

## How can AI be implemented to improve public services? Architecting Public Services: A Socio-technical Perspective on AI Deployment

The deployment of Artificial Intelligence (AI) holds a promising avenue to transform public services and deliver social benefits. However, depending solely on technocratic solutions and forgetting about ‘people’ can lead to a misalignment between citizens’ needs and intended outcomes. The deployment of AI systems to improve public services is a complex and iterative process that requires both social and technical elements to be incorporated. Often, AI initiatives in cities fail when solely focusing on technology, neglecting to understand and design the complex interdependencies between people, strategies, policies, regulations, and processes. This has led to AI-enabled public services that present significant risks and challenges for communities, such as potential bias and discrimination, privacy violations and citizen surveillance schemes<sup>1</sup>. A notable example is the Sidewalk Toronto project<sup>2</sup>, a smart city development proposed by a Google subsidiary in partnership with Waterfront Toronto. Although the project was eventually cancelled in 2020, it generated extensive debates and raised several concerns related to data trust and the responsible deployment of AI in urban environments. This and many other AI-related incidents<sup>3</sup> have emphasized the urgency of conceptualising and designing public services that embrace both the social and technical worlds. Aligning social and technical aspects becomes a critical planning and management responsibility that should put peoples’ needs above technical desires.

Public servants are required to create ‘public value’ and thereby achieve ‘socially desirable outcomes’ for all stakeholders including citizens and communities. This entails city professionals and planners working collaboratively to address complex urban problems and to achieve a common city vision across multiple sectors (e.g. energy, transport, water, housing, and the environment). Questions arise: how can city professionals – who generally have different professional backgrounds and expertise – communicate between them and with other societal groups to frame and describe AI-enabled public services? How can they define and describe the ‘public value’ they want to create and what exactly does the concept encompass? Do they need a common language among city planners (policymakers, smart city managers, diversity experts) and technology implementers (data scientists, machine learning engineers, IT professionals) to describe different stakeholders’ concerns like residents’ data privacy, public service reliability, societal risks, etc? How can they architect the transformation of public services with social and ethical coherence?

In the original edition, IEEE 1471:2000<sup>4</sup>, the definition of architecture was: “The fundamental organization of a system embodied in its components, their relationships to each other, and to the environment, and the principles guiding its design and evolution”. While various AI system architectures exist, the application of AI in complex urban settings demands a shift from conventional ‘software-centric’ perspectives. We necessitate socio-technical architectures for AI, enabling city professionals and managers to represent and describe their concerns regarding the transformation of public services. These architectures not only foster a shared understanding of AI systems among relevant stakeholders but also that the development of processes that support the assessment and mitigation of potential harms can be implemented.

My exploration into the implementation of AI systems in urban settings<sup>5</sup> seeks to unveil key socio-technical concepts. I argue that such socio-technical concepts must be considered and aligned to architect the responsible transformation and enhancement of public services through AI. These

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<sup>1</sup> What are the practical, legal and ethical implications of artificial intelligence (AI) and how can regulation help meet these challenges? <https://www.chathamhouse.org/2022/03/challenges-ai>

<sup>2</sup> <https://theconversation.com/sidewalk-torontos-master-plan-raises-urgent-concerns-about-data-and-privacy-121025>

<sup>3</sup> The AIAAIC Repository (standing for ‘AI, Algorithmic, and Automation Incidents and Controversies’), <https://www.aiaaic.org/home>

<sup>4</sup> <http://www.iso-architecture.org/ieee-1471/defining-architecture.html>

<sup>5</sup> <https://unhabitat.org/ai-cities-risks-applications-and-governance>

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concepts can empower city professionals to tackle the complex landscape of AI-enabled public services while addressing potential risks and mitigating societal harms.

#### The Public Value Concept

At the heart of reshaping public services with AI lies the profound concept of public value, an intricate multidimensional construct that delineates the contributions of public, private and civil society sectors to solve societal problems<sup>6</sup>. Public value becomes crucial when architecting a responsible transformation of public services through the integration of AI. This concept serves as the foundation for addressing the fundamental questions of why AI is necessary to enhance public services and what value it brings realistically to people and the environment.

Three key dimensions underpin public value: the utilization of public services as vehicles for delivering public value, the pursuit of social outcomes as high-level aspirations, and the establishment of trust, legitimacy, and confidence in government<sup>7</sup>. This paradigm proves instrumental in understanding government activity, shaping policy-making, and architecting service delivery. However, my own research and teaching experiences have taught me that the biggest challenge for city managers and professionals is defining public value in the digital age, especially with the complexities introduced by AI.

The adoption of a public value perspective necessitates a collaborative approach among city managers, aligning efforts to respond to citizens' needs and collective preferences while achieving multiple and sometimes conflicting goals. It implies moving away from the perception that social actors (e.g., citizens, residents, visitors) are merely the final users of public services. Instead, public value is about connecting with people's needs and aligning with city goals, such as achieving the Sustainable Development Goals (SDGs)<sup>8</sup>. The SDGs emphasize the need for integrated AI approaches across sectors and stakeholders<sup>9</sup>. This serves as a compass for city professionals, guiding them through the complex interplay of technology, public aspirations, and societal well-being, thereby laying the foundation for the responsible integration of AI into public services.

#### The Human Rights Concept

Another key element for creating trustworthy public services with AI is the crucial socio-technical concept of human rights. In the complex interaction between societal values and technological progress, human rights act as the guiding principle. They not only ensure the ethical use of AI but also align transformation processes with a people-centred approach.

Human rights, as a socio-technical concept, functions as the ground for fostering inclusive and equitable public service transformation. Placing people at the forefront of innovation encapsulates the essence of a society where technological advancements actively contribute to the realisation of fundamental human rights. Whether it be the right to privacy, non-discrimination, or access to information, human rights establish the framework for shaping public services that serve the diverse needs of all citizens. Thus, it becomes imperative to adhere to human rights principles to prevent exclusion and negative impacts on individuals and communities<sup>10</sup>. By basing the use of AI on human rights principles, public servants can ensure that the advantages of digital transformation are not

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<sup>6</sup> [https://www.ucl.ac.uk/bartlett/public-purpose/sites/public-purpose/files/public\\_value\\_final\\_30\\_may\\_2019\\_web\\_0.pdf](https://www.ucl.ac.uk/bartlett/public-purpose/sites/public-purpose/files/public_value_final_30_may_2019_web_0.pdf)

<sup>7</sup> <https://www.oecd-ilibrary.org/sites/1ab27217-en/index.html?itemId=/content/component/1ab27217-en>

<sup>8</sup> <https://sdgs.un.org/goals>

<sup>9</sup> On Artificial Intelligence Strategies, [https://sdgs.un.org/sites/default/files/2021-06/Resource%20Guide%20on%20AI%20Strategies\\_June%202021.pdf](https://sdgs.un.org/sites/default/files/2021-06/Resource%20Guide%20on%20AI%20Strategies_June%202021.pdf)

<sup>10</sup> <https://unhabitat.org/ai-cities-risks-applications-and-governance>

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only widespread but also ‘fairly’ shared. This perspective demands a conscientious approach to technology, emphasizing accountability and transparency to avoid leaving anyone behind. Consider, for instance, the design and deployment of AI-driven public services that involve diverse populations. The commitment to human rights ensures that these technological solutions are not only efficient but also ‘sensitive’ to the diverse needs, backgrounds, and vulnerabilities of individuals. The incorporation of human rights when designing and deploying AI can serve as a practical guide to assist city managers and AI developers in enhancing public services<sup>11</sup>.

#### The Regulation Concept

In shaping responsible public services with AI, regulations are fundamental considerations. The orchestration of AI in public services needs a well-defined framework of legislations and regulations, steering the design process to ensure ethical, accountable, and socially aware deployment.

Regulations and policies, as demonstrated by frameworks like the EU AI Act<sup>12</sup>, act as the boundaries that guide the path of AI-driven systems. These frameworks not only delineate the permissible boundaries for AI applications but also set the stage for a design process that aligns with societal values and norms. The EU AI Act presents a comprehensive regulatory framework that addresses the ethical and legal implications of AI, emphasizing the need for transparency, accountability, and risk assessment. It outlines responsibilities for both providers and users based on the risk level associated with artificial intelligence. Although some AI systems may present minimal risk, they still require evaluation<sup>13</sup>.

However, the importance of regulations transcends mere compliance; it extends to the holistic assessment of AI systems. Success in the realm of AI is not solely determined by technical specifications; rather, it relies on a comprehensive understanding that encompasses social, political, and contextual dimensions. Risk assessment and management thus becomes an important effort, acknowledging that the impact of AI systems extends beyond the technical world. For instance, an AI system employed in public services must undergo scrutiny not only for its technical efficiency but also for its potential social consequences, ensuring that it adheres to ethical standards and societal values.

AI regulations and legal mandates stand as pillars to encourage a balanced relationship between technical efficiency and societal well-being. Public servants and developers are required to design and deploy AI-enabled public services that are safe and are developed and used in compliance with fundamental rights obligations.

#### The Ethics and Responsible Innovation Concept

Ethics and responsible innovation serve as pivotal socio-technical concepts in shaping the responsible transformation of public services enabled by AI. Responsible innovation extends beyond merely anticipating unintended consequences; it necessitates reflection on both intended and unintended outcomes<sup>14</sup>. A critical examination of human-centred, ethical, and responsible AI design toolkits<sup>15</sup> reveals the inherent assumptions guiding their development. These toolkits, like any tools, encode specific perspectives on the tasks and methodologies involved in AI development<sup>16</sup>. How can

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<sup>11</sup> <https://www.ohchr.org/en/statements/2023/07/artificial-intelligence-must-be-grounded-human-rights-says-high-commissioner>

<sup>12</sup> Artificial intelligence act: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELLAR:e0649735-a372-11eb-9585-01aa75ed71a1>

<sup>13</sup> <https://www.europarl.europa.eu/news/en/headlines/society/20230601STO93804/eu-ai-act-first-regulation-on-artificial-intelligence>

<sup>14</sup> <https://www.ucl.ac.uk/responsible-innovation/what-responsible-innovation>

<sup>15</sup> Catalogue of Tools & Metrics for Trustworthy AI: <https://oecd.ai/en/catalogue/tools?page=1>

<sup>16</sup> Seeing Like a Toolkit: How Toolkits Envision the Work of AI Ethics: <https://dl.acm.org/doi/abs/10.1145/3579621>

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civil servants make their way through the growing array of ethical frameworks? Should they architect the transformation of public services based on these tools, or incorporate what works for specific urban problems and contexts?

Efforts to adhere to high-level AI ethics guidelines can be enhanced through the integration of socio-technical architectures. Such architectures offer a pathway to move beyond abstract ethical guidelines and principles and delve into the detailed design of socio-technical aspects inherent in AI systems. Current tools and approaches, while assisting in designing solutions, often operate in isolation. The need for integrated AI systems calls for the development of socio-technical architectures that unify the disparate elements of AI design. By leveraging these architectures, stakeholders can orchestrate holistic and ethically sound AI systems that transcend the boundaries of mere software. For instance, consider a scenario where a city municipality is implementing an AI-based system to optimize public transportation routes. An ethics-centred approach would involve ensuring that the system prioritizes inclusivity, considering the diverse needs of citizens, including those with mobility challenges. Responsible innovation would go beyond avoiding unintended consequences to proactively designing the system to enhance accessibility, contributing to social equity.

Considering ethics and responsible innovation is fundamental for a sustained approach to deploying AI responsibly. This can ensure that ethical considerations are integrated into the AI systems designed for the improvement of public services.

### The Public Servants Competencies Concept

In the dynamic landscape of urban digital innovation, the concept of competencies (i.e. knowledge and skills) of public servants emerges as a much-needed socio-technical element<sup>17</sup>. Deploying AI in cities goes beyond a mere outcome; it requires strong leadership that governs such digital technologies through ethics and responsible innovation. Empowering public servants becomes a critical aspect of creating public value and mitigating potential social harms like inequality, exclusion, and marginalization.

City managers and public servants often struggle with substantial challenges in steering digital innovation toward achieving desired social benefits, ranging from affordable housing to environmental sustainability. UK public servants have expressed both enthusiasm and concern regarding the utilization of (generative) AI in government<sup>18</sup>. The reshaping of competencies for civil servants and city professionals is essential in navigating AI deployment in urban landscapes. Technology developers may lack a comprehensive understanding of the impact of their technical solutions. Empowering city servants, managers, and planners with the capability to wield these technologies effectively becomes a cornerstone for successful and socially impactful urban digital innovations. This transformative shift ensures that the human-centric aspects of technology adoption are prioritized, aligning with the broader goals of enhancing public services and addressing the multifaceted challenges faced by modern cities.

In addition to achieving (urban) data interoperability, we need to understand and design urban systems that help to achieve ‘interoperability between people’. We need to have a culture whereby city professionals and managers work together, which requires organisations to build trust around shared understanding as well as shared – and sometimes conflicting – goals. Equipping city managers

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<sup>17</sup> Artificial Intelligence and Digital Transformation Competencies for Civil Servants: <https://unesdoc.unesco.org/ark:/48223/pf0000383325>

<sup>18</sup> <https://www.globalgovernmentforum.com/uk-public-servants-share-both-excitement-and-trepidation-about-using-ai-in-government/>

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and city professionals with the right competencies is imperative to successfully lead public service innovation enabled by AI.

### The Public Sector Capabilities Concept

The importance of public sector capabilities as socio-technical concepts lies in their critical role in implementing and sustaining responsible public services enabled by AI. Recent instances, like the Post Office Horizon scandal, highlight the consequences of inadequate (outsourcing) capabilities in handling complex systems<sup>19</sup>. This scandal serves as a valuable lesson about data and AI regulation<sup>20</sup>. Additionally, concerns have been raised by public servants regarding the support required by local government to enable the deployment of Large Language Models (LLMs), addressing the significant capacity challenges faced by councils for more efficient public service delivery<sup>21</sup>.

These capabilities encompass various dimensions crucial for the successful integration of AI systems into local governance structures. Firstly, proficiency in data input becomes foundational, ensuring that the AI system receives accurate, relevant, and representative data. Local authorities must possess the capabilities to curate, manage, and validate the data that feeds into the system, thereby influencing the quality and reliability of AI-driven insights. Secondly, capacity in algorithm design is essential for developing AI systems that align with the goals and values of local governance. Local authorities need the capability to tailor algorithms to address specific community needs, avoid biases, and enhance the transparency of decision-making processes. Thirdly, the focus on intended outcomes necessitates a deep understanding of the socio-technical implications of AI interventions. Local authorities must have the capabilities to define public value and assess the desired outcomes, ensuring that AI systems contribute positively to the well-being of the community. Lastly, a robust cybersecurity framework<sup>22</sup> is integral to safeguarding AI systems and the sensitive data they handle. Local authorities need the capabilities to implement and maintain cybersecurity measures, protecting against potential threats and ensuring the responsible use of AI technologies.

Essentially, the success of AI in public services relies on the capabilities of the public sector (often involving suppliers' capacity). This empowers local governance to use AI effectively, manage risks, and promote a culture of responsibility and accountability.

### Conclusion

The challenges faced in the deployment of AI to improve public services are complex and multidisciplinary. Conceptualising and designing urban interventions from a socio-technical perspective requires city leaders to harness AI responsibly while delivering social benefits. A socio-technical architectural perspective offers a framework for managing city complexity and designing digital solutions aligned with citizens' needs. As introduced earlier, systems architectures not only outline system components but also define their relationships. I contend that identifying these components within the socio-technical concepts introduced is challenging but essential. Hence, a structured socio-technical architectural approach becomes crucial in establishing alignment between these diverse concepts. This alignment acts as a bridge, establishing a robust connection between urban planners and AI developers, and facilitating collaboration and understanding of the relationships between social and technological requirements. By doing so, it not only enhances leadership capacity within local authorities and the private sector but also prioritizes public value

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<sup>19</sup> <https://theconversation.com/post-office-horizon-scandal-four-reasons-why-the-governments-model-for-outsourcing-is-broken-220919>

<sup>20</sup> <https://connectedbydata.org/blog/2024/01/17/post-office-lessons>

<sup>21</sup> Large Language Models: LGA, Socitm and Solace joint response to the Communication and Digital Committee inquiry - September 2023: <https://www.local.gov.uk/our-support/cyber-digital-and-technology/cyber-digital-and-technology-policy-team/llm>

<sup>22</sup> <https://www.ncsc.gov.uk/report/impact-of-ai-on-cyber-threat>

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creation at the core of efforts aimed at improving public services. This socio-technical architectural approach can ensure a comprehensive guideline for driving positive outcomes for communities and urban environments.