 assessment names senior-level leadership engagement as a gap the city has not closed internally. External and Internal U4SSC endorsement could help by strengthening the small base of senior-level champions and advocates that already exists, since a DDG commitment carries weight in a way an internal recommendation from mid-level staff typically does not, and city leadership tends to prioritize what has external visibility and accountability attached to it.

[98] Karl Filip Coenegrachts, "there is no operational local digital twin as it is defined in the work, for instance, in ITU anywhere, not even in Singapore… not in Rotterdam, not in any city at this moment. What you have is visualization layers on top of data… the first barrier is awareness. Nobody knows about it… It is the governance… that is quite crucial. Who is actually going to set this up?"

The clearest opportunity of the three requires no invention at all. The youth led, gamified, co-created tools already piloted locally, Rotterdam Go, built with young people rather than marketed at them, and the Sociaal AI Lab's applied projects, including the volunteers foundation AI tool developed alongside the community it serves, are usable proof points for Cluster 1 and Cluster 2 DDGs on participation and inclusion, functioning local precedent the framework could reference directly rather than aspirational examples it would need to invent.

Threats

Some of Rotterdam's limits are simply not solvable at the city level. Big tech dependency and jurisdiction sit structurally outside municipal control, data hosted abroad, and platforms governed elsewhere, which cap what any DDG framework can honestly promise if it is written as though cities have full authority over their own digital environment. A second, more immediate threat is sustaining commitment across political cycles – not the cycles themselves, given that they are a natural feature of democratic governance, but rather, the difficulty of maintaining long-term urgency and institutional backing without deliberate communication and continuity planning. Program-funded initiatives are contingent on election outcomes, meaning DDG commitments made today could lose institutional backing within a single term.

Furthermore, when looking at what's underneath that political fragility, government-funded digital work is structurally disadvantaged relative to commercially funded initiatives specifically because citizen-centered, non-profitable work does not generate the kind of return that protects it during budget pressure, meaning the very projects the DDGs would most want to hold up as models are also the ones most exposed when funding tightens (Nadia Khawalid)[99].

The final threat is one that no framework can design its way around on a fixed timeline. Governance capacity does not naturally keep pace with the speed at which compute and platform capability are growing, and without deliberate investment in oversight structures ahead of that curve, digital urban environments risk drifting toward an ungoverned condition regardless of what any framework specifies on paper (Ajay Nair)[100].

The SWOT Analysis suggests a single throughline for the U4SSC Working Group: Rotterdam is not short on capability, ambition, or even working local models. What it lacks is a durable structure, at the senior leadership level, across election cycles, and in how community and civic actors are written into governance rather than consulted after decisions are made. A DDG framework that only measures technical capability will miss this. One that measures structural durability and community authorship will actually capture what Rotterdam's experience has to

[99] Nadia Khawalid, "The U4SSC can be of aid in terms of funding… the fact that AI is created on a global scale but we are trying to answer these questions at a local level says something about the struggle that you sometimes work with."

[100] Ajay Nair, "When the speed of compute is growing, all these software platforms will have exponential capabilities to provide features to the customers, but do we have a system to govern it also? Otherwise, it will be like an anarchic kind of condition."

teach. To understand what this means for the DDGs beyond Rotterdam, the next section shifts from assessing Rotterdam's internal strengths and vulnerabilities to comparing the broader city examples raised by interviewees. These examples help clarify which aspects of Rotterdam's experience may be transferable, which are context-specific, and how a global DDG framework can support cities without assuming a single model of digital transformation.

B. Broader Relevance for Other Cities

Throughout the interviews a number of interviewees mentioned other cities where digital transformation is taking form, providing a number of key insights, examples, and alternate models to focus on. The cities mentioned include but are not limited to Dubai, Singapore, Qatar, Jakarta, London, and Amsterdam. Each of these municipalities offered a distinct example of how digital transformation can be approached. Dubai's model, for instance, focuses on centralizing the common aspects of digitalization, while decentralizing the innovation taking place. This methodology allows Dubai to possess an interoperable model that can be more easily adapted to other city's contexts [Geray][101]. However, this is, as Dr. Geray puts it, largely possible because Dubai is a smaller municipality. Contrarily, in larger cities such as Singapore, Qatar, and even in the U.S. highly detailed plans are created to generate a "fundamental" growth network which can be added to and adapted over time [Nair][102]. However, these fundamentals and models are not as transferable to other cities such as Jakarta where the political structure, societal values, and economic situation are vastly different [Nair][103]. For instance Rotterdam's Open Urban Platform is not something that could be adopted by large parts of the world, not only because a potential lack in technological capacity but also because of varying priorities within their respective social-economic system [Hilgers][104] Although these models cannot be used directly, they can still be used as case-study's or learning lessons for other cities to develop off of [Coenegrachts][105].

Building from these examples, the broader lesson is that Rotterdam's digital experience cannot, and should not, be replicated exactly by other cities. Its specific tools, platforms, and governance models are shaped by Rotterdam's own political structure, institutional capacity, and local priorities. Instead, the interviews suggest that other cities can learn from the conditions that make digital transformation more responsible and useful in practice. This means looking at how cities organize leadership, deliver digital inclusion efforts, support youth participation, and adapt

[101] Dr. Okan Geray, We do all the things that are common to all the government entities… So we centralize the common aspects, but decentralized and let the entities innovate on their own when it comes to these issues."
[102] Ajay Nair, "Singapore it happened, Qatar it happened. I have seen numerous examples in US also… many cities in the US are highly planned, well planned, well organized. They have this process of physical planning as a one fundamental network to bring in the further growth"
[103] Ajay Nair, "You go to Jakarta… you cannot, you know, copy the whole structure of Manhattan into Jakarta."
[104] Gert Hilgers, "the reality is when you now think about the open urban platform that you have in Rotterdam".. "is not going to work for large parts of the world."... "what can a mid-sized city in Mexico", "Indonesia or somewhere else in the world, what can they actually learn?". "why should a city focus on this instead of focusing on providing clean water", "more housing", "more jobs, which of course often will be a priority and for good reason."
[105] Karl-Flip Coenegrachts, "Models cannot be copied. Models can be used."

digital goals to the real barriers their residents face. As Dr. Geray[106] noted, Rotterdam can be a strong case study, but it should not become the only basis for a global DDG effort because cities around the world are working from very different levels of digital maturity, resources, and need.

This is especially important when considering governance and organizational structure. As Peter Joziasse[107] explained, cities are organized differently across the world, meaning not every municipality will have the same capabilities or leadership structure as Rotterdam. However, this does not make Rotterdam's structure meaningless, rather it emphasizes that every city does not have to follow the same blueprint. A more useful approach would be to meet municipalities and governments where they are, rather than asking them to conform to a one size fits all model. Instead, the DDGs could provide guidance that helps cities strengthen the structures, partnerships, and programs they may already have in place.

Digital inclusion was one of the clearest areas where interviewees emphasized the need for local adaptation. Every city may have its own programs to help close the digital divide, but those programs will not look the same everywhere. London, for instance, was raised as an example of a city taking a practical approach by collecting and refurbishing old devices from public and private sector organizations and redistributing them to digitally excluded communities [Joziasse][108]. This type of initiative may be transferable to other cities globally, but only if it is adapted to the local context, available infrastructure, and the specific communities being served. Amsterdam offers another example, where digital inclusion is connected more directly to youth development and engagement [Joziasse]. Both initiatives are working toward the same larger goal, but in different formats.

At the same time, digital inclusion should not only be understood as getting more people online. Jochem Cooiman's comments add an important layer to this discussion because he emphasized that the DDGs should also account for people who are not digitally engaged, as well as those who may still want the right to remain offline. This matters for cities with different levels of digital maturity because a global framework should not assume that all residents are ready, able, or willing to access public services digitally. In that sense, inclusion is not only about providing access to technology, but also about making sure public services remain understandable, usable, and resilient for the people they are meant to serve [Rantanen][109].

The biggest takeaway from these examples is that cities can learn from one another without copying one another. Dubai, Singapore, Qatar, Jakarta, Rotterdam, London, and Amsterdam each show different ways that digital transformation can take shape depending on a city's governance

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[106] Dr. Okan Geray, "The world is very different. The way member states, countries, cities look at things are really different... Rotterdam is quite an advanced digital city. We're talking about Citiverse... How many cities can you find today that have that implementation...They are advanced but keep your perspective much broader."

[107] Peter Joziasse, "So when you look at how a city is organized, it's different in every corner of the world... In Rotterdam, there is... a deputy mayor responsible for digital inclusion... so it's not in every city... Rotterdam organized digital inclusion at the highest level of the governance."

[108] Peter Joziasse, "So, London is a good example of doing things concrete on digital inclusion, I believe."

[109] Teppo Rantanen, "[Making it] understandable and simple enough so that they can be implemented..."

structure, resources, digital maturity, and local priorities. Some cities may offer lessons in centralized coordination, long-term planning, interoperability, or platform development. While others show the importance of practical digital inclusion, device access, youth engagement, and community-based support. However, the broader value is not in treating any city as a fixed model. Instead, these examples help other cities identify what may be useful within their own local realities. This is where the DDGs could play an important role. As Teppo Rantanen emphasized, the challenge is finding the connection between people and technology so that whatever is developed is actually implementable and usable for citizens, not only in advanced cities, but across different city contexts.[110]

C. Considerations for the DDG Framework

Based on the Lessons Emerging From Rotterdam and the Key Findings, the following four considerations for the DDG framework arose:

First, cities must walk the talk. Rotterdam is a prime example of moving beyond theory and into execution, with its Open Urban Platform, Digital Twin, and AI and XR as current digital offerings. These programs advance DDG Cluster 3 on Interoperability by providing shared spaces for data and urban digitalization from diverse perspectives, including citizens, academics, organizations, and industries. Rotterdam's programs also reinforce the Outcome-Driven and Measurable Implementation theme from the U4SSC Perspective, because they are guided by the city's own digital values framework. This charter is tailored to Rotterdam, illustrating how global values on digital governance can be distilled into actionable steps at the local level, serving as an example for DDG Cluster 1 on Values, Rights, and Governance. Local efforts to upskill citizens through the Sociaal AI Lab are another tangible example that advances Cluster 2, New Societal Outcomes. These initiatives underscore the central takeaway for the U4SSC: providing cities with DDGs is not sufficient in itself. Cities must be shown what achieving them looks like in practice, and Rotterdam offers a compelling model of what that execution can resemble.

Second, the U4SSC must consider the governance gaps between principles and tangible action. For instance, despite its advanced status in the Digital Twin, Rotterdam has a low rate of citizen awareness and use of the digital town. This is not an isolated problem, as one interviewee working on digital twins in Dublin echoed a similar issue [Dhingra].[111] Furthermore, because many digital development programs depend on government funding and election outcomes, they are at risk of disappearing even as they advance their goals. As a result, the U4SSC must consider how the DDGs can be embedded into cities beyond senior government buy-in. When

[110] Teppo Rantanen, "And I think the biggest challenge that we have is to find this connection between people and the technology that we have. So looking at the citizen aspect of things, looking at how we can engage citizens, how we can make sure whatever we do, whatever we're developing is actually implementable and usable for the citizens... in tusers.outlinedhe context of the United Nations, it needs to be implementable all over the world. So not only the most advanced cities...but also in you know all the other cities..."

[111] Mani Dhingra, "Right now, I haven't seen them [residents] using the digital twin. And they probably don't know much about it…"

these goals are part of city culture beyond political agendas, their related programs will not need to depend on election cycles. Furthermore, Rotterdam illustrates the necessity of transparency for these programs. The effects of the 2014 Rotterdam scandal persist, as there is a trust deficit in how government funds are used. As outlined by the Chief Citiverse Officer, trust must exist not only between users within the cities but also within the municipality and broader infrastructure itself [Roland][112] Thus, themes such as Implementation and Operational Clarity and Local Context and Co-Creation should be considered as the U4SSC shares these DDGs with cities that have their own governance gaps, trust cultures, and local needs.

Third, Rotterdam's lessons showcase various opportunities. Rotterdam has a quadruple- and quintuple-helix model of collaboration that serves as an example for DDG collaboration styles. As the theme Human-Centered Digital Development emphasized, people using the technology must come before technological development itself, as shown in citizen engagement, participation, and measurability. Rotterdam's case, with youth-led approaches such as Rotterdam Go or citizen-first approaches in the X-CITE tool ("x-CITE", 2025a) Rotterdam is therefore relevant to the global framework of the DDGs because it serves as an example of what on-the-ground, people-first initiatives do to propel the city into one that uses digital transformation in an inclusive way.

Lastly, there are considerations outside of the city that the DDGs have to make. As exemplified in the Interoperability and Public Infrastructure theme, cities do not operate in a vacuum. While they can create their own digital offerings, the hosts of that data and the city's citizens may still rely on private corporations. As illustrated by an interviewee, when cities sign long-term contracts with big tech, their ability to share that data is often reduced, stifling interoperability [Hilgers][113]. Since the public and private sectors do not operate in silos, incorporating the private-sector perspective can help cities navigate this dynamic. While the growing enthusiasm among cities worldwide to advance the DDGs is encouraging, this momentum will remain constrained without a clear strategy for engaging with, or operating around, big tech.

Recommendations for Rotterdam

As Rotterdam continues its digitalization journey, the interviews suggest that the city's future development will depend not only on the expansion of digital infrastructure, but also on how that infrastructure is governed, accessed, trusted, and adapted to local realities. Existing initiatives such as the Open Urban Platform, 3D Digital Twin, Citiverse, Digitaal Meedoen, Mijn

[112] Roland van der Heijden, "So if they don't trust infrastructure or they don't trust each other that ecosystem won't fly."
[113] Gert Hilgers, "In how can you bring in the private sector, be it smaller or larger firms, to really engage with the DDGs and the development and say, hey, we're supporting this, even if that means we're not going to get long-term contracts with the cities. But that we have practical solutions that can be one part of the bigger ecosystem."

Rotterdam, the Sociaal AI Lab, and the Dutch Algorithm Register indicate that Rotterdam has already begun developing a data-enabled and citizen-facing digital ecosystem. However, the interview findings also point to the need for these initiatives to be understood not as separate projects, but as part of a broader pathway shaped by governance, inclusion, interoperability, trust, resilience, equity, and local co-creation.

Rotterdam's Future

Figure 3: Rotterdam's Future Digitalization Recommendations



Disclaimer: *This visual was created with the assistance of AI and reviewed by the project team to ensure it accurately reflects the themes and framework developed for the case study.*

The recommendation matrix translates the interview themes into a structured set of future priorities for Rotterdam's next phase of digital transformation. Rather than presenting each theme in isolation, the matrix links each priority to its meaning in Rotterdam's context, the current initiatives it may build on, the intended outcome, and the relevant Digital Development Goals cluster. Its purpose is not only to identify digital tools, platforms, or infrastructure, but to show how Rotterdam's digitalization journey can better enable people to participate in an

interconnected social, physical, and digital urban world. Given the size and scope of the interview base, these recommendations should be read as stakeholder-informed priorities rather than definitive conclusions; they identify areas where Rotterdam's existing work and the emerging DDG framework appear to align, while also pointing to issues that would benefit from further testing, validation, and implementation planning.

Conclusion

Ultimately, this case study used the City of Rotterdam as both an example of advanced urban digitalization and a prototype case for examining the implementation of the U4SSC's emerging Digital Development Goals for Cities. Three research questions guided the analysis:

- The City: What do Rotterdam's successes, challenges, and controversies reveal about digital transformation?
- The Reach: Which lessons apply to cities with different governance, resources, and maturity?
- The Framework: How can Rotterdam's experiences shape the emerging global framework?

Interviews from 27 stakeholders across the City of Rotterdam, the U4SSC Working Group 6, and global experts answered these questions by emphasizing that digital limitations are not only technical, they are also social. Even an advanced digital city such as Rotterdam faces gaps in the human dimension of digitalization, including citizen engagement, political alignment, and trust-building. While Rotterdam has been building its digital capacity since 2005, with its Glass River Maas Program, it has now evolved into an integrated digital ecosystem with interoperable programs such as the Open Urban Platform, Digital Twin, and the Citiverse, which connect the infrastructure, visualization and planning, experimentation, social, and governance levels of digitalization. These questions also highlight how digitalization is infrastructural, as cities with different governance and maturity face different issues. Nevertheless, the 12 themes identified in this paper will help the municipality address gaps in political alignment and trust by providing key considerations for city-wide digitalization.

Furthermore, the purpose of these themes is that they will help support the U4SSC Working Group 6 in defining the Digital Development Goals. The themes, ranging from Outcome-Driven & Measurable Implementation to Local Context & Co-Creation, share a key takeaway: technology depends on people, and different institutional perspectives provide context for how this takeaway can inform the DDGs. U4SSC-affiliated stakeholders emphasized that the goals must be precise enough to be measurable and accountable, while still flexible enough to apply across different city contexts. Rotterdam-affiliated stakeholders pointed to the operational challenge of moving beyond pilots and funding cycles toward infrastructure and programs that are consistently backed by policy, leadership, and public trust. Together, these perspectives suggest that the DDGs must uphold shared global principles while remaining adaptable to local implementation realities.

Overall, Rotterdam brought an operational perspective to the DDG discussion by illustrating that digital infrastructure is only as valuable as the public purpose it serves and the people it enables. The stakeholder interviews suggest that even a digitally acclaimed city continues to face barriers, including senior-level alignment, citizen awareness, political continuity, and trust. At the same

time, Rotterdam should not be treated as a baseline model that other cities can simply copy. Each city has different capacities, governance structures, resources, and levels of digital maturity. Rotterdam's value lies instead in the principles it may offer for building federated digital ecosystems: systems in which local authorities retain governance over their own digital infrastructure while remaining interoperable with others. A useful comparison is a road network, where each authority develops and manages its own roads, but those roads still connect into a wider system for users. Similarly, the DDGs may need to define a minimum set of shared requirements for interoperability while preserving maximum flexibility for local context, capacity, and governance maturity.

In this case study, Rotterdam served as an example of a city focused on digital development, but it is not the baseline. Instead, it is evidence that the DDGs must address the hard questions: it's not what the technology can do, but who it is for, who wants in, and what effects it will have beyond digitalization itself on governance, the ecosystem, and the broader culture. By answering those questions through actionable, measurable mechanisms, the DDGs will move beyond exploratory clusters and toward goals that serve as a roadmap, guiding cities toward digitally advanced, inclusive futures.

Team Reflection

As a student research team, this case study changed how we understand digital transformation. At the beginning of the project, it was easy to think of digitalization primarily through platforms, data systems, digital twins, and emerging tools. The interviews pushed us to see that technology is only one part of the challenge. Even a digitally advanced city such as Rotterdam continues to face questions around leadership, fragmented mandates, public trust, institutional continuity, and sustaining work across funding cycles and political transitions. For us, this reframed digital transformation as a governance and implementation challenge as much as a technical one.

The project also showed us that documents alone cannot fully explain how digital transformation works in practice. Formal assessments may identify issues such as trust, inclusion, or governance capacity, but interviews revealed how those issues are experienced day to day. We saw that stakeholder engagement is not only about speaking with experts, but also about understanding who communities already trust and how residents encounter digital systems in their daily lives. Civil society organizations, community-facing actors, teachers, libraries, and local intermediaries can play a central role in connecting digital policy to lived experience. This made us think more carefully about how digital governance must include officials and technical experts, but also the people who use, question, or may be excluded by digital services.

Working across Rotterdam and international perspectives also raised important questions about global framework development. The DDGs need enough consistency to guide cities toward shared principles, but enough flexibility to reflect different levels of digital maturity, resources, governance structures, and local priorities. We were especially struck by the tension between broad global goals and city-level implementation: global frameworks can become too abstract, while cities often need concrete tools, clear expectations, measurable outcomes, and realistic implementation pathways. Future DDG case studies should therefore pay closer attention to cities at earlier stages of digital maturity, including cities across Africa, Asia, Southeast Asia, Latin America, and other non-European contexts, where constraints and priorities may differ significantly from Rotterdam's.

A remaining question for us is how the DDGs will translate values such as inclusivity, accessibility, consent, resilience, and sustainability into practical guidance that cities can use. Inclusivity cannot remain an umbrella term; it has to shape how cities design services, engage residents, build digital skills, preserve offline options, and protect the right not to be forced into digital systems. Several of us came away with a stronger awareness that digital resilience is not only about disaster preparedness or technical redundancy. It is also about social trust, everyday vulnerability, meaningful choice, and ensuring that digital-first systems do not create new forms of exclusion.

As emerging leaders, we leave this project with a clearer understanding that digital governance is ultimately about public value. Technology can move faster than a city's ability to govern it, so

leadership requires more than enthusiasm for innovation. It requires patience, accountability, resident-centered engagement, and the ability to turn broad values into durable structures that survive beyond individual projects or leaders. The lesson we carry forward is that responsible digital transformation should not simply impress through new tools; it should help cities serve people more fairly, accessibly, and sustainably.

Appendices

Appendix A: AI Use Disclaimer and Transparency Statement

This case study used artificial intelligence as a support tool during the research, writing, and imagery creation process. AI was used to help create post-interview review documents based on interview notes and transcripts collected by the project team. These reviews were used to organize key points, identify recurring ideas, and support the team's internal analysis after each interview.

AI was also used to help locate relevant quotes from interview transcripts that supported themes identified in the Key Insights section of the case study. The themes, interpretations, and final written analysis were developed by the project team. AI was not used as a replacement for interviewee perspectives, team judgment, or human analysis. All AI-assisted outputs were reviewed by the team for accuracy, relevance, and alignment with the original interview material.

Appendix B: AI Prompts Used

To provide transparency, the prompts used during the AI-assisted review and quote-location process are included below.

Prompt 1: Post-Interview Review

```
"You are organizing raw interview material into a structured,
quotable review document for a stakeholder research project. For a
single interview I will give you: notes from two note-takers, a full
transcript of the conversation, and a few header details. Produce one
organized review document following the rules below exactly.

 ## Source-of-truth rules (most important â€” do not break these)
 - The **TRANSCRIPT is the only source for quotations.** Every quote
must appear verbatim in the transcript.
 - The two note sets are used ONLY to (a) recover which questions
were actually asked, (b) identify which themes the team cared about,
and (c) cross-check. **Never quote from the notes.**
 - **Never turn a note-taker's paraphrase or shorthand into a
quotation.** If a polished line appears in the notes but not in the
transcript, do not put it in quotation marks.
 - **Do not invent questions.** Use only questions actually asked
(find them in the transcript/notes). If a passage has no clear
question behind it, put a short topic label in the Question cell and
mark it `[topic â€” not a verbatim question]` rather than fabricating
an exchange.
 - **Preserve every named organization, person, and concrete
example** from the source material. Do not silently drop them.
 - Where the two note sets **conflict**, flag it; do not silently
pick one.
 - If the interviewee asked a question of the interviewers, or made a
point unprompted, capture it under an appropriately labeled section
rather than discarding it.

 ## Output format
 **Header block:**
 - Interviewee: [name(s)]
 - Project: [project]
 - Consent: [status â€” e.g., quoting allowed, review requested
before publication]

 **Then numbered thematic sections** â€” as many as the content
needs; derive the themes from the material, do not force a fixed
count. Each section is a three-column table:

 | Question | Direct response from interview | Summary |
 |---|---|---|

 - **Question:** the actual question asked, or a flagged topic label.
 - **Direct response from interview:** a VERBATIM quote from the
```

```
transcript, in quotation marks. Keep it tight â€” you may trim with
"â€¦" â€” but never alter or smooth the wording.
 - **Summary:** 2â€“4 sentences of NEUTRAL, analytical paraphrase.
Describe and contextualize the interviewee's position and attribute
it to them ("X arguesâ€¦", "X framesâ€¦"). Do NOT advocate for,
endorse, or editorialize the view.

 **Closing overall summary:** a short neutral synthesis of the
interviewee's overall position plus the main tensions or open
questions it raises. Describe the stance; do not sell it.

 ## Notes for review (always include this section at the very end)
 - Any claim used that could NOT be matched verbatim to the
transcript.
 - Any named org / person / example from the notes that is missing or
that you had to place from context.
 - Any conflicts between the two note sets.
 Keep this section short and factual.

 ## Style
 - Plain, neutral prose in summaries. No advocacy tone. Be concise.
 - When something is ambiguous or unsupported, flag it rather than
smoothing it over.

 ---

 ## PASTE YOUR INPUTS BELOW

 Interviewee:
 Project: Rotterdam GCL
 Consent: Yes

 --- NOTE-TAKER A ---

 --- NOTE-TAKER B ---
 [paste notes here]

 --- TRANSCRIPT ---
 [paste full transcript here]”
```

Prompt 2: Quote Location Support

```
“Task (instructions to the model)

You are helping a research team extract supporting quotes from a
multiple labeled interview transcript for the Global City Leaders
Digital Development Goals (DDG) project. You will be given four
things: a theme (a few words), a one-sentence descriptor of that
theme, the cluster it belongs to (1–4), and a pasted transcript of
```

one interview. Find the strongest verbatim quotes from the interviewees that substantively speak to the theme.

The four clusters (reference only — the user tells you which number; do not subdivide them)

1. Values, Rights & Governance — required governance frameworks for proper digitalization.
2. New Societal Outcomes — new job types beyond traditional categories; digital environments for education, culture, collaboration.
3. Comprehensive Interoperability — technology-platform and data interoperability; operational, procurement, legal, HR interoperability.
4. Digital Technology Itself — environmental sustainability of digital infrastructure; fairness and inclusivity in digital systems.

The cluster sets context, but the theme and its descriptor are the real target. A quote that fits the cluster broadly but not the specific theme does not qualify. The named cluster may only be partially relevant to the theme — defer to the theme + descriptor.

Procedure

1. Restate the target. In one or two sentences, state how you're interpreting the theme based on the descriptor, so the team can catch a misread before reading any quotes.
2. Use the interviewee's words only. Speakers may not be consistently labeled. Attribute quotes to the interviewee; infer interviewee vs. interviewer from context (questions vs. substantive answers). If you genuinely cannot tell whether a passage is the interviewee or the interviewer, do not use it — and note in Limitations if that set aside otherwise-strong material.
3. Apply the substantive-claim gate. A passage qualifies only if the interviewee says something *about* the theme — an assertion, example, tension, mechanism, or recommendation. Reject passages that merely mention a related word without making a point about it.
4. Rank what passes by the criteria below and return the top 4–5.

Ranking criteria (priority order)

A passage must clear relevance to be listed at all. Among those that clear it, rank by:

1. Relevance — how squarely it speaks to *this* theme (per the descriptor), not the cluster in general.
2. Directness — the point is made explicitly and assertively, not merely implied or glanced at.

3. Concreteness — specific detail, example, mechanism, or figure over abstract generality.

Quote fidelity

Reproduce each quote as faithfully as you can: the interviewee's actual wording, no paraphrasing, no smoothing. Mark any internal cut with …, and only cut pure filler or unrelated tangents — never in a way that changes meaning. Preserve markers such as [inaudible] or [sic] if present. Use [square brackets] only for a word essential to make the quote readable.

Output format

For each quote, best to worst:

1. "<preserved quote>" [CITATION HERE] *Why:* <one sentence naming the specific phrase or idea that earns its rank>

…continuing through 4–5. Then:

Limitations. State honestly if: fewer than 4 quotes cleared the bar (return only those), none did (say so and name the gap rather than stretch a weak quote), the theme was only partially addressed in this interview, or speaker ambiguity forced you to set material aside.

Borderline (optional). If a passage orbits the theme but doesn't land on it, you may list it here, clearly labeled as not meeting the bar — never promoted into the main list.

INPUT — fill in each run

- Theme (a few words):
- One-sentence descriptor:
- Cluster (1–4):
- Transcript: Resource Transcript - *File Attached"*

Prompt 3: Creation of Figure 3 - Rotterdam's Future Digitalization Recommendations

"Create a clean professional infographic titled "Rotterdam's Future Digitalization Priorities" for a UN/city government case study.

The infographic should transform the recommendation matrix into a visually concise framework. Organize the 9 themes into grouped sections or cards, and for each theme include:

- Theme

- What it means for Rotterdam

- Current initiatives

- Intended outcome
- Relevant DDG cluster

Themes:

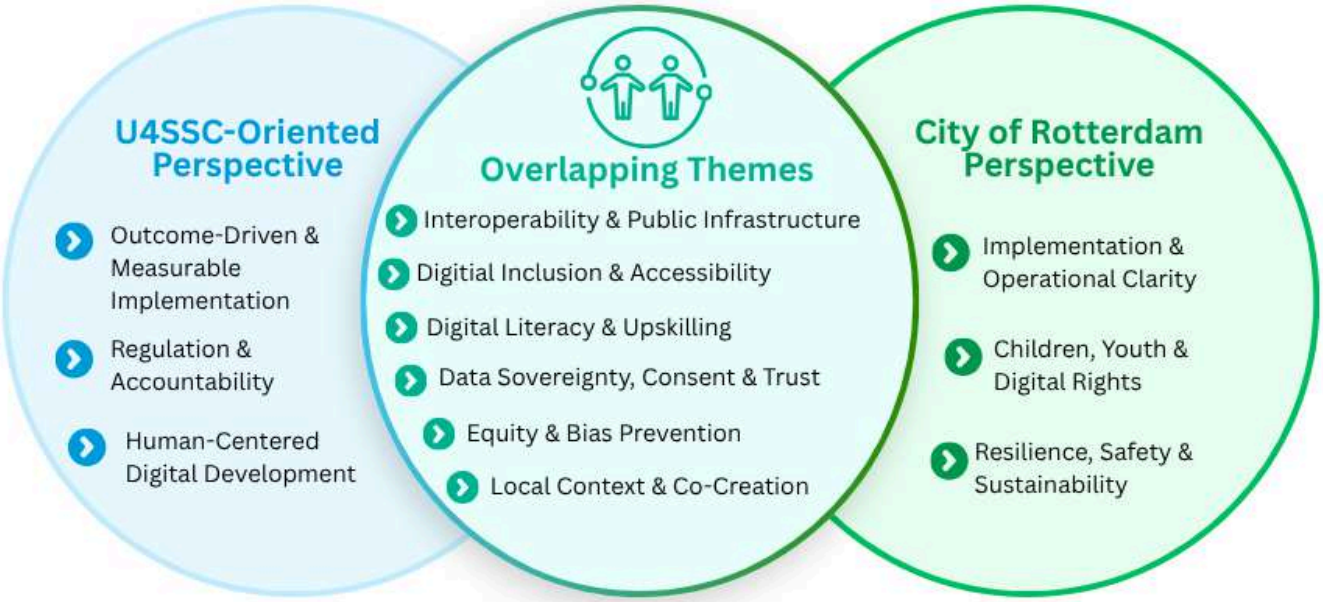
1. Implementation & Operational Clarity
2. Children, Youth & Digital Rights
3. Resilience, Safety & Sustainability
4. Interoperability & Public Infrastructure
5. Digital Inclusion & Accessibility
6. Digital Literacy & Upskilling
7. Data Sovereignty, Consent, & Trust
8. Equity & Bias Prevention
9. Local Context & Co-Creation

Use concise wording only, not long paragraphs.

Use a modern policy-report style suitable for the City of Rotterdam and the U4SSC Digital Development Goals Working Group. The design should be clear, elegant, structured, and readable, with muted professional colors, icons, and a layout that can fit on one slide or one page.”

Appendix C: Supporting Visuals

Exhibit 1: Identifying Shared Priorities Across U4SSC-Oriented and Rotterdam Affiliated Individuals



Description: This visual illustrates how themes identified through interviews oriented toward the U4SSC and Digital Development Goals work overlap with themes identified through interviews oriented toward the City of Rotterdam. While the two groups of interviews emphasized different priorities, several themes, including digital inclusion, trust, interoperability, and co-creation, emerged across both. The exhibit reflects the GCL team's synthesis of the interview data and demonstrates how the case study findings were informed by both broader international discussions and Rotterdam's city-level experience.

Disclaimer: *This exhibit is an academic analysis developed by the Global Challenge Lab team at Thunderbird School of Global Management. It represents the team's synthesis of themes identified through interviews and discussed in the Key Findings and Cross-Cutting Themes section of this report. The categories and areas of overlap shown here should not be interpreted as official positions of U4SSC, its supporting United Nations organizations, or the City of Rotterdam, nor do they indicate formal approval or endorsement of this analysis by those organizations. The exhibit is not intended to represent the full scope of perspectives held by either group. Rather, it reflects the themes most prominently identified in the interviews and materials examined during the project.*

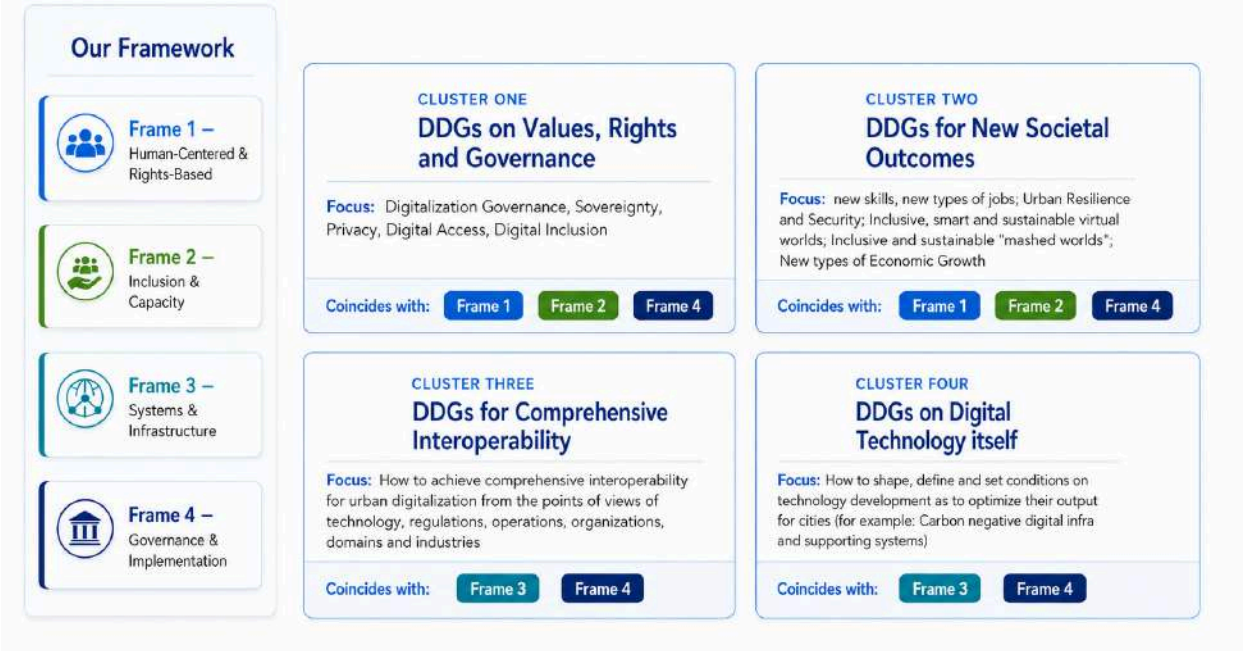
Exhibit 2: Organizing Interview Themes into Four Analytical Frames



Description: This visual was developed to organize the major themes from the interviews into four broader frames: human-centered and rights-based development, inclusion and capacity, systems and infrastructure, and governance and implementation. These frames helped the team move from individual interview insights toward a clearer structure for analysis. The exhibit shows how the themes connect to one another and provides a simplified framework for interpreting the broader findings of the case study.

***Disclaimer**: This visual was created with the assistance of AI and reviewed by the project team to ensure it accurately reflects the themes and framework developed for the case study.*

Exhibit 3: Mapping Four Analytical Frames to U4SSC Working Group 6 DDG Clusters



Description: This visual maps the project team's four analytical frames against the Digital Development Goal clusters developed through U4SSC Working Group 6. The four frames were created from themes identified through the interview process and are used here to illustrate areas of alignment with the broader DDG structure. Rather than representing a separate framework, the analysis helps translate the DDG clusters into practical areas of consideration for cities. The exhibit also demonstrates how insights from Rotterdam's experience can contribute to discussions about how the DDGs may be understood and applied at the city level.

Disclaimer: *This exhibit is an academic analysis developed by the Global Challenge Lab team at Thunderbird School of Global Management. The mapping between the four analytical frames and the U4SSC Working Group 6 Digital Development Goal clusters reflects the project team's interpretation of interview findings and project materials and should not be interpreted as an official U4SSC or United Nations classification, framework, approval, or endorsement. The visual was created with the assistance of AI and reviewed by the project team for accuracy and consistency with the case study findings.*

Appendix D: Questions to Consider from Interviewees

During the interview process, when time permitted, interviewees were asked what questions they would most want to bring to either the U4SSC Working Group or the City of Rotterdam. This question was included to support the project's role as a bridge between both organizations, allowing stakeholder perspectives to move in both directions rather than only being collected for analysis. Some interviewees offered specific questions or concerns, while others did not have a direct question or the interview ended before this portion could be reached.

Interviewee	Audience	Question or issue to bring forward
Marie-José Hoefmans	U4SSC WG	Will the U4SSC step up and make personal data sovereignty a core DDG, including systems where institutions can verify data without gaining full access to it?
Gerard Nijboer	U4SSC WG	Do the DDGs actually work in the micro surroundings of people's lives, in the here and now?
Gert Hilgers	City of Rotterdam / U4SSC WG	How can Rotterdam's experiences be made genuinely useful to other cities, especially less-developed cities?
Salma Siddiqi	City of Rotterdam	What is the city's view on data collection, consent, and whether residents are opted in or must opt out as AI and large technology companies collect more data?
Melissa Armas	City of Rotterdam	What has Rotterdam done for senior citizens, who may be among the most digitally left behind and vulnerable?
Nadia Khawalid	U4SSC WG	How will the U4SSC provide funding and structural support for local governments trying to respond to global-scale AI challenges with local budgets and political cycles?
Peter van Waart	City of Rotterdam	How will Rotterdam prevent digital technologies from widening social inequality and ensure that more residents benefit from them?
Maurice de Beer	U4SSC WG	How does the U4SSC intend to rebuild trust, both as a global institution and through its own organizational structure, before expecting the DDGs to be adopted?
Mani Dhingra	City of Rotterdam	How does Rotterdam keep citizens meaningfully engaged in digitalization strategies and tools, and what does engagement mean in practice?

Jochem Cooiman	U4SSC WG	Why create DDGs at all, what added value do they have beyond the SDGs, and for whom are they being designed?
Jake Taylor	U4SSC WG / City of Rotterdam	Can the DDGs or Citiverse clearly explain how this will affect an everyday resident at the individual, day-to-day level?
Ellie Lee	U4SSC WG	What is the purpose of creating the DDGs, and why did the U4SSC initiate them?
Eric Houtman	U4SSC WG	Will the U4SSC create or support global AI and digital security standards, similar to global BIM standards, so cities can trust certified tools more easily?
Bamidele Adebisi	City of Rotterdam	How ambitious does Rotterdam want to be, and if budgets shrink during an economic downturn, where will smart city investment sit among city priorities?
Chenayi Mutambasere	City of Rotterdam	Ten years from now, what does Rotterdam's digital economy look like, and how is it experienced by different groups across the city?
Dr. Okan Geray	U4SSC WG	What are we trying to achieve, and what do we mean concretely by digital development?
Karl-Filip Coenegrachts	U4SSC WG	How can U4SSC agencies work together more and avoid duplicating or competing on digital goals?
Christina Yan Zhang	City of Rotterdam	How will Rotterdam's Citiverse make the digitalization process easier in practice?

Appendix E: Standardized Interview Questions

The following standardized questions were used across interviews to create consistency in the interview process and ensure that each stakeholder could speak to the broader goals of the case study.

Disclaimer: *In addition to these shared questions, the team also developed personalized questions for each interviewee based on their background and expertise. Since those personalized questions varied by interviewee, only the standardized questions asked to all interviewees are listed.*

1. What is unique about the digitalization opportunities and challenges you are facing in Rotterdam? OR Given your U4SSC background, how is your work and perspective different from the City in regards to the DDGs?
2. In your career, what initiatives or policies have you seen to be most effective in facilitating a digitally inclusive future?
3. What initiatives have you seen abroad that you admire? How does that translate into the creation of DDGs?
4. What are 2-3 factors you believe anyone involved in the creation of DDGs should take into consideration?
5. What is a typical mistake people are likely to make as they develop the DDGs?
6. If you could make a DDG, what would it be? (if needed, example from Marie: Digital Data Sovereignty)

Appendix F: Interviewee Profile and Interview Summaries

Interviewee Name: Marie-José Hoefmans

Interview Date and Location: June 4, 2026 | In-Person |

Role / Affiliation:
Chief Essential Officer, Schluss

Brief Background:
Marie-José Hoefmans is the Co-Founder and Chief Essential Officer of Schluss, a Dutch privacy-tech cooperative focused on giving individuals control over their personal data. Her work centers on data sovereignty, digital identity, ethical data governance, and citizen-centered data infrastructure. The interview materials identify Schluss as a cooperative model rather than a commercial platform, with a focus on personal data vaults that allow individuals to decide who can access their information online. Her perspective is especially relevant to Rotterdam's digital transformation because Schluss has been active in Rotterdam's digital ecosystem and connects directly to the city's interest in digital inclusion, data literacy, and citizen-centered digital services. Although no direct U4SSC DDG role is documented, her work closely aligns with DDG themes around values, rights, governance, and digital technology itself.

Interview Summary:
Marie's interview centered on the idea that digital transformation should not only make services more efficient, but should also return power to citizens. Her main contribution was a clear argument for moving beyond data privacy toward data sovereignty. In her view, privacy alone is too limited because it often leaves people reacting to systems they do not control. Sovereignty, by contrast, means that individuals can decide what data to disclose, to whom, for what purpose, and for how long.

Through her discussion of the Datakluis, Marie framed personal data infrastructure as a long-term civic project rather than a simple technology product. The proposed vault model would allow trusted organizations, such as municipalities, doctors, banks, or pension providers, to write data into a citizen-controlled structure while leaving the individual in control of access. This matters for Rotterdam because it challenges the city to think about digital trust not only through regulation or service design, but through the deeper question of who holds power in the data relationship.

Marie also emphasized that citizen education is essential. Her focus group experience showed that many people support data control in theory but do not fully understand how much personal data already circulates online. When the explanation moved too quickly from risk to solution, some participants reacted with fear, suggesting that digital inclusion must include careful public learning, not just access to tools.

For the DDGs, Marie's central recommendation was that personal digital data sovereignty should become a core goal. She warned against weakening the idea into partial control, arguing that over compromising would undermine the purpose of the framework. Her interview contributed a strong governance lens to the case study by showing that responsible digital development requires technical design, legal evolution, public education, and cooperation across cities, governments, independent organizations, and international bodies.

Interviewee Name: Gerard Nijboer

Interview Date and Location: June 8, 2026 | In-Person |

Role / Affiliation:
Procesmanager Innovatie at Gemeente Rotterdam

Brief Background:
Gerard Nijboer is a Rotterdam municipal innovation process manager whose work focuses on emerging technologies, public sector innovation, and the relationship between technology and community life. His role centers on helping the city explore how new technologies can create value for both the municipal organization and residents. He is connected to Rotterdam's broader innovation ecosystem, including VONK, the city's digital innovation lab, where experimentation, co-creation, and public value are central themes. His perspective is especially relevant to Rotterdam's digital transformation because he approaches innovation through people, communities, and local context rather than technology alone. His work also connects to the Digital Development Goals because it raises important questions about how global digital principles can remain useful while still being flexible enough for cities to adapt them to their own realities.

Interview Summary:
Gerard's interview challenged the idea that digital transformation should be understood mainly through tools, platforms, or speed. Instead, he framed Rotterdam's digital challenge as a question of how technology reaches people at the community level. For him, innovation must begin with understanding how residents live, how communities form, and whether public institutions truly represent the people they claim to serve.

A central insight from Gerard was that the emotional and social side of digitalization is often overlooked. He emphasized that city governments should not only analyze residents through data or service use, but should also understand collective feelings, community values, and the lived experience behind digital change. This perspective contributed to the case study by showing that Rotterdam's digital future depends on trust, interpretation, and relationship-building as much as technical development.

Gerard also offered a critical lens on the Digital Development Goals. He viewed global frameworks as useful only if they function as broad intentions rather than fixed solutions. In his view, cities need room to translate shared principles into their own local context. He warned against creating generalized best practices or solution databases that ignore the specific realities of different communities.

His interview strengthened the case study by emphasizing local fit, "slow governance," and the need to rethink whether a stated problem is actually the problem communities experience. For Rotterdam, his perspective suggests that digital transformation should not be measured only by efficiency or technological progress, but by whether innovation becomes meaningful and safe for residents. For the DDGs, his contribution suggests that global goals should guide cities without forcing uniform implementation or shifting responsibility away from institutions and onto individuals.

Interviewee Name: Dr. Gert Hilgers

Interview Date and Location: June 8, 2026 | Zoom |

Role / Affiliation:
Founder & Principal Adviser, Interveo

Brief Background:
Dr Gert Hilgers runs an independent strategic advisory practice based in Berlin, Germany. He advises international organizations, technology-driven firms, and public authorities on digital innovation, digital policy, and the geopolitical dynamics that shape them. Within the local public sector context, he supports the global city and community network Open & Agile Smart Cities (OASC) on solving interoperability challenges and scaling digital solutions across Europe and beyond. He co-leads Track 16 'Interoperable Citiverse' of the Global Initiative on AI, Digital Twins and Virtual Worlds together with the Municipality of Rotterdam and also co-leads the U4SSC Working Group 7 on the 'Policy & Practice of Organizational Interoperability' (PPOI). Beyond his client work, he is a member of the DDG WG core team and co-stewards the DDG Cluster 3 on 'Comprehensive Interoperability'. Gert is a development economist by training and holds a PhD on policy decision-making. His perspective is relevant to Rotterdam and the Digital Development Goals because he connects the technical solutions of digital innovation with the organizational and cultural layers of interoperability, working towards a sustainable and people-centric Citiverse.

Interview Summary:
Gert's interview emphasized that interoperability is not simply a technical issue. While standards, data formats, and digital systems matter, he stressed that the bigger challenge is often organizational. Cities may have data spread across departments, units, and even individuals, each with different mandates, interests, and goals. Long-term vendor contracts can also make it harder for cities to bring in new tools or avoid dependency on one technology provider. For Rotterdam, this insight is important because it shows that digital maturity depends not only on having advanced platforms, but also on whether the city can coordinate across its own internal structures.

Gert described Rotterdam as an advanced digital city, but not one free from the same challenges facing other local authorities. Even with strong leadership and ambitious digital projects, the city still has to understand where data sits, who controls it, and how it can be used responsibly across departments. His comments helped frame Rotterdam's digital transformation as both a technical and institutional challenge.

For the Digital Development Goals, Gert's strongest contribution was the idea that global goals can create political momentum and give city leaders a mandate to act. He saw the DDGs as useful if they help cities pay attention to digital transformation, organize practical next steps, and eventually support a usable toolbox. However, he also warned against goals that are too shaped by one city's experience, one sector's priorities, or one vendor's solution.

His interview contributed to the case study by grounding the DDGs in implementation. He pushed the project to consider interoperability, vendor lock-in, organizational change, and local context as central to responsible digital transformation. For Rotterdam, his perspective suggests that the city's experience can be valuable globally, but only if it is translated carefully for cities with different capacities, resources, and governance structures.

Interviewee Name: Salma Siddiqi

Interview Date and Location: June 8, 2026 | Zoom |

Role / Affiliation:
Co-Founder & CEO, Natural You LTD

Brief Background:
Salma Siddiqi is the Co-Founder and CEO of Natural You Ltd, a London-based venture focused on personal wellbeing and natural health. Additionally, Salma is also a founding partner and CTO of Synergy Consulting Partnership, a boutique management consultancy, based in Covent Gardens, London. She also brings a long technical background in network communications, service delivery, technical support, and change management. Her experience spans infrastructure, enterprise technology, and implementation, giving her a practical understanding of how digital systems are built, maintained, adopted, and challenged in real-world settings. She is also connected to the U4SSC Working Group 6 as a leader of Cluster 4, bringing a perspective that combines technical infrastructure, social value, inclusion, and future-facing digital governance. While her work is not directly tied to Rotterdam, her insights are relevant to the city's Citiverse ambitions because she focuses on resilience, digital access, consent, inclusion, and the operational risks that cities must consider when building digital futures.

Interview Summary:
Salma's interview contributed a practical and future-oriented perspective to the case study. She emphasized that digital transformation must be resilient, inclusive, and built with long-term relevance in mind. When discussing the Citiverse, she immediately focused on cyber risks, infrastructure resilience, risk assessment, and the need for audits. Her perspective helped frame Rotterdam's digital transformation as something that must be tested not only for innovation value, but also for its ability to withstand disruption, cyber threats, and failures in critical city systems.

A central theme in Salma's interview was that the DDGs should remain broad enough to apply across different cities while still giving each city space to adapt them locally. She warned that the goals could become less useful if experts go too deeply into narrow technical details too early. In her view, the DDGs should function as a high-level framework that cities can map to their own realities, rather than a fixed set of detailed prescriptions.

Salma also emphasized equity, fairness, societal value, and longevity as essential principles for the DDGs. She viewed the framework as something that should remain relevant decades into the future, not only for current digital challenges. This was especially clear in her proposed DDG around universal access to a basic digital device that connects people and allows them to function in the modern world.

Her interview also strengthened the case study's focus on inclusion. She raised concerns about women's safety, visible participation, algorithmic bias, older generations, digital poverty, and the need to preserve the human element as services become more digital. She also highlighted consent and data control as major questions city leaders need to confront. Overall, Salma's contribution pushed the case study to consider whether digital progress is truly accessible, safe, and meaningful for the people it is supposed to serve.

Interviewee Name: Christoph Maria Ravesloot

Interview Date and Location: June 9, 2026 | Zoom |

Role / Affiliation:
Research Professor of Applied Sciences, Professor of Sustainable Building Information Modeling with AI, Rotterdam University of Applied Sciences at the Centre of Expertise HRTech (CoE HRTech)

Brief Background:
Christoph Ravesloot is a Professor of Applied Science Lector at Hogeschool Rotterdam whose work focuses on sustainable construction, Building Information Modeling (BIM), AI, open urban data, and digital quality assurance. His expertise connects technical innovation with the human and organizational capabilities needed to make digital tools work in practice. Rather than approaching digital transformation as a technology-only issue, his work emphasizes professional competence, collaboration, learning, and implementation across individuals, teams, organizations, and interorganizational systems. His perspective is relevant to Rotterdam because the city's digital future depends not only on platforms and data systems, but also on whether professionals, public institutions, and partners can use those systems responsibly and effectively.

Interview Summary:
Christoph's interview emphasized that digital transformation succeeds or fails through people. He framed BIM, AI, and digital city tools as shared systems that require professionals to adapt their roles, identities, and ways of working. His main point was that change creates stress and uncertainty, especially when people feel that technology is replacing the meaning or value of their work. For Rotterdam, this insight is important because the city's digital transformation is not only about building platforms, digital twins, or AI tools. It also requires careful leadership that helps people move into new roles without creating resistance or fear.

A key example was Rotterdam's move toward a three-dimensional open urban data platform and automated model checking for building permits. Christoph used this to show that digital tools can improve accuracy and efficiency, but they can also disrupt existing professional roles. His discussion of former city clerks becoming potential checkers of AI systems showed that human expertise does not disappear in digital transformation. Instead, it must be repositioned.

He also stressed that digital readiness exists at multiple levels: the individual, the team, the organization, and the interorganizational network. This contributed to the case study by showing that implementation capacity should be treated as a core part of responsible digital development. For the DDGs, Christoph's perspective suggests that global goals should measure more than policy ambition or technical infrastructure. They should also consider whether cities have the skills, protocols, leadership models, and collaborative capacity to apply digital tools in real projects.

His interview strengthened the case study's focus on implementation, workforce readiness, and human-centered governance. It also showed that Rotterdam's digital ambitions will be most effective when technology is treated as appropriate to local circumstances and connected to autonomy, trust, and practical use.

Interviewee Name: Melissa Armas

Interview Date and Location: June 9, 2026 | Zoom |

Role / Affiliation:
Lead Strategist & Founder, AZ Collab

Brief Background:
Melissa Armas is the Lead Strategist and Founder of AZ Collab, an AI adoption and cross-border execution firm that works across data, systems, strategy, startups, civic agencies, coalitions, and cities. Her background spans operations, low-code and no-code automation, data analytics, cybersecurity, nonprofit leadership, and digital access work with underserved communities. She also serves as co-leader of Cluster 4 in the U4SSC Working Group 6 process for the Digital Development Goals and is a member of Arizona's Governor-appointed Generative AI Steering Committee. Her perspective is relevant to Rotterdam because she brings a practical implementation lens to city digital transformation, especially around responsible AI, institutional readiness, stakeholder mapping, and the difference between designing technology and ensuring people can actually use it.

Interview Summary:
Melissa's interview centered on the idea that digital transformation should begin with people, not technology. Her approach starts with exploration, discovery, assessment, and alignment before any technical solution is chosen. A major part of this method is asking "who" repeatedly: who is being served, who is most affected, who will use the system, and who is accountable when something breaks. This contributed to the case study by reinforcing that Rotterdam's digital transformation cannot be evaluated only by the existence of tools, platforms, or pilots. It must also be evaluated by whether the right stakeholders are involved throughout the full lifecycle of implementation.

Melissa also emphasized AI literacy and public readiness. She argued that many current decision-makers are not digitally native, which can lead to fear-based or all-or-nothing thinking about AI. For cities, this means AI literacy should be intentional, context-specific, and designed around the needs of different groups rather than treated as a generic training program.

For the Digital Development Goals, Melissa's strongest contribution was her focus on implementation realities. She emphasized buy-in, trust, last-mile adoption, accountability, and transparency as essential conditions for digital goals to become meaningful in practice. She warned that a common mistake is confusing outputs with outcomes: producing a digital system is not the same as creating public benefit.

Her proposed DDG focused on universal, meaningful internet access. Importantly, she distinguished access from adoption, noting that basic connectivity or a device does not automatically mean people can participate digitally. For Rotterdam and the DDGs, her interview highlights the need to measure whether digital systems are usable, equitable, trusted, and beneficial, especially for groups such as senior citizens and digitally excluded communities.

Interviewee Name: Peter Van Waart

Interview Date and Location: June 10, 2026 | In-Person |

Role / Affiliation:
Coordinator Smart and Social City, Hogeschool Rotterdam

Brief Background:
Peter Van Waart is an academic and practitioner at Hogeschool Rotterdam whose work focuses on smart and participatory cities, digital education, and the social impact of technology. As Coordinator Smart and Social City, he connects students, researchers, public institutions, and local projects around questions of urban innovation and citizen engagement. He is also connected to the Sociaal AI Lab Rotterdam, which creates space for residents to learn about AI through practical, public-facing activities. His perspective is especially relevant to Rotterdam's digital transformation because he links digital development to education, social inequality, public trust, and local participation.

Interview Summary:
Peter's interview emphasized that Rotterdam's digital transformation should be understood as a social process, not only a technical one. He recognized Rotterdam's progress in building digital infrastructure, including the open urban platform and digital twin, but stressed that the city still needs to understand how these systems are used, who benefits from them, and who may be left behind. For him, one of the main challenges is that digital technology is often hidden. Unlike physical infrastructure, digital systems can be introduced without residents clearly seeing how they work or how they affect daily life.

A major theme in the interview was social inequality. Peter argued that challenges in Rotterdam, especially in South Rotterdam, cannot be addressed only through work or housing policy. Digitalization is now part of social opportunity, and unequal access to digital skills, networks, and education can widen existing divides. He connected this to the need for stronger digital literacy in schools and communities, arguing that cities cannot become smart unless residents are supported in becoming digitally capable as well.

Peter also challenged the way governments use technology. He warned that some systems function more as surveillance than as services, which can damage public trust. His perspective suggests that Rotterdam should ask how digital tools can help residents rather than simply monitor or correct behavior.

For the DDGs, Peter emphasized future vision, public voice, and implementation. He argued that digital goals should begin with a shared vision of the kind of city people want in 20 or 30 years. He also warned that global frameworks may reflect individualistic assumptions and should make room for collective rights, cultural differences, and local voices. His interview contributed to the case study by showing that DDGs must move beyond documentation and become practical, inclusive, and lived through local participation.

Interviewee Name: Roland van der Heijden

Interview Date and Location: June 10, 2026 | In-Person |

Role / Affiliation:
Chief Citiverse Officer, Citiverse

Brief Background:
Roland van der Heijden is the Chief Citiverse Officer for Rotterdam and a long-standing leader in the city's digital transformation work. His role focuses on the strategic design, direction, and implementation of the Citiverse, including its technological, social, legal, ecosystem, and financial dimensions. He brings a background in urban planning, Geographical Information System (GIS), sustainable urban development, and digital city programming. Before becoming Chief Citiverse Officer, he helped lead Rotterdam's Digital City work, including the Open Urban Platform and 3D Digital Twin, which became important foundations for the Citiverse. His perspective is central to the case study because he connects Rotterdam's practical city-level experimentation with broader questions of interoperability, accountability, digital governance, and the future role of cities in digital development.

Interview Summary:
Roland's interview framed the Citiverse as more than a technology project. He described Rotterdam's digital future as a shift toward a reality where the social, physical, and digital dimensions of the city increasingly interact with one another. This helped clarify that the Citiverse should not be understood as a separate virtual world or a single tool, but as part of how the city may function, plan, govern, and serve residents in the future.

A key theme in Roland's interview was practical value. From his perspective as a Rotterdam civil servant, the case study matters most if it can help the city and its citizens in concrete ways. He was interested in learning from other cities, but only if those comparisons could be translated into usable insights for Rotterdam. This grounded the case study in implementation rather than abstract benchmarking.

Roland also emphasized accountability. When digital systems, AI, or automated decisions affect residents, he argued that humans must remain responsible and that someone should always be identifiable as accountable within the process. At the same time, he acknowledged that protocols can struggle to keep up with the speed of AI and other emerging technologies. This insight contributed to the case study by showing that responsible digital transformation requires governance structures that evolve alongside the technology.

His interview also strengthened the importance of interoperability and trust. For the Citiverse to work, participants must trust one another and trust the infrastructure that connects them. This connects directly to the DDGs because global digital goals must help cities avoid isolated systems, vendor lock-in, and fragmented digital infrastructure. Overall, Roland's contribution positioned Rotterdam as an ambitious and advanced digital city, while also showing that its future success depends on human accountability, public value, open standards, and digital systems that remain meaningful for residents.

Interviewee Name: Nadia Khawalid

Interview Date and Location: June 10, 2026 | In-Person |

Role / Affiliation:
Project Manager Digitale Inclusive, Sociaal AI Lab Rotterdam

Brief Background:
Nadia Khawalid is a Project Manager for Digital Inclusive at the Sociaal AI Lab Rotterdam. Her work focuses on making artificial intelligence understandable, fair, and accessible for residents, while connecting responsible AI development with citizen participation and public trust. She brings experience from education, inclusion-focused municipal work, and employment support for people with physical and mental disabilities. Her role is especially relevant to Rotterdam's digital transformation because the Sociaal AI Lab creates space for residents, researchers, designers, students, policymakers, and public institutions to explore AI in a more practical and socially responsible way. Her perspective connects to the Digital Development Goals through themes of AI literacy, inclusive governance, responsible design, and meaningful participation.

Interview Summary:
Nadia's interview emphasized that responsible digital transformation should begin with civic need, not with technology. Through the Sociaal AI Lab, she approaches AI by first asking what different groups in Rotterdam actually need and whether AI is even the right tool to address the issue. This "question zero" approach is important because it challenges the assumption that AI should automatically be added to public services simply because it is available.

A central theme in the interview was the difference between access, digital literacy, and AI literacy. Nadia made clear that having a device or internet connection is not enough if residents do not have the skills, confidence, or support needed to use digital systems. She connected digital exclusion to socioeconomic background, outdated devices, slow internet, and the growing reliance on digital services in essential parts of society. For Rotterdam, this shows that digital inclusion must be treated as a social issue, not only a technology issue.

Nadia also stressed that innovation must be participatory from the beginning. In her view, involving residents only after a tool has already been designed is not true inclusion. Digital tools and policies should be shaped with the communities most affected by them, especially groups that are often underrepresented in formal policy spaces.

For the Digital Development Goals, Nadia's strongest contribution was her focus on responsibility, inclusivity, and measurability. She warned that vague terms such as AI literacy can become difficult to implement if they are not clearly defined. Her proposed direction for the DDGs centered on digital inclusivity and representation, ensuring that the diversity of society has a real voice in the design of digital policy and tools. Her interview strengthened the case study by showing that Rotterdam's digital future depends on public trust, practical inclusion, and long-term support for programs that help residents participate meaningfully.

Interviewee Name: Maurice de Beer

Interview Date and Location: June 11, 2026 | In-Person |

Role / Affiliation:
Battalion Chief / Knowledge and Innovation Director / Fire Department / Safety Region Rotterdam-Rijnmond

Brief Background:
Maurice de Beer is a Battalion Chief and Knowledge and Innovation Director at the Rotterdam-Rijnmond Safety Region, where his work connects emergency response, crisis management, public safety innovation, and Rotterdam's wider digital transformation. He brings nearly three decades of frontline fire and rescue experience, including operational incident command, hazmat response, and rescue diving. He also leads innovation work connected to SAFE3D, a collaboration with Rotterdam's Digital City programme that uses the 3D Digital Twin and Open Urban Platform to improve situational awareness for emergency responders. His perspective is especially relevant to the case study because he connects digital transformation to real-time decision-making, public safety, resilience, and the operational realities of city governance.

Interview Summary:
Maurice's interview emphasized that digital transformation must work under real conditions, not only in strategic plans or pilot environments. Through SAFE3D, he showed how Rotterdam's digital infrastructure can support emergency services by improving situational awareness and helping responders better understand complex incidents. However, he made clear that the main obstacles are not only technical. Successful implementation also depends on stakeholder adaptation, trust, data-sharing practices, legal constraints, and whether people can clearly see the practical value of the technology.

A central theme in his interview was incremental experimentation. Rather than forcing a fully designed transformation from the top down, Maurice described the importance of small, practical steps that allow people to test, learn, and build confidence. This matters for Rotterdam because it shows that digital innovation becomes meaningful when it is tested alongside the people who will actually use it, especially in high-pressure public safety environments.

Maurice also connected digitalization to resilience. His work highlights that cities must be able to function during disruption, including emergencies, outages, and moments when digital systems may fail. This perspective expands the case study's understanding of digital inclusion: residents and institutions should benefit from digital systems, but cities also need backup capacity, social trust, and operational preparedness when those systems are unavailable.

For the Digital Development Goals, Maurice's contribution suggests that public safety and resilience should be treated as core parts of responsible digital development. His interview showed that DDGs should not only measure access, innovation, or infrastructure, but also whether digital systems can support crisis response, cross-agency cooperation, and public value in moments of urgency. His perspective grounded the case study in implementation, reminding the project that digital transformation must ultimately serve people when it matters most.

Interviewee Name: Dr. Mani Dhingra Ph.D (she/her)

Interview Date and Location: June 11, 2026 | Zoom |

Role / Affiliation:
ADAPT Digital Twin Research Lead embedded in Dublin City Council's Smart City Unit School of Information and Communication Studies, University College Dublin

Brief Background:
Mani Dhingra works across smart city research, digital twins, urban innovation, and digital governance. Her background includes architecture, city planning, sustainability, and a PhD focused on smart cities and urban innovation, particularly in relation to India's Smart Cities Mission. She is based in Ireland and has worked with Dublin City Council and the Smart Dublin Initiative, where new technologies and systems are tested against local urban challenges. Her work also connects to the ADAPT Research Centre, with a focus on a balanced digital society. Within the Digital Development Goals process, she contributes to the cluster on new societal outcomes, bringing a perspective that connects digital infrastructure with ethics, accessibility, data governance, citizen engagement, and institutional capacity.

Interview Summary:
Mani's interview emphasized that digital transformation should not be treated as a technology project alone. Drawing from her work with digital twins and smart cities, she argued that the real challenge is often change management, institutional capacity, and the ability of public organizations to adapt. This perspective is important for Rotterdam because the city's digital twin, Citiverse, and data infrastructure will only create value if they are supported by the right governance structures, skills, and public engagement practices.

A central theme in the interview was citizen participation. Mani noted that many residents do not yet understand what a digital twin is or how it could benefit them. She used Dublin's experience to show that digital tools can open new forms of engagement, such as 3D models, VR/AR previews, dashboards, and public demonstrations. However, she also stressed that participation often remains stuck at informing or consulting residents rather than involving them in a deeper way. For Rotterdam, this suggests that digital tools should be designed not only to visualize the city, but to help residents meaningfully understand and shape decisions.

For the DDGs, Mani emphasized universality, adaptability, data ethics, and human oversight. She argued that the goals should remain high-level enough to apply across different local contexts while still being measurable and practical. She also warned that poor data quality and biased training data can create unfair outcomes, especially when AI or predictive systems are used in areas that affect citizens directly.

Her interview contributed to the case study by connecting digital twins to broader societal outcomes. She proposed digital democratization and future skills as important DDG directions, emphasizing meaningful public engagement and continuous upskilling for city staff. Overall, Mani's perspective suggests that the DDGs should be a living framework, not a one-time report, and should help cities keep people at the center as technologies continue to evolve.

Interviewee Name: Jochem Cooiman

Interview Date and Location: June 15, 2026 | In-Person |

Role / Affiliation:
Digital Innovation Officer, City of Rotterdam

Brief Background:
Jochem Cooiman is a Digital Innovation Officer with the City of Rotterdam's CIO Office. His work focuses on digital transformation, innovation strategy, technology collaboration, and connecting Rotterdam with wider European digital networks. He has helped position Rotterdam within European city conversations, including through Eurocities and the Digital Office of Europe. His background also includes ICT, business operations, financial control, strategic development, and community-building through Rotterdam's innovation ecosystem, including VONK. His perspective is especially relevant to the case study because he connects Rotterdam's local digital ambitions with European policy, interoperability, data governance, and cross-city collaboration.

Interview Summary:
Jochem's interview emphasized that Rotterdam's digital transformation is part of a much larger European conversation about law, trust, skills, and city capacity. Drawing on his Eurocities experience, he explained that municipal leaders are trying to understand how emerging regulations and technologies affect the real work of cities. Issues such as the AI Act, data compliance, digital sovereignty, generative AI, and civil servant training are not abstract policy topics. They shape whether cities can responsibly use new technologies in daily governance.

A central theme in the interview was that digital innovation depends on strong data foundations and open standards. Jochem connected Rotterdam's open data platform and Open Urban Platform to the broader need for interoperability, so data, applications, and services can be exchanged across municipalities and partners in a secure and transparent way. His perspective helped show that the Citiverse and digital twin should not be treated as isolated Rotterdam projects, but as part of a wider digital ecosystem that requires compatibility, trust, and shared rules.

Jochem also highlighted the value of immersive technologies for citizen engagement. He described how residents become personally connected when they can see and interact with familiar places in a digital environment. For Rotterdam, this suggests that digital tools can make planning, mobility, housing, and urban change more understandable if they are designed around participation rather than only technical performance.

At the same time, Jochem was clear that collaboration barriers are often organizational. Siloed responsibilities, unclear incentives, and the question of what each actor gains from sharing data can slow progress. For the DDGs, his interview suggests that global goals should focus not only on technology adoption, but also on interoperability, incentives, trust, and the ability of cities to work across institutional boundaries. His strongest inclusion insight was that digital development must account for people who are not digitally engaged and preserve meaningful offline options. This connects digital inclusion to resilience, ensuring that residents can still function when devices, electricity, or digital systems fail.

Interviewee Name: Stephen Goldsmith[114]

Interview Date and Location: June 15, 2026 | Zoom |

Role / Affiliation:
Derek Bok Professor of the Practice of Urban Policy, Director of the Data Smart Cities Program

Brief Background:
Stephen Goldsmith is a Professor of Practice in Urban Policy at Harvard Kennedy School and a Senior Fellow at the Ash Center for Democratic Governance and Innovation. He previously served as Mayor of Indianapolis and Deputy Mayor of New York City under Mayor Bloomberg. His work focuses on government reform, public sector innovation, data-smart cities, civic technology, and how mayors and senior public leaders can use digital tools to improve governance. He is also involved in the U4SSC Digital Development Goals working group process. His perspective is relevant to Rotterdam and the DDGs because he brings a comparative municipal governance lens, especially around AI, public service modernization, digital inclusion, accountability, and the institutional changes cities need in order to use new technologies responsibly.

Interview Summary:
Stephen's interview emphasized that AI has changed what is possible for city government. Rather than treating digital transformation as the next stage of e-government, he framed it as an opportunity to rethink how cities listen, collaborate, allocate resources, and intervene earlier in both physical and social problems. For Rotterdam, this perspective reinforces that advanced digital infrastructure is only valuable if it changes the way the government works for residents.

A central theme in the interview was the balance between opportunity and risk. Stephen argued that AI and smart city tools can greatly improve public safety, service delivery, and government responsiveness, but those same tools can also create risks of surveillance, abuse, bias, and unequal treatment. His view was not that cities should avoid AI, but that they should build strong governance around it. This includes transparency, auditing, monitoring, attention to biased data, and public servants trained in public values.

Stephen also expanded the discussion of digital inclusion. He emphasized that access includes devices, broadband, affordability, and the ability of cities to identify "access deserts" geographically. He also highlighted the challenge of hearing from underrepresented communities that may not contact city call centers or formal participation channels. This contributed to the case study by showing that inclusion must be actively mapped and addressed, not assumed.

For the DDGs, Stephen's strongest contribution was the need for government modernization. He argued that many developed governments are highly structured, rule-bound, and bureaucratic, which can prevent them from using technology effectively. His perspective suggests that DDGs should not only focus on tools or infrastructure, but also on whether public institutions have the discretion, accountability, digital literacy, and supervisory capacity needed to use technology fairly and effectively.

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[114] ***Interview Limitation Disclaimer:***
Due to the interviewee's time restrictions, the team was not able to ask every prepared interview question. The summary therefore reflects the topics and insights covered during the available interview time, rather than the full standardized question set.

Interviewee Name: Jake Taylor[115]

Interview Date and Location: June 15, 2026 | Zoom |

Role / Affiliation:
Owner, Producer, BNC Design Studios

Brief Background:
Jake Taylor brings a systems-engineering, design-thinking, and frontier-technology perspective to questions of urban digital transformation. His background includes experience in game development, public-sector technology application, smart-city work, immersive technology, artificial intelligence, and digital twins. His connection to the Digital Development Goals comes through his ongoing work with Bas Boorsma and his involvement in discussions around how cities can translate emerging digital frameworks into practical implementation. His perspective is especially relevant because he approaches city digitalization from outside a traditional municipal governance lens, focusing instead on systems thinking, behavioral adoption, user experience, and the practical conditions required for digital tools to create value.

Interview Summary:
Jake's interview contributed a critical and implementation-focused perspective to the case study. He emphasized that the DDGs should function as an administrator-level framework and toolkit, but argued that they must still be grounded in concrete outcomes for everyday residents. A central theme in his interview was the importance of moving beyond high-level digital ambition toward clearly defined impacts with what changes for residents, how departments use the tools, and how cities avoid building technology for its own sake. He repeatedly framed cities as interconnected systems rather than collections of separate departments, arguing that digital transformation requires enterprise-level coordination, shared infrastructure, and a stronger understanding of how one part of the urban system affects the others.

His perspective also highlighted several issues relevant to Rotterdam's digital transformation and the DDG such as municipal capacity, interoperability, data sovereignty, vendor dependency, citizen-centered design, and downstream adoption. He cautioned against cities independently solving the same digital problems in isolation and stressed the importance of designing from real citizen needs rather than top-down assumptions. He also pointed to the value of safe experimentation environments, such as technology sandboxes, where municipal departments can test tools while still maintaining governance and organizational control. For the case study, Jake's interview helped sharpen the distinction between digital experimentation and practical implementation. His contribution reinforced the need for the DDGs to be adaptable across local contexts while remaining actionable enough to guide cities toward measurable, resident-centered digital outcomes.

[115] ***Interview Limitation Disclaimer:***
Due to ambiguity around quotability in this interview, direct quotations were excluded from the appendix entry. The summary reflects the interview's main themes without attributing verbatim statements.

Interviewee Name: Ajay Nair

Interview Date and Location: June 16, 2026 | Zoom |

Role / Affiliation:
Smart Cities & Data Governance Consultant, Nexis Space

Brief Background:
Ajay Nair is an urban planning and digital governance specialist with extensive experience across physical planning, smart city strategy, data governance, and urban technology implementation. His career spans work with ISRO, the National Planning Agency of Qatar, Singapore's Urban Redevelopment Authority, the private sector in the United States, and UN-related smart city work. He is also connected to the U4SSC initiative under ITU/UN-Habitat, where he leads the governance component of the Digital Development Goals, and he is involved with the Metaverse Standards Forum on city and urban metaverse implementation. His perspective is especially relevant to the Rotterdam case study because he connects digital transformation to governance readiness, physical planning foundations, data stewardship, interoperability, and the practical conditions required for cities to implement digital tools responsibly.

Interview Summary:
Ajay's interview emphasized that governance, rather than technology itself, is the central condition for successful digital transformation. He argued that cities should not treat digital tools, digital twins, or Citiverse platforms as substitutes for strong physical infrastructure, clear administrative systems, and mature governance procedures. In relation to Rotterdam, his perspective suggests that initiatives such as the Digital Twin, Open Urban Platform, and Citiverse should be understood as layers built on top of broader urban planning, data governance, and institutional capacity. He also stressed the importance of context, noting that cities cannot simply copy digital models from one another because each city has different histories, infrastructures, cultures, and governance conditions. This insight is important for the DDGs because it reinforces the need for a global framework that is adaptable to different city contexts rather than a rigid one-size-fits-all model.

A major contribution of Ajay's interview was his detailed explanation of data governance and interoperability. He identified data silos as a core barrier to effective city digitalization and emphasized the need for "data bridges," data stewards, data managers, lineage mapping, formal protocols, SOPs, and measurable data-quality procedures. His view was that interoperability is not only a technical matter, but also a governance infrastructure issue that requires clear responsibility and institutional accountability. He also discussed the governance risks of AI-enabled city platforms and the Citiverse, especially as software capabilities grow faster than cities' ability to govern them. For the case study, Ajay's interview helped clarify why Rotterdam's future digitalization priorities must include governance maturity, data stewardship, citizen participation, internal capacity-building, benchmarking, sustainability, and continuous feedback loops. His perspective contributed directly to understanding how the DDGs can support cities not only in adopting digital technologies, but in building the governance systems needed to use them effectively, safely, and in ways that improve quality of life.

Interviewee Name: Ivy Yang

Interview Date and Location: June 17, 2026 | Zoom |

Role / Affiliation:
AI//Digital Policy Navigation Specialist, Open & Agile Smart Cities

Brief Background:
Ivy Yang works at the intersection of digital policy, technical support, and city-level implementation through her role with Open & Agile Smart Cities. Her expertise is especially relevant to the case study because she focuses on how broad digital policy concepts, such as interoperability, digital sovereignty, sustainability, inclusivity, trustworthiness, and regulation, are translated into practical decisions for cities. Although she noted that she is not directly part of the DDG Working Group, her perspective contributed an operational and policy-navigation lens to the project, particularly around how cities interpret complex digital governance language and turn it into implementable strategies.

Interview Summary:
Ivy's interview emphasized the importance of clarity, scope, and implementation in the development of the Digital Development Goals. She argued that terms commonly used in U4SSC and EU policy spaces, such as sustainability, digital sovereignty, inclusivity, and trustworthiness, may not always be explicit or consistently understood in local practice. For Rotterdam and the DDGs, her perspective suggests that the challenge is not simply introducing new terminology, but clarifying what each concept means for specific stakeholders, decisions, and implementation contexts. She repeatedly redirected the conversation from abstract policy language toward practical questions: what problem is being addressed, who the relevant stakeholders are, what level of governance is being discussed, and what action should follow.

A central contribution of Ivy's interview was her framing of interoperability and inclusivity as design, planning, and procurement questions rather than purely citizen-facing concepts. She explained that residents may not need to understand the technical details of interoperability, but they do need digital systems that are trustworthy, usable, and beneficial in everyday life. She also expanded the idea of "leaving no one behind" by noting that inclusion must account not only for people who lack access or skills, but also for those who do not want to use digital solutions. This perspective is important for Rotterdam because initiatives such as the Open Urban Platform, Digital Twin, Citiverse, and public-facing digital services must be designed with both digital users and non-adopters in mind.

Ivy also contributed to the case study by emphasizing that the DDGs should be practical and implementable rather than simply adding another layer of high-level goals. She identified clarity, practicality, and transparency as key factors for effective digital governance, especially when multiple decision-makers and stakeholders are involved. Her perspective helped the team understand that Rotterdam's digital transformation, and the DDG framework more broadly, will require careful translation from global language into local strategy. For the case study, Ivy's interview reinforced the need to define concepts clearly, avoid unspoken assumptions, and ensure that digital governance frameworks are actionable for cities rather than only aspirational.

Interviewee Name: Ellie Lee

Interview Date and Location: June 18, 2026 | Zoom |

Role / Affiliation:
Manager, Urban Innovation Division (Digitalization & International Cooperation), Smart City Association Member, U4SSC Working Group 6 (DDGs)

Brief Background:
Ellie Lee is a smart city practitioner with a background in civil engineering and urban planning, currently affiliated with the Korea Smart City Association. Her work connects to city digitalization, smart city implementation, international standards, mobility data, digital infrastructure, and technology adoption. Her perspective contributed to the Rotterdam case study by bringing a practitioner's view from South Korea's smart city ecosystem, especially on how cities manage data, infrastructure, interoperability, environmental trade-offs, and long-term operation of digital systems.

Interview Summary:
Ellie's interview emphasized the practical lifecycle of digital infrastructure. Rather than focusing only on the launch of smart city technologies, she repeatedly returned to what happens after digital systems are built: how they are maintained, updated, powered, governed, and eventually disposed of. This perspective is especially relevant to Rotterdam as the city continues developing initiatives such as the Open Urban Platform, Digital Twin, Citiverse, and broader data-driven urban systems. Ellie framed data centers as essential to smart cities because they enable data collection, analysis, and service improvement, but she also stressed that cities must address the energy, cost, and waste implications of digital infrastructure over time.

Her interview also contributed important insights on privacy, measurement, inclusion, and interoperability. Ellie discussed how identifying information may be accessed in emergency contexts, while emphasizing that routine mobility planning generally does not require personal driver data. On digital inclusion, she described a generational divide in technology adoption, noting that younger residents may be more open to new digital services while older residents may need dedicated training and support. She also highlighted Seoul's free digital education programs for older residents as an example of practical support for adoption. In relation to the DDGs, Ellie suggested that the development process could learn from the formation of the SDGs, while also emphasizing that the DDGs should account for long-term management and end-of-life responsibilities for digital infrastructure.

A central contribution of Ellie's perspective was her focus on interoperability and standards. She argued that cities become more isolated when they only work with their own data, while shareable and interoperable data allows cities to collaborate, compare, and adapt solutions from elsewhere. This is directly relevant to Rotterdam's future digitalization because platforms such as the Open Urban Platform and Digital Twin depend on common standards, data sharing, and coordination across systems. Her proposed idea of a "digital infrastructure ecosystem" helped the team think about digital transformation not only as innovation, but as a full ecosystem that includes maintenance, sustainability, interoperability, and responsibility for what happens after technologies are deployed.

Interviewee Name: Peter Joziasse

Interview Date and Location: June 19, 2026 | In-Person |

Role / Affiliation:
Founder, Digital Child Rights

Brief Background:
Peter Joziasse is the founder/director of the Digital Child Rights Foundation, or *Stichting Digitale Kinderrechten*, based in Rotterdam. His work focuses on digital child rights, lifelong learning, youth digital empowerment, and children's access to safe, age-appropriate digital environments. He runs programs such as the Connection Desk and Connection Challenges for young Rotterdammers, participates in the Rotterdam Digital Child Rights Network, collaborates with Erasmus University on research related to children's digital privacy and access rights, and has worked internationally on digital access and children's rights, including through UN/ITU-related digital agenda work.

Interview Summary:
Peter's interview brought a distinct child-rights perspective to the case study by emphasizing that children and young people should not be treated as a small subset of general digital inclusion. Instead, he framed them as a rights-bearing group with specific developmental needs, vulnerabilities, and forms of expertise in digital environments. In relation to Rotterdam, he recognized the city's high-level commitment to digital inclusion, but highlighted a gap between formal governance commitments and the lived digital realities of children in schools, families, youth hubs, libraries, and online platforms. He argued that city departments and community institutions often remain siloed, while children's digital lives are shaped by platforms and algorithms that municipalities cannot fully govern on their own. His perspective connected Rotterdam's digitalization journey to questions of digital child rights, age-appropriate access, parental and teacher digital literacy, youth safety, Big Tech accountability, and the need for stronger local capacity around children's digital wellbeing.

Peter also contributed a future-facing view of how Rotterdam and the DDGs could better integrate youth voices into digital development. He described initiatives such as youth hubs, libraries, the Rotterdam Digital Child Rights Network, and "Rotterdam Go" as ways to bridge young people's digital lives with the physical city through gamification, peer support, and youth-led design. For the DDGs, his central message was that frameworks must move beyond policy language into practical tools, local implementation, and multicultural relevance. He emphasized that children and young people should be involved not only as beneficiaries, but as co-creators of digital development goals. His interview helped the case study identify children, youth, and digital rights as a major priority for Rotterdam's future digitalization, especially as the city expands the Citiverse, digital inclusion programs, and citizen-facing digital tools.

Interviewee Name: Roland van der Heijden (Follow-up Interview)

Interview Date and Location: June 19, 2026 | Zoom |

Role / Affiliation:
Chief Citiverse Officer, City of Rotterdam

Follow-up Interview Disclaimer:
Because the first interview with Roland van der Heijden covered the standardized interview questions, this follow-up interview focused on additional targeted questions. The discussion explored issues that needed further clarification, including accountability, open standards, big tech dependency, digital inclusion, interoperability, long-term adaptability, and how the case study could be most useful to Rotterdam.

Interview Summary:
Roland's follow-up interview deepened the case study's understanding of what Rotterdam needs from the final deliverable. He emphasized that the case study should not only describe Rotterdam's digital transformation, but should produce concrete insights that can help the city and its residents. He was also interested in learning from other cities, but only in ways that could be translated into practical value for Rotterdam. This helped frame the case study as a comparative tool, not simply a descriptive report.

A major theme in the follow-up was accountability. Roland argued that when digital systems or automated processes affect residents, humans must remain responsible for decisions. This is especially important in the Citiverse because shared data, AI, and digital infrastructure can create situations where responsibility becomes unclear. His perspective showed that governance must be built into digital systems from the beginning, rather than added after problems occur.

The interview also clarified Roland's position on open standards and big tech. He emphasized that cities need greater independence from commercial technology providers, especially when public infrastructure depends on private software ecosystems. His view was not that all technology must be open source, but that data entering and leaving systems should follow open standards. This distinction matters because it shifts attention from who owns the software to whether cities can exchange, read, and use data without becoming locked into one provider.

Roland also connected digital inclusion to basic access, schools, and social behavior. He described inclusion as beginning with devices, connectivity, and skills, especially for residents who are hardest to reach. He also emphasized that schools should help children learn how to live with digital technology rather than simply remove it from the classroom. For the DDGs, his strongest follow-up contribution was the idea that digital literacy should be treated as a core goal because residents need the capacity to understand and respond to the digital world around them.

Interviewee Name: Eric Houtman

Interview Date and Location: June 19, 2026 | In-Person |

Role / Affiliation:
General Manager, InterGarant Groep

Brief Background:
Eric Houtman is a practitioner in building compliance, permitting, and AI-enabled public administration. The post-interview report identifies him as the founder/director of PlanGarant, a certified building assessment organization with offices in Rotterdam that works with local governments and environmental services agencies across the Netherlands. His work is closely connected to digital transformation through *Struck*, an AI tool used to check building plans and zoning compliance against official government data. His perspective is especially relevant to the Rotterdam case study because he works directly with municipalities adopting AI in regulated permitting processes, including the practical challenges of trust, workflow integration, standards, and institutional capacity.

Interview Summary:
Eric's interview contributed a highly practical view of AI implementation in municipal systems. Unlike more policy-oriented interviews, his insights came from direct experience deploying AI tools across Dutch municipalities and supporting public-sector users as they integrate AI into permitting workflows. He emphasized that the main barrier to digital transformation is not the technology itself, but people's ability to trust, understand, and use it effectively. In the context of Rotterdam, this perspective is important because digital tools such as AI-supported permitting, open data systems, and urban platforms only create value when municipal staff, specialists, developers, and partners can integrate them into everyday work. His discussion of Struck showed how AI can reduce the time needed to assess building and zoning feasibility, but also how adoption depends on domain expertise, training, workflow compatibility, and confidence in the tool's outputs.

Eric's interview also helped the case study understand the risks of fragmented digital development. He described silos between technical AI practitioners, materials specialists, and sustainability experts, arguing that these groups often work in parallel rather than as part of a shared system. For the DDGs, this reinforces the importance of interoperability, standards, and cross-sector coordination. He also stressed that AI is developing too quickly for cities or global frameworks to wait for perfect solutions; instead, digital governance must be able to adapt while tools continue to evolve. His perspective contributed to the case study by grounding abstract DDG themes such as digital inclusion, interoperability, standards, and capacity-building in a concrete municipal use case: the transformation of building compliance and permitting through AI.

Interviewee Name: Teppo Rantanen

Interview Date and Location: June 22, 2026 | Zoom |

Role / Affiliation:
Founder and CEO, TR Citiverse Oy

Brief Background:
Teppo Rantanen brings experience in city leadership, business development, consulting, and urban innovation. The post-interview report describes him as having recently moved from serving as Executive Director of the City of Tampere into advisory roles with Business Tampere and the Chamber of Commerce, while also chairing the board of Business Finland. His background includes over 30 years in consulting and accounting with global firms, followed by approximately a decade working directly with the City of Tampere. His perspective is relevant to the Rotterdam case study because Tampere and Rotterdam are both involved in Citiverse-related work, and he contributed insight on people-centered implementation, accessibility, interoperability, ecosystem coordination, and the role of cities as testing grounds for the Digital Development Goals.

Interview Summary:
Teppo's interview emphasized that the DDGs must be practical, people-centered, and globally implementable. He described Rotterdam's relationship to the DDG process as one of co-development, rather than simply observation, and identified the central challenge as connecting people with the technologies being developed. In comparing Tampere and Rotterdam, he suggested that Rotterdam is more advanced in building technology platforms, while Tampere has been especially strong in engaging a wider ecosystem of companies, public-sector actors, and immersive-reality use cases. This comparison helped the case study understand Rotterdam's Citiverse work not as an isolated project, but as part of a broader international learning network involving cities such as Tampere, Valencia, Dubai, and Nordic and Baltic partners.

A major theme in Teppo's interview was accessibility. When asked what goal he would prioritize, he focused on making digital tools usable and reachable for residents, especially elderly people and people with disabilities. He repeatedly cautioned that the DDGs should not become too academic, too vertical, or too complicated to implement. Instead, they should remain simple enough for cities to apply and meaningful enough to improve everyday life. His perspective contributed to the case study by reinforcing that Rotterdam's digital transformation should be evaluated not only by the sophistication of its platforms, but by whether those platforms are understandable, inclusive, and useful for residents. His interview also highlighted unresolved challenges around financing, non-technical interoperability standards, and the need for cities to actively test and guide the DDG framework as it develops.

Interviewee Name: Professor Bamidele Adebisi

Interview Date and Location: June 23, 2026 | Zoom |

Role / Affiliation:
Professor and Director of Smart Infrastructure Research at Manchester Metropolitan University; and Director, University Board Member, African Hydrogen Partnership (AHP)

Brief Background:
Bamidele Adebisi is a Co-leader of Cluster 4 in the U4SSC Working Group 6 process for the Digital Development Goals, a Professor In Intelligent Infrastructure Systems at Manchester Met University, UK, and Director of the African Hydrogen Partnership. His expertise connects digital development, smart city infrastructure, interoperability, and people-centered technology deployment. His perspective was especially relevant to the Rotterdam case study because he brought experience from Manchester's smart city projects, including Triangulum and City Verve, as well as international work on energy access, peer-to-peer energy systems, and inclusive infrastructure development. His interview helped connect Rotterdam's digital transformation and the DDGs.

Interview Summary:
Bamidele's interview emphasized that the DDGs should function as a people-centered minimum standard rather than a technology-first framework. He argued that digital development should be judged by whether it improves people's lives, expands access, and creates fairer outcomes, rather than by whether cities adopt the newest technologies. Drawing from Manchester's Triangulum and City Verve experiences, he highlighted a key lesson for Rotterdam that smart city projects can fail when planners assume residents will automatically accept a technology without first understanding local needs. This insight is directly relevant to Rotterdam's digitalization journey because initiatives such as the Open Urban Platform, Digital Twin, and Citiverse must be grounded in resident value, not only technical capability.

His interview also contributed important insights on interoperability, sustainability, equity, and co-design. He described interoperability as a practical condition for smart systems to work, noting that disconnected data, inconsistent naming, and vendor-driven fragmentation can prevent cities from realizing the value of integrated digital infrastructure. He also stressed that technologies meant to improve sustainability should not consume more energy than they save, making environmental responsibility a core part of digital governance. For the DDGs, Bamidele identified people, equity, and future-proofing as central considerations, while warning against overconfidence and narrow perspectives. His strongest contribution to the case study was his emphasis on co-design, rather than "engaging" residents after decisions have already been made, cities and the U4SSC should involve communities from the beginning through co-creation, co-development, and co-deployment. This perspective helped reinforce the importance of local context, equity, transparency, and accountable automated decision-making in Rotterdam's future digital development.

Interviewee Name: Chenayi Mutambasere

Interview Date and Location: June 24, 2026 | Zoom |

Role / Affiliation:
Strategic Director, Director for Africa Center for Economic Justice

Brief Background:
Chenayi Mutambasere is the founder and director of the Africa Centre for Economic Justice, with a background in development economics and an extended career in digital transformation across banking, legal services, and the public sector, including experience with Manchester City Council. Her recent work focuses on Africa-specific digital and AI strategy, AI readiness, capacity building, digital inclusion, and community-centered technology use cases. She has worked with civic society organizations, African governments, and international organizations including GSMA and ITU, and is also collaborating with Bas Boorsma and Thunderbird on the Digital Development Goals. Her perspective is especially relevant to the Rotterdam case study because she connects digital governance to equity, data poverty, community co-creation, and the risk that global frameworks may overlook the lived realities of underrepresented communities.

Interview Summary:
Chenayi's interview introduced a strongly rights-based and inclusion-centered perspective to the case study. Her central concept was data poverty. In her view, if a community is not represented in the data ecosystem, it risks being excluded from the social and economic benefits of digital transformation. This perspective is important for Rotterdam because it expands the discussion of data governance beyond privacy and compliance to include representation, visibility, and benefit-sharing. For a city developing platforms such as the Open Urban Platform, Digital Twin, and Citiverse, her insights suggest that digital systems must be evaluated not only by the data they collect, but also by whose realities are included, whose data is missing, and who benefits from the resulting tools.

Her interview also contributed directly to the development of the DDG case study by challenging the team to think beyond abstract goals and toward outcome-led, testable, and community-grounded frameworks. She argued that concepts such as trust, sovereignty, inclusion, and connectivity can mean very different things across contexts, especially between the Global North and the Global South. As a result, she emphasized the need for clear definitions, measurable outcomes, and co-creation with the communities most affected by digital development.

Interviewee Name: Okan Geray

Interview Date and Location: June 25, 2026 | Zoom |

Role / Affiliation:
Digital Dubai, U4SSC Chair, Senior Digital City Strategy Advisor

Brief Background:
Dr. Okan Geray is a Senior Digital City Strategy Advisor at Digital Dubai and Chair of United for Smart Sustainable Cities (U4SSC). He also serves as Vice-Chair of Working Party 1 and Rapporteur for the evaluation and assessment question in ITU Study Group 20, and as Steering Committee Chair for the Global Initiative on AI and Virtual Worlds. His expertise spans digital city strategy, smart sustainable cities, digital public infrastructure, people-centered digital transformation, AI governance, virtual worlds, standards, KPIs, and city-level digital assessment. His perspective is especially relevant to the Rotterdam case study because he connects local digital transformation efforts, such as Rotterdam's Citiverse and digital governance work, to broader UN/ITU efforts to develop practical and globally relevant Digital Development Goals.

Interview Summary:
Dr. Geray's interview emphasized the importance of designing the DDGs as a clear, structured, and globally usable framework. He explained that the DDGs could either translate the existing SDGs into a digital context or be developed as a separate structure with their own goals, targets, and indicators. His main caution was that Rotterdam should be treated as an advanced and inspiring case, but not as the baseline for all cities. Because many cities, especially in the Global South, still face foundational digital challenges, he argued that the DDGs must remain generic enough to apply across different levels of maturity while still being specific enough to guide action. This insight helped position Rotterdam as a learning case for the DDGs rather than a universal model.

A major theme in Dr. Geray's interview was the need for people-centered, practical, and adaptable digital development. Drawing from Digital Dubai's experience, he described the value of centralizing common digital services, such as identity, payment, HR, procurement, and finance, while allowing individual government entities to innovate in their own domains. He also highlighted digital public infrastructure, accessibility, digital well-being, skills, privacy, responsible AI, data sovereignty, and global digital cooperation as important areas for consideration. For the Rotterdam case study, his perspective reinforced that digital transformation should not be judged only by the sophistication of platforms such as the Citiverse, but by whether cities can make digital systems usable, inclusive, trusted, and adaptable to local priorities. His interview also helped clarify that the DDGs should build on existing KPI and standards work without becoming only a measurement exercise; they should provide a policy-oriented direction that cities can customize, implement, and use in practice.

Interviewee Name: Karl-Filip Coenegrachts

Interview Date and Location: June 25, 2026 | Zoom |

Role / Affiliation:
Chair and Executive Director, Open & Agile Smart Cities

Brief Background:
Karl-Filip Coenegrachts is a smart city and interoperability leader affiliated with Open & Agile Smart Cities, with extensive experience working across city digital transformation, Minimal Interoperability Mechanisms, digital inclusion, digital sovereignty, and public-sector innovation. His perspective is especially relevant to the Rotterdam case study because he has worked directly with cities on interoperability frameworks and has insight into the operational, governance, and political barriers that affect initiatives such as the Open Urban Platform, Digital Twin, and Citiverse. He also brings a public-sector implementation perspective, emphasizing that digital transformation depends not only on technology, but on awareness, governance, institutional capacity, procurement, standards adoption, and long-term political support.

Interview Summary:
Karl-Filip's interview emphasized that the biggest barriers to Rotterdam's Citiverse and broader digital transformation are not primarily technical, but operational and institutional. He argued that no city currently has a fully operational predictive local digital twin as defined in international digital twin work; rather, most cities have visualization layers built on top of data. For Rotterdam, this distinction matters because initiatives such as the Open Urban Platform, Digital Twin, and Citiverse require more than pilots or visual demonstrations. They require shared definitions, governance structures, ownership models, funding continuity, and clarity about who manages the data, AI, use cases, and long-term implementation. His Rotterdam-specific insight also highlighted the fragility of innovation when it depends heavily on individual leadership, political circumstances, budget cycles, and external project funding.

His interview also contributed strongly to the DDG framework by emphasizing interoperability, digital sovereignty, and actionable implementation. He argued that models cannot simply be copied from one city to another; instead, reusable components should be identified through mechanisms such as Minimal Interoperability Mechanisms. He connected this to the DDGs by warning that the goals must not become another framework used only by the people who created it. To be useful, they must be understandable, actionable, incentive-backed, and relevant to cities and smaller local authorities alike. His perspective helped the case study frame Rotterdam as an important but non-universal learning case: advanced enough to generate insight, but not a model that can be directly transferred everywhere. For the DDGs, his contribution reinforced the need for open standards, digital sovereignty, civil-society involvement, bottom-up implementation, and goals that complement the SDGs while remaining ambitious enough to

Interviewee Name: Cristina Bueti

Interview Date and Location: June 25, 2026 | Zoom |

Role / Affiliation:
Counsellor on Virtual Worlds and AI, International Telecommunication Union

Brief Background:
Cristina Bueti is a senior official at the International Telecommunication Union whose work focuses on digital development, smart cities, AI policy, digital inclusion, gender in ICT, environmental sustainability, and international standards. She is an active contributor to the Digital Development Goals process, which involves multiple U4SSC entities, and connects this work to broader U4SSC frameworks such as the Global Digital Compact and the Pact for the Future. Her perspective is especially relevant to the Rotterdam case study because she brings an international standards and governance lens, while also recognizing Rotterdam as a pioneering city in appointing a dedicated officer for the AI-enabled city.

Interview Summary:
Cristina's interview emphasized that the DDGs should serve as a "wake-up call" for city leaders by helping them build the institutional capacity needed to achieve broader global commitments, including the SDGs, the Global Digital Compact, and the Pact for the Future. She framed digital development not only as a question of adopting tools, but as a governance responsibility that includes training people, setting clear goals, measuring progress, and anticipating the impacts of AI on citizens. In relation to Rotterdam, her perspective highlighted the importance of moving from reactive digital governance toward anticipatory governance, especially as cities adopt AI, digital twins, and immersive technologies. She identified Rotterdam's AI-enabled city role as globally significant, suggesting that the city is institutionally experimenting with the kind of future-facing governance capacity the DDGs may need to encourage.

Her interview also contributed several important themes to the case study, including gender inclusion, sustainability, responsible innovation, standards, interoperability, and vendor lock-in. She stressed that gender must be built into the DDGs as a design requirement, not treated as an optional add-on, and connected this to the risk that AI-driven labour transformation could disproportionately affect women in sectors such as call centers. She also stressed that responsible innovation must consider whether digital technologies widen inequality or create environmental harm.

Interviewee Name: Christina Yan Zhang

Interview Date and Location: June 26, 2026 | Zoom |

Role / Affiliation:
CEO, Metaverse Institute

Brief Background:
Dr Zhang is the CEO and Founder of The Metaverse Institute, a London-based advisory body that supports the UN, governments, investors, and corporations in identifying impactful use cases for frontier technologies including AI, digital twins, and spatial intelligence. In her capacity as a global authority on the convergence of these technologies, she bridges geopolitics, finance, and tech governance to translate strategic foresight into institutional action. Dr Zhang currently leads Track 5 (Evaluation and Assessment Framework) of the UN/ITU Global Initiative on AI and Virtual Worlds: Discovering the Citiverse, and serves as Co-Chair of the CitiVerse Task Group at the ITU. She is also a Vice Chair of the U4SSC ITU Metaverse Working Group on Sustainability, Accessibility, and Inclusion.In the interview, she discussed the relationship between the ITU Citiverse initiative and the emerging Digital Development Goals, distinguishing the DDGs as a broader, macro-level framework and the Citiverse as a more specialized, city-level concept.

Interview Summary:
Christina's interview emphasized pragmatism as the central requirement for both the DDGs and Citiverse development. She viewed Rotterdam as a strong and successful case with a comprehensive implementation plan, but stressed that even the most exciting digital framework will not succeed without a sustainable business model, financing structure, institutional capacity, skilled people, and citizen adoption. Her perspective contributed to the case study by reminding the team that Rotterdam's digital transformation should not be evaluated only by the strength of its vision or strategy, but also by whether it can be funded, staffed, implemented, and adopted in practice.

Her interview also helped position the DDGs within a broader global and political context. She identified geopolitics and environmental impact as two major factors that DDG developers should consider, noting that UN-level frameworks face real implementation limits when member states, funding, and institutional influence are uncertain. She also emphasized that a DDG framework shaped mainly by European city contexts must avoid becoming irrelevant elsewhere by directly asking lower-income cities and their citizens what they need. On environmental sustainability, she stressed that the burden should not fall only on individual citizens but large corporations, institutions, and industries must also be part of the solution because their contributions to environmental impact are much larger..

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