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Skilling Up for Tomorrow's Cities: The Workforce of Smart Cities

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Abstract

The paper explores the emerging occupational profiles and key technological areas that will shape the workforce of the future in smart cities. The paper discusses the importance of transversal skills, core competencies, and specialized knowledge required to succeed in this dynamic environment. It identifies the five categories of occupational profiles: Management Occupational Profiles, Technological Occupational Profiles, Smart City Occupational Profiles and Green Occupational Profiles. Each category plays a vital role in ensuring the holistic development of smart, green, and resilient cities, addressing the multifaceted requirements of contemporary urban spaces. The key findings, considerations, and future directions of the paper emphasize the need for continuous learning, adaptation, and a diverse skillset to address the challenges of smart city development. The research methodology is based on a selective literature review of existing job profiles.

Introduction

The world is rapidly urbanizing, with an estimated 68% of the global population projected to live in urban areas by 2050. This unprecedented urbanization, occurring in a VUCA (Volatile, Uncertain, Complex, and Ambiguous) environment, poses significant challenges for cities. These challenges include resource scarcity, environmental degradation, and social inequality, all exacerbated by the volatility and unpredictability of the modern world. To address these challenges in such a VUCA context, cities are turning to smart city solutions. These solutions leverage advanced technologies and data analytics to optimize resource management, improve urban efficiency, and enhance quality of life, even in the face of rapid changes and uncertainties.

However, the transformation of traditional cities into smart cities, especially in the context of the European Green Deal (EGD) and the challenges posed by climate change, requires a skilled and specialized workforce. This transformation is not just a technological shift but a fundamental change in how cities operate in a VUCA (Volatile, Uncertain, Complex, and Ambiguous) world. New occupations are emerging to meet the unique demands of smart cities, such as specialists in renewable energy, sustainable waste management, and green infrastructure. These roles are crucial for addressing the

frequent disruptive weather events, water scarcity, flooding, and the need for sustainable urban development.

Traditional job roles are also being augmented with new skills and knowledge, particularly in green and digital transitions. The twin challenges of environmental sustainability and digital transformation require a workforce that is not only technically proficient but also adaptable and capable of continuous learning. This paper explores the emerging occupational profiles in this context, focusing on key technological areas like advanced data analytics, Internet of Things (IoT) implementations, and sustainable resource management that will shape the workforce of the future in smart cities.

Vocational Education and Training (VET), along with collaboration among governments, employers, universities, and local communities, is vital in this transition. Cities, as hubs of innovation and policy implementation, play a strategic role in developing and steering local actions towards meeting green commitments and targets. The workforce in smart cities must be equipped to handle the complexities of urban environments, which include not only technological advancements but also the social and environmental responsibilities of the green transition.

In summary, this paper delves into the multifaceted nature of workforce development in the era of smart cities, highlighting the interconnectedness of environmental, technological, and social factors in shaping future jobs and skills.
We begin with a review of existing literature and scholarly work on smart cities. This review provides an in-depth overview of the concepts, challenges, and advancements in the field of smart cities. We then delve into the main occupations and job profiles that will be crucial to the functioning and advancement of smart cities. We examine the specific skills, knowledge, and expertise required for these occupations, highlighting their relevance to the unique challenges and objectives of smart city initiatives.

Finally, we conclude by summarizing the key findings and implications for policymakers, city planners, and individuals seeking to pursue careers in smart cities. We emphasize the importance of adapting educational and training programs to meet the evolving needs of smart cities and highlight the significance of continuous learning and upskilling in this rapidly changing landscape.

By examining the occupational profiles and key technological areas of tomorrow's smart cities, this paper aims to contribute to a better understanding of the evolving workforce requirements and the critical areas of knowledge and expertise that will shape the cities of the future.

Background

The rise of smart cities has fundamentally transformed the urban landscape, presenting a unique opportunity to address the pressing challenges of sustainability, resilience, and citizen well-being. Smart cities, characterized by their integration of advanced technologies, data-driven decision-making, and citizen engagement, hold the potential to create more efficient, equitable, and sustainable urban environments (Bibri, 2021).

As P. Fitsilis (2021) has highlighted “Although for several years we were working on the development of this new smart ecosystem, quite recently we discovered that the people factor was not considered, sufficiently. We realized that even

though billions were invested in technological or urban development, not sufficient effort has been spent in training the necessary workforce with the skills to fulfil this vision. Development of a smart city was considered “business as usual” by the IT vendors, or even yet another case of modern technology deployment. However, this is far from true as smart cities transvers every aspect of our lives and our activities”.

Therefore, the realization of this vision hinges on the development of a skilled and knowledgeable workforce capable of navigating the complexities of smart city ecosystems. These professionals, equipped with a range of transversal skills and specialized competencies, play a pivotal role in shaping the future of urban governance (Fitsilis, 2022).

Transversal Skills: The Cornerstone of Smart City Success

At the heart of smart city success lies a set of transversal skills, encompassing digital literacy, stakeholder engagement, and collaborative governance. Digital literacy is paramount, ensuring that all city residents and professionals possess the proficiency to utilize and manage the ever-evolving technological landscape. This includes the ability to access, analyze, and interpret data, as well as to develop and implement digital solutions for enhancing urban services and infrastructure (Fitsilis & Kokkinaki, 2021).

Expanding on stakeholder engagement, it is not merely about involving citizens, businesses, and policymakers, but also about creating a shared vision for the smart city. This approach demands active and inclusive participation, enabling diverse voices to be heard and integrated into the decision-making process. It bridges the gap between technology and its users, ensuring that the solutions developed are not only technologically advanced but also socially relevant and accepted. Such a participatory model of governance transcends traditional methods, leading to outcomes that are not only effective but also equitable and sustainable. By fostering a culture of open dialogue, smart cities can effectively address complex urban challenges, harnessing the collective expertise and creativity of all stakeholders (Szulc-Wałecka 2022).

Core Competencies: Shaping the Operational Landscape of Smart Cities

A skilled workforce is the backbone of effective smart city operations. Urban planners and smart infrastructure developers play a critical role in integrating intelligent technologies into urban planning strategies, optimizing resource utilization, and enhancing the livability of urban environments. They are responsible for designing and implementing smart solutions for transportation, energy, water management, and waste management, ensuring that cities operate efficiently and sustainably (Fitsilis& Kokkinaki, 2021).

Data analysts and information managers are at the forefront of extracting meaningful insights from the vast amount of data generated by smart city infrastructure. They analyze real-time data streams, identify patterns, and develop predictive analytics to inform decision-making, optimize service delivery, and improve public safety. Their expertise is crucial for understanding the impact of smart city initiatives and ensuring that they are contributing to the overall goals of the city.

Resilience Management: Enabling Smart Cities to Thrive in a VUCA World

Resilience is an essential characteristic of smart cities, enabling them to withstand and recover from various disruptions, including natural disasters, cyber-attacks, and pandemics. Emergency preparedness and disaster management professionals possess the expertise to assess risks, implement effective response protocols, and coordinate resource allocation during emergencies. They ensure that cities are prepared to mitigate the impact of disasters and minimize disruptions to essential services (Cowell, & Cousins, 2022).

Adaptive planning and community resilience specialists focus on building and maintaining community resilience, fostering social connections, and empowering residents to actively participate in disaster preparedness and recovery efforts. They promote initiatives that enhance community cohesion, foster social support networks, and equip residents with the skills and knowledge to respond effectively to crises (Lawrence, 2013).

Green and Technology Competencies: Shaping Sustainable and Technologically Advanced Urban Landscapes

The green transition is essential for smart cities aiming to develop sustainable, eco-friendly urban spaces. They adopt clean energy, resource efficiency, and circular economy concepts to lower carbon emissions and lessen climate change effects, fostering long-term environmental health. This shift includes using renewable energy, energy-saving technologies, and sustainable methods in transportation, waste management, and city planning. Prioritizing this transition, smart cities not only align with global climate objectives but also boost residents' quality of life with better air quality, lower noise pollution, and healthier surroundings (European Commission, 2020).

Sustainability is therefore a cornerstone of smart cities, with professionals dedicated to promoting sustainable living practices and environmental stewardship. This includes expertise in green infrastructure, renewable energy sources, and sustainable urban development practices. These professionals design and implement solutions that reduce the environmental footprint of cities, promote energy efficiency, and conserve natural resources (Pilipczuk, 2020).

Innovation in green technology is essential, requiring competencies in developing and implementing cutting-edge technologies that minimize environmental impact and promote resource conservation. This includes expertise in renewable energy technologies, smart grids, and sustainable urban transportation systems. These professionals drive the development of innovative solutions that contribute to the environmental sustainability of cities.

Climate change mitigation and adaptation specialists are at the forefront of addressing the pressing challenges posed by climate change, developing strategies to reduce greenhouse gas emissions and build resilient communities that can adapt to the impacts of climate change. They assess the vulnerability of cities to climate change risks, develop mitigation plans to reduce greenhouse gas emissions, and implement adaptation measures to protect infrastructure and populations from the effects of climate change.

To cultivate a skilled and knowledgeable workforce capable of navigating the complexities of smart city ecosystems, educational institutions must adapt their curricula to incorporate the transversal skills, core competencies, and specialized knowledge required to succeed in this dynamic environment. This includes providing digital literacy training, fostering a

culture of civic engagement, and equipping students with the skills to analyze large datasets, manage complex systems, and develop innovative solutions to urban challenges

Research methodology

This research, rooted in the authors' direct involvement in smart city projects like SmartDevOps, CRISIS, and OpenDCO, started with compiling job profiles from these initiatives. These projects, over the past five years, have been central in shaping the study's direction, focusing on developing innovative job profiles and curricula for smart cities. For example, SmartDevOps was key in defining roles within smart city technology, CRISIS offered insights into competencies for smart city resilience, and OpenDCO explored smart cities open data job profiles.

The groundwork from these projects provided a practical and theoretical base for understanding essential roles in smart urban ecosystems. The full list of these projects is presented in Annex A. The study then broadened to include emerging trends and technologies, transitioning from hands-on observations to structured academic inquiry.

A selective, narrative literature review was conducted, focusing on the pre-established list of job profiles. This review method, preferred over a full-scale review due to the vast scope of smart city occupations, enabled an in-depth exploration of specific roles within the broader field. This narrative approach involved analyzing each profile through existing academic and industry literature, case studies, and policy documents, creating a comprehensive view that connects theoretical concepts with practical applications (Baumeister & Leary, 1997)..

This methodology aligns with narrative review practices common in interdisciplinary studies, follows grounded theory principles (Charmaz, 2006) where data-driven theories are developed, and uses an iterative process suitable for the evolving nature of smart cities. It allows themes to emerge organically from the literature, ensuring a holistic understanding of the dynamic field of smart city development.

Emerging occupation profiles for future urban development

In the rapidly changing world of urban planning, the concept of a smart, green, and resilient city has emerged as a crucial paradigm. As cities worldwide seek to enhance their sustainability, technological advancement, and adaptability to various challenges, the demand for a comprehensive approach to urban planning and management grows increasingly evident. This approach not only involves integrating digital technologies and environmental initiatives but also necessitates the development of resilience strategies to withstand environmental, social, and economic disruptions.

Building upon the Giffinger model (Giffinger & Gudrun, 2010), which distinguishes the key areas of a smart city: economy, mobility, environment, people, living, and governance, this research seeks to classify the diverse occupational profiles essential for constructing and maintaining these multifaceted urban environments. These profiles are categorized into four distinct groups:

1. Management Occupational Profiles: Roles that encompass strategic planning, innovation, and overall coordination of smart city initiatives.
2. Technological Occupational Profiles: Specialized positions focused on the implementation and management of technological solutions within urban settings.
3. Smart City Occupational Profiles: Positions dedicated to developing the smart cities.
4. Green Occupational Profiles: Professions centered on environmental sustainability, promoting green infrastructure and practices.

Each of these categories plays a vital role in ensuring the holistic development of smart, green, and resilient cities, addressing the multifaceted requirements of contemporary urban spaces.

Management Occupational Profiles

At the forefront of smart city development stand individuals with expertise in strategic planning, innovation, and overall coordination of smart city initiatives. These management occupational profiles play a pivotal role in shaping the future of urban environments. According to Coursera skills report "Seven out of ten of the top fastest-growing skills overall are business skills in 2023 (Coursera, 2023).

- **Chief Innovation Officer.** The Chief Innovation Officer serves as the driving force behind innovation in a municipality, utilizing digital technologies and data-driven decision-making to transform urban governance. They develop comprehensive innovation strategies, oversee the integration of cutting-edge technologies, and manage digital transformation projects that enhance efficiency, optimize resource utilization, and improve citizen services.
- **Smart City Resilience Officer.** Providing a strategic vision for enhancing city resilience, the Smart City Resilience Officer plays a crucial role in building a city's capacity to withstand various challenges, including natural disasters, cyber threats, and social disruptions. Their expertise lies in risk assessment, emergency planning, community engagement, and capacity building initiatives that safeguard the city's infrastructure, economy, and social fabric.
- **Civic Technologist.** Championing digital inclusion and public engagement, the Civic Technologist designs, implements, and manages civic technology solutions that foster enhanced citizen participation and service delivery. Their proficiency in ICT consulting, digital equity, and project management ensures that technological advancements align with the needs of the community, promoting inclusivity and accessibility.
- **Multi-cultural Facilitator.** Integrating diverse perspectives and promoting cross-cultural understanding, the Multi-cultural Facilitator plays a critical role in fostering a harmonious and inclusive urban environment. Their expertise in cultural policy management, communication, diversity awareness, and community outreach enables them to bridge cultural divides, fostering social cohesion and celebrating the city's unique multicultural tapestry.

These management occupational profiles represent a microcosm of the diverse expertise required to navigate the complexities of smart city development. Their contributions are essential in shaping cities that are not only technologically advanced but also resilient, inclusive, and responsive to the multifaceted needs of their citizens.

Technical Occupational Profiles

Driving the technological advancements at the heart of smart cities are individuals with specialized skills in developing, implementing, and managing cutting-edge solutions. These technical occupational profiles are essential in transforming urban landscapes into interconnected, data-driven ecosystems, underpinned by several technological pillars:

1. Internet of Things (IoT): Smart cities rely heavily on IoT devices for real-time data collection and management of various city functions like traffic control, waste management, and environmental monitoring.
2. Big Data and Analytics: The massive amounts of data generated by IoT devices and other sources are analyzed to improve decision-making, optimize resource allocation, and enhance public services.
3. Cloud Computing: Cloud platforms provide the necessary infrastructure for data storage, processing, and sharing, facilitating the integration and scalability of smart city solutions.
4. Artificial Intelligence (AI) and Machine Learning (ML): AI and ML are used for predictive analytics, enhancing efficiency in areas like traffic flow management, energy use, and public safety.
5. Cybersecurity: As cities become more connected, the importance of robust cybersecurity measures to protect data and infrastructure from cyber threats increases.
6. Sustainable Technologies: Technologies promoting sustainability, such as renewable energy systems and green buildings, are integral to the development of smart cities.

In this rapidly evolving digital environment, organizations need employees capable of identifying digital transformation opportunities, leveraging emerging technologies, and adapting or reshaping production, service, and customer processes. A digitally skilled workforce is critical for organizations, supporting their capacity to innovate and stay competitive.

However, Europe faces a significant skills gap, with 70% of EU companies reporting a lack of adequate digital skills as an obstacle to investment (European Commission, 2021). Addressing this gap is crucial for increasing the competitiveness of organizations and the employability of people while promoting digital inclusion. The EU aims to increase the number of IT professionals from 9 to 20 million to ease labor shortages. In 2022, 4.5% of EU companies reported difficulties in recruiting IT specialists, a challenge particularly visible in countries like Denmark, Germany, Luxembourg, the Netherlands, and Austria. This shortage is most acute in sectors like computer programming, consultancy, information service activities, pharmaceuticals, and scientific research and development, where a significant percentage of companies struggle to fill IT-related vacancies (CEDEFOP, 2023a).

The need for skilled IT professionals in smart cities is not just about filling current vacancies but about fostering a future-ready workforce capable of driving the digital transformation essential for the development of smart, sustainable urban environments.

Driving the technological advancements at the heart of smart cities are individuals with specialized skills in developing, implementing, and managing cutting-edge solutions. These technical occupational profiles is expected to play a crucial role in transforming urban landscapes into interconnected, data-driven ecosystems.

- **Smart City Data Analyst.** The Smart City Data Analyst serves as a data maestro, collecting, analyzing, and interpreting vast amounts of urban data to inform policy decisions and optimize city operations. Their expertise lies in data collection, analysis, and visualization techniques, enabling them to derive meaningful insights from complex data sets.
- **AI & Machine Learning Scientist.** The AI & Machine Learning Scientist harnesses the power of artificial intelligence and machine learning to revolutionize urban systems. They develop AI models to analyze data, optimize traffic flow, predict energy consumption, and enhance public safety. Their expertise spans AI development, data science, and IoT integration, enabling them to create intelligent solutions that address the challenges of modern cities.
- **Digital Twin Expert.** The Digital Twin Expert orchestrates the creation of a virtual representation of the city, integrating data from various sources to provide real-time insights into urban operations. They manage the integration of multi-source data, develop system models, and implement real-time analytics to optimize city functions and inform decision-making.
- **Cybersecurity Manager.** The Cybersecurity Manager safeguards the city's digital infrastructure from evolving cyber threats. Their expertise lies in cybersecurity planning, network monitoring, and threat mitigation strategies, ensuring the protection of critical data and systems. They are the guardians of the city's digital realm, preventing cyberattacks and maintaining data integrity.
- **Augmented Reality Designer/Developer.** The Augmented Reality Designer/Developer creates immersive augmented reality experiences that enhance urban applications, such as tourism and education. Their expertise in AR content design, application development, and user experience optimization transforms urban spaces into interactive and engaging environments.
- **Smart Grid Engineer.** The Smart Grid Engineer designs and maintains the infrastructure that powers smart cities. Their expertise in energy system design, infrastructure maintenance, and system optimization ensures the efficient distribution of energy while minimizing environmental impact. They are the architects of sustainable urban energy systems.
- **Autonomous Vehicle Operator/Technician.** The Autonomous Vehicle Operator/Technician monitors, controls, and maintains autonomous vehicles, ensuring their safe and efficient operation. Their expertise in vehicle operation, system troubleshooting, and maintenance is essential for the integration of autonomous vehicles into urban transportation networks.
- **Digital Health Coach.** The Digital Health Coach empowers individuals to manage their health using digital tools and platforms. Their expertise in health coaching, digital tool utilization, and patient education equips them to guide individuals towards a healthier lifestyle. They bridge the gap between technology and healthcare, promoting personalized and accessible health management.

These technical occupational profiles represent the core of smart city development, driving innovation and shaping the future of urban living. Their contributions are invaluable in creating cities that are data-driven, resilient, and seamlessly integrated with advanced technologies.

Smart City-Related Occupational Profiles

At the forefront of smart city development are individuals with expertise in designing, implementing, and managing smart city initiatives that transform urban landscapes. These smart city-related occupational profiles play a pivotal role in shaping the future of urban environments. Further extending this, the document emphasizes that emerging skill needs in municipalities aiming to become smart and green relate to establishing and using a Smart and Green City (SGC) approach. This involves designing, developing, and constructing infrastructure for smart and green solutions; managing this infrastructure; delivering services in an urban setting; monitoring, evaluation, and maintaining citizen engagement and participation. The range of skills required is broad, and significant changes in the roles of city managers and urban planners are expected (CEDEFOP, 2022).

- **Smart City Planner.** The Smart City Planner serves as a visionary leader, conceptualizing and executing smart city projects to enhance urban livability. They develop strategies for smart transportation, public communication infrustructure, and other digital initiatives, overseeing their implementation and ensuring seamless integration with existing infrastructure. Their expertise spans urban planning, digital integration, and project management, enabling them to create a cohesive and innovative urban ecosystem.
- **Urban Mobility Manager.** The Urban Mobility Manager optimizes urban transportation systems, ensuring efficient and sustainable movement of people and goods. They develop strategies for bike-sharing, intelligent transportation systems, and other mobility solutions, coordinating efforts across various transport modes and managing real-time traffic congestion. Their expertise lies in mobility planning, traffic optimization, and stakeholder coordination, enabling them to address the complex challenges of urban mobility.
- **Urban Air Mobility Expert.** The Urban Air Mobility Expert pioneers the integration of urban drone technologies, paving the way for innovative delivery, maintenance, and monitoring services. They support the development of drone technology, oversee operational planning, and ensure safety and regulatory compliance. Their expertise encompasses drone operation, urban planning, and regulatory compliance, enabling them to safely integrate drone technologies into urban environments.
- **Municipal Broadband Manager.** The Municipal Broadband Manager spearheads the deployment of municipal broadband networks, expanding access to high-speed internet in unserved areas. They design and implement network infrastructure, manage project implementation, and engage with stakeholders to ensure seamless connectivity. Their expertise lies in telecommunications engineering, project management, and network deployment, enabling them to bridge the digital divide and foster a connected urban landscape.
- **Smart Building Manager.** The Smart Building Manager optimizes energy-efficient and technologically advanced buildings, integrating smart systems like lighting and HVAC. They manage building operations, optimize energy consumption, and ensure seamless integration of smart technologies. Their expertise encompasses building management, energy efficiency optimization, and system integration, enabling them to create sustainable and comfortable urban spaces.

These smart city-related occupational profiles represent a diverse range of skills and expertise that are essential for

shaping the future of urban environments. Their contributions are invaluable in creating cities that are connected, efficient, and sustainable, enhancing the lives of residents and fostering a thriving urban future.

Green City-Related Occupational Profiles

The skills gap in renewable energy professions directly impacts the development and management of smart sustainable cities. As these cities aim to integrate green technology and sustainable practices, the need for skilled professionals in renewable energy becomes increasingly crucial. This encompasses not only technical roles but also managerial and developmental aspects, where expertise in both technology and sustainable urban planning is required. Addressing this gap is essential for effectively implementing the vision of smart, sustainable cities, aligning with the goals of the EU Green Deal (CEDEFOP, 2023b).

- **Green Infrastructure Specialist.** The Green Infrastructure Specialist designs and implements green infrastructure projects, such as parks, green roofs, and rain gardens, to enhance urban sustainability and resilience. They utilize ecological design principles to promote biodiversity, improve air quality, and manage stormwater runoff. Their expertise lies in ecological design, project coordination, and stakeholder engagement, enabling them to create environmentally sound and livable urban spaces.
- **Circular Economy Manager.** The Circular Economy Manager develops strategies to promote the circular economy, a resource-efficient approach to economic development. They focus on minimizing waste, extending the life of products, and fostering a closed-loop system for resource utilization. Their expertise encompasses circular economy principles, sustainability, and strategic planning, enabling them to create a circular economy within cities.
- **Climate Change Specialist.** The Climate Change Specialist develops and implements strategies to mitigate and adapt to the impacts of climate change. They conduct climate impact assessments, develop adaptation plans, and promote renewable energy solutions. Their expertise lies in climate science, environmental policy, and strategic planning, enabling them to address the challenges posed by climate change.
- **Biodiversity Protection Professional.** The Biodiversity Protection Professional safeguards biodiversity, ensuring the health and diversity of plant and animal species in urban environments. They develop and implement policies to protect endangered species, promote habitat restoration, and raise public awareness of environmental issues. Their expertise encompasses environmental science, policy development, and stakeholder management, enabling them to protect the natural world within cities.
- **Local Energy Community Manager.** The Local Energy Community Manager supports the creation and management of renewable energy communities, fostering local ownership of renewable energy generation. They educate communities about renewable energy technologies, develop community-based energy plans, and manage renewable energy systems. Their expertise lies in renewable energy, community management, and technical and legal expertise, enabling them to empower communities to harness renewable energy sources.
- **Heat Managers** are crucial professionals who oversee the strategic management of temperature within urban environments. They monitor, analyze, and mitigate urban heat island effects, promote green spaces and smart cooling solutions, educate communities, and collaborate with experts to create resilient, livable, and sustainable cities.

These green city-related occupational profiles represent a diverse range of expertise that is essential for creating sustainable and resilient urban environments. Their contributions are invaluable in mitigating the environmental impact of cities, promoting resource conservation, and ensuring a healthy and thriving urban ecosystem for future generations.

Key Findings, Considerations, and Future Directions

The advent of smart cities has ignited a transformation in the urban workforce, birthing a dynamic ecosystem of diverse skills that seamlessly blend technological prowess with traditional management expertise. These new professions embody the intricate tapestry of smart cities, where social, financial, environmental, and technical aspects intertwine to form sophisticated urban ecosystems. Navigating this ever-evolving landscape demands continuous learning and adaptation, equipping professionals with the necessary skillset to address a vast array of challenges.

As smart cities evolve, so does the demand for a workforce that can bridge the gap between technological innovation and urban management. These professionals must possess a deep understanding of both domains, enabling them to harness the power of technology to address urban challenges while ensuring the harmonious integration of technological advancements into the fabric of the city.

This is a preliminary study that focuses on a limited set of job profiles and may not capture the full range of roles in smart cities. Predicting future job roles and skills is challenging due to technological advancements and socio-economic shifts. Soft skills and non-technical aspects are crucial for holistic smart city development.

Our future work includes expanding this research to include a wider array of job profiles and track their evolution over time. Investigate the role of soft skills, social sciences, and humanities in smart city development. Analyze the impact of government policies and regulatory frameworks on smart city workforces. Gather input from diverse stakeholders to understand their needs and perspectives. Develop and evaluate educational and training programs tailored to future smart city skills.

Annex A – List of background projects

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