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Faculty of Business Economics

Master of Management

Master's thesis

***Fostering Mission-Oriented Innovation and AI for Sustainable Cities and Communities:
Advancing Collaboration and Synergistic Progress towards the 2030 Agenda***

Stanley Gavino

Seyed Ebrahim Sobhani

Thesis presented in fulfillment of the requirements for the degree of Master of Management, specialization Strategy and Innovation Management

SUPERVISOR :

Prof. dr. Jean-Pierre SEGERS



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Executive Summary

1. Research Purpose

The continuous rise of urban populations around the world offers various issues for cities as they strive to meet the changing requirements of their citizens while also achieving sustainable development goals. To overcome these issues, the use of artificial intelligence (AI) in smart cities has emerged as a possible solution. AI has the ability to optimize urban services, reduce resource consumption, increase public safety, and improve inhabitants' general quality of life. The exponential expansion of population is one of the most significant difficulties that cities face. With cities housing more than half of the world's population and a projected 23% rise by 2050, metropolitan areas must deal with difficulties such as pollution, traffic congestion, security concerns, and strained infrastructure. These issues need the implementation of novel solutions, and AI has the potential to play a revolutionary role in addressing them.

In the context of smart cities, AI can give several benefits. It allows for the analysis of massive amounts of data collected from a variety of sources, including sensors, cameras, and digital platforms. This information can be utilized to improve urban services, transport systems, energy efficiency, and encourage sustainable urban design. Predictive analytics, machine learning, and data-driven decision-making are examples of AI-powered technologies that can dramatically improve the effectiveness and efficiency of municipal operations.

2. Research Methodology

The researchers did qualitative research in this study and created different interview sessions for 8 respondents. The interviews were semi-structured interviews to collect primary data, and the questions were divided into several clusters so that it helped to highlight the sub topic more for each section. The respondents differed from each other, including representatives from the private sector and educational institutions. These were arranged so that there could be multiple points of view and will enrich the perspectives of how things are going on based on their organizational background. Out of the total 8 interviews conducted, 6 of them lasted approximately 45 to 60 minutes each and were carried out online due to the geographical distance of the respondents from different cities and countries. The remaining 2 interviews were in the form of written responses, as the participants preferred to receive the questions and provide their viewpoints on the interview questions through documents.

3. Findings

After the researchers finished with the interview sessions, there are important findings that have been highlighted and discussed by the researchers. The findings emphasize the challenges and concerns associated with the use of AI in smart cities. Financial constraints are a key hurdle because adopting AI technologies demands considerable investments in infrastructure, data

management systems, and skilled human personnel. Cities aiming to fully use emerging technologies face challenges due to a lack of a professional staff fluent in AI. Furthermore, ethical concerns like privacy, algorithmic biases, and transparency in decision-making processes must be addressed in order to enable responsible and fair AI implementation. It is proven in the beginning that the collaboration and participation of each stakeholder, from Public, Private sectors and Educational institutions are very important and relate to one another.

The development of AI itself is still needed and still far from perfect since in some cases there are too many dependencies on the AI technology and resulting in misinformation and misconducted actions. This results negatively into the responses of the society and citizens which demand more improved technology and are not fully dependent on the technology. A lot of people also still are not open with the technology that is implemented in their cities. Proper communication and education evenly throughout the society is very crucial. People have the right to know and understand completely how this AI technology works and actually benefits them in their daily life. Besides that, the sole purpose of open communication to the citizens is that they must know how AI will not violate their privacy and it works ethically. It has been a major topic and an elephant in the room that privacy and ethical concerns often become the counter point from society. It can not be denied and avoided that indeed the whole process of AI technology will affect and be related with people's privacy. Thus the mitigation of these risks associated with the AI technology must be discussed and eventually shown to the citizen transparently.

Money and manpower are critical components in successful AI implementation, and they are inextricably linked and interdependent. Because of the importance of technological integration in cities, significant financial investment is required. Effective implementation requires competent financial management. Furthermore, post-implementation, continuing process reviews are required.

To avoid problems, urban growth is accelerating, demanding quicker and well-managed processes. This acceleration is heavily influenced by people's willingness to embrace change and technology. Adequate financial assistance is essential for this process to be sustained and catalyzed.

This study is being undertaken because the technological era has greatly accelerated and is becoming a casual trend that is happening all over the world, regardless of which area of it, and it is happening very quickly without even people realizing it. In keeping with this, the sustainable development goals established a few years ago are also in process and going forward near the deadline. The development of AI in many ways affecting human life is also going very fast and strong, and seems promising in assisting humans and to support their daily life. But like any kind of era, the change towards it is not always easy and needs a lot of things in order to support it and to make sure it is developed well and driven to the right direction to achieve the right goals.

4. Critical Considerations and Recommendations

This research highlights financial limitations and limited human resources as primary hurdles in integrating AI in smart cities, leading to significant implications for future research. To overcome these challenges, exploring alternative funding models, like public-private partnerships, crowdsourcing, and impact investments, can provide valuable insights for policymakers and city planners. Additionally, investigating social acceptance and trust in AI technologies within smart cities is crucial for successful integration. Grasping public perceptions and concerns, and employing communication strategies can foster acceptance. On the managerial front, actions can be taken to ensure effective AI implementation. Providing comprehensive AI education and information to citizens, regardless of city size, is vital to increase awareness and willingness to adopt technological advancements. Overcoming resistance, resolving ethics, and guaranteeing transparency are critical for AI integration success. Supporting the implementation process through financial resources and expertise can accelerate progress, while regular evaluation and monitoring of AI initiatives can gauge their cost-effectiveness. Sustained collaboration among public, private sectors, and educational institutions is pivotal. By embracing these insights, cities can effectively navigate challenges, promoting sustainable development and enhancing resident well-being. Hence, this research still has its own limitations and still has spaces to improve and to be conducted better. The variety of subjects and their background need to be broader and also analyzed from different countries with different conditions. For example, it is essential to have more subjects from countries that are still developing, because it always occurs that each country has its own characteristics, and conditions related to their economy, society and many other things that might affect the findings. More perspectives from the governmental side will also be nice to be taken into account since most of the time the government plays a big role as the policy makers.

A set of cohesive policy recommendations is vital to encourage collaborative innovation and achieve Sustainable Development Goals (SDGs) in smart cities. Enhancing Data Sharing and Accessibility Policy promotes informed decision-making through open data sharing. Implementing Ethical AI and Regulation Policy ensures responsible AI deployment. Formulating a robust Funding Policy supports AI integration and long-term goals. Enforcing a rigorous Monitoring and Evaluation Policy optimizes resource allocation. These policies collectively pave the way for collaborative innovation, ethical technology, and measurable progress towards SDGs, fostering prosperous communities.

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1. Problem Statement

With the growth of urban populations, cities are facing mounting pressures to satisfy their needs while simultaneously achieving sustainable development objectives. The utilization of artificial intelligence (AI) in smart cities presents a promising approach to address these challenges by optimizing urban services, diminishing resource consumption, and enhancing the quality of life for citizens. Nevertheless, successful AI implementation in smart cities necessitates a concerted effort that takes into account the distinct requirements of each city and the varied communities that reside within them. Therefore, as part of mission-oriented innovation, the challenge is to develop and execute AI-based solutions that are sustainable, inclusive, and effective in accomplishing the United Nations' Sustainable Development Goals at the city level.

As mentioned above, more than half of the world's population now lives in cities, with a 23% rise expected by 2050, potentially adding more than 2.5 billion people spread throughout cities and megacities (United Nations, 2018). Rapid urbanization caused major issues such as pollution, traffic, security and privacy concerns, and even crime. All of these factors drive huge demand for smart city technologies. As a result, cities will face more pressure to provide better quality services, increase efficiency and reduce associated costs, enhance productivity, and handle overcrowding and environmental challenges. All these pressures will encourage cities to become smart and to develop and implement numerous intelligent solutions to boost their competitiveness and accomplish sustainable development and growth. AI has revolutionary potential because it incorporates a system's ability to grasp external data, learn from it, and adapt that knowledge to fulfill specified goals and tasks (Kaplan et al., 2019).

Nowadays, AI has revolutionized people's lives in a lot of ways, starting from semi-autonomous cars on the road to robotic vacuum cleaners in houses, and it is likely that AI is projected to enter every part of the lives, from health care to education, entertainment or leisure activities, and security, for a while to come (Li et al., 2018). One of the major effects of AI and is important will be transportation. With the vast and rapid development of AI, there will be a huge role in its potential applications on infrastructure, vehicles, drivers, or transport users, which will integrate and provide a transportation service that encourages user engagement and especially supports human-machine interactions. There are various reasons why AI should be implemented into integrated road transportation management systems. One of them is that conventional traffic management and control technologies have shortcomings when confronted with critical traffic conditions and widespread congestion. This is a recurring problem in most European metropolitan and urban locations, and it is usually caused by a locally conceived study of traffic behavior, necessitating the development of more strategic, high-level control approaches (Miles et al., 2006). It is much expected that AI is capable of providing solutions for solving problems such as congestion, pollution, and environmental degradation together with telecommunication and energy application. As a result, smart cities can be formed and developed well.

Smart cities are technologically advanced metropolitan areas with highly linked individuals and organizations. They are systems with intelligent subsystems. All components work together to produce an integrated system that provides real-time access to high-quality services and goods in a long-term-growth economic and social environment. This strategy comprises utilizing information and communication technologies (ICTs) to stimulate economic growth and improve quality of life, as well as integrating all hardware and software technologies to improve urban administration (Voda et al., 2018). AI learns how people use the city through its application. The application of AI pattern recognition technology to manage huge amounts of raw data, such as mass transit ticket sales, police reports, traffic sensors, and weather stations, is common (Mathur et al., 2016).

Adaptive signal management technology based on real-time data obtained from many cameras and other companies that update their applications with the most up-to-date information on traffic conditions at various spots throughout the city can be used to adjust traffic lights. This can save travel time by more than 10% in major cities and by 50% in areas where signal timings are out of date. Many countries are employing this technology in order to reduce traffic congestion costs due to wasted fuel and productivity. In places such as San Diego, San Antonio, Bellevue, and Los Angeles, the benefits of this technology have been accepted, measured, and shown (Navarathna et al., 2018).

Another significant advantage of AI implementation in smart cities is the potential to improve public safety and security. With increasing population and urbanization, ensuring public safety has become a major concern for governments all over the world. Artificial intelligence (AI) technology can assist law enforcement agencies in identifying potential threats and analyzing patterns of criminal behavior, making cities safer for their citizens. For example, AI-powered video surveillance can detect unusual behavior, such as loitering, and notify authorities so that appropriate action can be taken. This technology can also be used to monitor traffic and detect accidents, allowing emergency responders to act quickly.

Furthermore, AI has the potential to significantly reduce energy consumption and carbon emissions in smart cities. Cities can substantially reduce their carbon footprint and mitigate the negative effects of climate change by optimizing their energy use. AI can assist in this by forecasting energy demand and supply, optimizing energy production and distribution, and regulating energy consumption. AI-powered traffic management systems, for example, can reduce traffic congestion, lowering fuel consumption and emissions. Similarly, by analyzing user behavior and regulating heating, ventilation, and air conditioning (HVAC) systems, AI can optimize energy usage in buildings, resulting in significant energy savings.

At last, the use of AI in smart cities can improve citizen engagement and participation in decision-making. Citizens can provide advice, report incidents, and interact with their local government via AI-powered communication channels. AI can also aid in the collection and analysis of citizen data, which can then be used to improve municipal services and policies. Cities can

ensure that their policies and initiatives are aligned with citizens' needs and preferences by involving citizens in decision-making.

At theoretical explanation, this research performs a detailed analysis of Mission-Oriented Innovation, Sustainable Development Goals, Artificial Intelligence, and also Smart Cities. This approach informs us about How Sustainable Development Goals as Mission Oriented Innovation are reached using AI and its implementation in Smart Cities. The dissertation is structured as follows. The next part is Literature Review, followed by Research Methodology and the Methodology used in this research as the third part and will be closed by the conclusion of the findings. This research will also do a comparative analysis between 2 cities in Europe, which are Barcelona and also Brussels. In doing so, the research will be conducted using qualitative analysis.

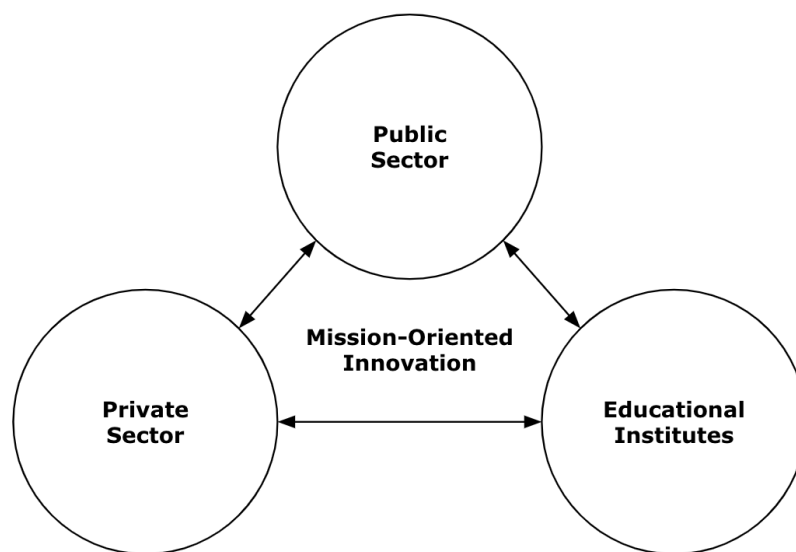


Figure 1: Triple helix model (Etzkowitz & Leydesdorff, 2000)

2. Literature Review

2.1. Introduction

Nowadays, research and innovation are expected to not only provide people with well-being but also to provide solutions to society's problems and challenges (Jütting, 2020). According to Mazzucato's research (Mazzucato, 2018), large challenges such as the United Nations' Sustainable Development Goals (SDGs) are transformed into tangible, attainable steps—so-called missions—that can be accomplished through research and innovation. Artificial intelligence is a rapidly evolving field with enormous potential to transform many aspects of society, including sustainable development (Hardian, 2020). The United Nations' Sustainable Development Goals serve as a blueprint for achieving a more sustainable and equitable future for all, and AI has the potential to facilitate their achievement through mission-oriented innovation (Walsh, 2020). This entails focusing innovative efforts on specific goals, such as the SDGs. Novel and creative approaches to tackling complex problems can be implemented by utilizing AI. For example, AI can assist in the analysis of massive amounts of data in order to identify patterns and trends that can inform decision-making and aid in the development of more effective policies and interventions (Sawers, 2021). Furthermore, AI can aid in the development of new environmentally sustainable and eco-friendly technologies and systems.

It is convenient to state that AI is something that can be used in multiple ways. There are different purposes aimed at AI as a tool of development. AI as a development tool is used for a variety of purposes. Many complex situations arise in the development of smart cities, such as economic reform, environmental protection, government, and mobility. Artificial intelligence, for example, can be used to achieve the long-term development of intelligent structures. This is accomplished through the use of electronic devices, software-driven systems, or other advanced artificial intelligence (AI) technologies that detect the building environment and act to improve/optimize system performance (Adio-moses et al., 2016). AI is not only a practical and convenient solution for transportation system design, construction, maintenance, and scheduling but it can also be used to solve complex transportation system challenges on a larger and more efficient scale, such as massive amounts of data processing. Integrating AI is also advantageous because it assists in providing real-time traffic incident reports and forecasting traffic situations (Agawar et al., 2015). Despite all of the benefits and functionalities of AI usage in smart cities, there are also drawbacks that can not be ignored. It is obvious that things do not run as good as it seems. Risks associated with the implementation of AI in Smart Cities also need to be addressed and taken into consideration.

Most prior research and literature have discussed and studied how Artificial Intelligence helps to overcome issues and impediments in creating Smart Cities as part of the SDGs. However, earlier literature did not focus or study much on how the real implementation process of AI technology is actually difficult and not as simple as people believe. There are numerous challenges related to the implementation process, which will be covered in this dissertation. Unfortunately,

there are only a few studies and literature on how to evaluate the process and enhance current methods of implementation, which are very important and essential in the implementation process and to speed it up so that the Sustainable Development Goals agenda can be reached on time. Some opinions from other cities, as well as the respondents' domicile conditions, will be discussed and influence their points of view.

This research will go into detail about the development of AI in smart city infrastructure in the following sections.

2.2 Mission-Oriented Innovation

The concept of mission-oriented innovation, which involves setting specific goals and mobilizing resources to achieve them, has been identified as a crucial framework for promoting sustainable development. According to the research by Mazzucato (2018), A mission should have social importance, such as the ability to improve the health, nutrition, or living environment of a substantial number of European residents from various Member States. Missions of research and innovation should aim to increase the well-being of society. This will necessitate careful framing. An innovation system is often described by its structural components, which include the people, networks, institutions, and materiality or technology that influence the rate and direction of innovation - which is frequently understood as technological development (Markard et al., 2008). Larrue (2019) suggests a "mission-orientation" concept that is composed of diverse elements. This concept pertains to the policy's aim (addressing societal challenges), its substance (an organized collection of tools), and certain aspects of its implementation (objectives and timeline). As a result, mission-oriented policies call into question existing institutional setups for implementing innovation policy and advocate for greater integration of various policy instruments and actors to accomplish the desired outcomes. However, without modifications to the top-down coordinated process of execution, a re-orientation will not always result in any true transformative innovation, but may instead result in the subsumption of prior operations under new headlines, similar to putting "old wine into new bottles" (Daimler et al. 2012). The clarity increases when Kuitinen et al. (2018) characterize mission-oriented policies as "bold, investigative, and pioneering, frequently spanning multiple disciplines, aimed at a specific issue or challenge, with a significant impact and a clearly delineated timeframe".

Mission-oriented innovation policy has received a lot of attention in recent years, especially when it comes to addressing global societal challenges (Larrue, 2021). The approach is founded on the understanding that innovation can play a big role in addressing complex issues such as climate change, public health, and inequality. Policymakers can drive innovation toward tangible outcomes that benefit society by aligning innovation efforts with specific missions (Brown, 2021). The identification of specific missions or goals is a key principle of mission-oriented innovation policy. These missions are typically ambitious, requiring substantial investment and collaboration to complete. Policymakers can ensure that resources are directed toward societal challenges that require immediate attention by directing innovation efforts toward specific missions (Mazzucato,

2018). Setting clear missions can also help to stimulate innovation by providing a sense of purpose and direction.

Mission-oriented innovation policy also emphasizes the government's role in driving innovation. Governments can play an important role in shaping the direction of innovation by establishing priorities, providing funding, and developing regulatory frameworks that promote innovation (Todeva, 2013). Governments, for example, can invest in research and development programs that focus on specific missions, or provide tax breaks and grants to companies that work toward these objectives. Furthermore, governments can enact policies that encourage innovation, such as carbon pricing or emission standards that promote the development of clean energy technologies (Okoye et al., 2022)

Another key principle of mission-driven innovation policy is collaboration (Essén et al., 2022). By bringing together stakeholders from various sectors, such as government, industry, and educational institutions, policymakers can leverage each group's diverse expertise and resources to address complex challenges. Public-private partnerships, consortia, and co-creation platforms are all examples of collaboration. Collaboration can help to accelerate innovation while also ensuring that solutions are aligned with societal needs. Mission-oriented innovation policy acknowledges the significance of innovation ecosystems (Wanzenböck et al., 2020). The complex networks of actors, organizations, and institutions that support innovation are referred to as innovation ecosystems. Universities, research institutions, businesses, investors, and policymakers can all be part of these ecosystems (Zheng & Cai, 2022). Policymakers can help to stimulate innovation, create new industries, and drive economic growth by creating supportive innovation ecosystems.

Setting appropriate levels of ambition for a given mission is one of the challenges of mission-oriented innovation. The mission should be ambitious enough to inspire and mobilize the research and development community but should not be overly grandiose to be unattainable. Moreover, the mission should have the flexibility to adapt to changing circumstances and integrate new technologies and knowledge (Jütting., 2020).

Another challenge of mission-oriented innovation is ensuring equitable distribution of its benefits across society (Janssen et al., 2021). If the government funds research and development for a particular mission, private companies may utilize the resulting technology and knowledge to generate profits without contributing to the public good. Hence, policies and regulations must be in place to guarantee that the advantages of mission-oriented innovation are accessible to all and not concentrated among a few (Mazzucato., 2018). In one of the research by Jütting (2020), It implies that the study of mission-oriented innovation ecosystems suggests that the public sector plays a more significant role. Governments move beyond their simple regulatory role in many subtypes of mission-oriented innovation ecosystems to actively develop and orchestrate ecosystems. This finding is consistent with the general shift in the government's role in mission-oriented innovation policy (MIP) (Mazzucato, 2018). Using 'directionality' as a starting point, MIP also advocates for a

collective priority-setting process that involves a varied range of society stakeholders—with varying interests, problem perceptions, and pushing for distinct solutions—to combine numerous sources of knowledge in novel ways (Schot et al., 2018).

2.3 Sustainable Development Goals

The United Nations' Sustainable Development Goals (SDGs) are excellent instances of mission orientation (Borrás, 2019). The aim of the SDGs initiative is to establish a collection of worldwide objectives that tackle crucial environmental, political, and economic issues impacting both advanced and developing nations. The SDGs were intended to replace the Millennium Development Goals (MDGs), which initiated a global endeavor in 2000. The Millennium Development Goals (MDGs), set at that time, outlined universally accepted targets for addressing severe poverty and hunger, curbing deadly diseases, and ensuring all children have access to primary education, among other developmental priorities (UNDP 2015). Regrettably, the MDGs were unable to completely fulfill the objectives they established within the designated period (2000-2015). This was due to three major factors. Initially, even though they received approval from 189 UN members, the necessary financial resources to back their execution were not entirely provided. Second, there were no efficient methods established for assessing progress and providing recognition for advancements. Third, Although the MDGs held substantial importance, their presence and visibility in international dialogues and debates were not as prominent as they ought to have been. Nevertheless, the MDGs did facilitate progress in several crucial sectors, such as moderately reducing poverty rates in certain countries, providing essential access to water and sanitation, decreasing child mortality, and enhancing maternal health, among numerous others. Therefore, individual objectives need to be executed through a stringent framework that amalgamates planning, budgeting, activity delivery, and monitoring and evaluation (Leal Filho, 2020). To prevent repeating past mistakes, the SDGs were developed through an intensive and often extremely collaborative process involving numerous stakeholder groups from throughout the world, including organized civil society, the private sector, and local bodies (Klopp and Petretta, 2017).



Figure 2: Sustainable Development Goals (United Nations, 2015)

The Sustainable Development Goals itself consists of 17 goals, which propose to change the world. The 2030 Agenda was unanimously adopted by all United Nations Member States in September 2015, and it went into effect on January 1, 2016 (Rosa et al., 2019). The 17 Sustainable Development Goals (SDGs) of the agenda aim to promote equity for all peoples and improve relations within and between nations, with major themes encompassing People, Planet, Peace, Prosperity, and Partnership (Tremblay et al., 2020). The 2030 Agenda is based on the Millennium Development Goals' blueprint for social justice (2000-2015). SDG 3 emphasizes the importance of Good Health and Well-Being; for example, various social determinants (SDGs 1, 2, 4-6), economic welfare (SDG 8), and the ability of cities and human settlements to remain inclusive and resilient (SDG 11) all have a direct impact on society's ability to create, experience, and maintain health. In turn, one's health affects one's ability to work, play, and live with dignity.

As a structure, the SDGs expand upon the earlier Millennium Development Goals (MDGs) in several respects, particularly in their attempt to profoundly interconnect the social, economic, and environmental facets of the goals. In their current form, The SDGs constitute a global collection of goals, objectives, and benchmarks that will be utilized by UN member nations to shape their agendas and policies. By adopting the 2030 Agenda, which encompasses 17 SDGs, 169 targets, and 303 indicators, the member nations of the United Nations have built a structure for national initiatives and worldwide cooperation on sustainable development (International Institute for Applied Systems Analysis, 2018). Achieving the SDGs will necessitate profound structural changes in all sectors of society. This begs the important question of how to organize strategies to accomplish the 17 SDGs (Sachs et al., 2019). Working backward from these time-bound aims is also required to identify the system architecture, investment trajectories, and technologies capable of delivering long-term goals (Sachs et al., 2016; Waisman et al., 2019).

The execution of the SDGs will require a global innovation system that is agile and interconnected, actively linking regions across the globe, bridging research and societal entities,

and fostering the co-production and exchange of knowledge and technology that is suitable for local contexts. Stafford-Smith et al. (2017) underscore the importance of intensifying attention on the interconnections in three areas: across diverse sectors like finance, agriculture, energy, technology, and transport; across various societal actors such as local authorities, government agencies, the private sector, and civil society; and across nations with low, medium, and high income levels.

While the MDGs did not directly tackle urban concerns, the incorporation of a distinct urban goal (SDG 11) within the Agenda 2030, along with the creation of the New Urban Agenda, signifies the effectiveness of advocacy for heightened policy focus and financial support for urban regions. This is in acknowledgment of the crucial role that cities perform in facilitating sustainable development (Simon et al., 2016; Watson, 2016; Klopp and Petretta, 2017). These can also serve as tools to assess governance frameworks and prioritize sustainability—including justice and equity—in urban planning and development agendas (Sietchiping et al. 2016). In this context, two significant challenges are present: (a) current urban growth paths are marked by rigidity in planning systems and entrenched interests, and (b) prevailing global economic systems often clash with the attainment of elevated sustainability standards (Watson, 2016). These problems may make implementing the SDGs by 2030 impossible. The significance of comprehending how diverse local authorities globally have acknowledged, involved, and endeavored to implement these agendas is crucial for potential success in addressing these challenges (Valencia et al., 2019).

2.4 Artificial Intelligence

In general, AI can be defined as a set of computing technologies that try to replicate, extend, and improve human intelligence (Niu et al., 2016). Based on the previous research by John McCarthy (2004), AI is the science and engineering that goes into creating intelligent machines, specifically intelligent computer programmes.

The Fifth Industrial Revolution is expected to be based on the use of Artificial Intelligence and Deep Learning, which will assist in making production and management decisions (Serrano, 2018). AI is defined as software technology that exhibits various capabilities, including perception (audio, visual, textual, tactile), decision-making (e.g., medical diagnosis systems), prediction (like weather forecasting), knowledge extraction, pattern identification from data (e.g., detecting fake news networks), interactive communication (social robots, chatbots), and logical reasoning. This perspective encompasses a broad array of sub-disciplines, one of which is machine learning (Vinuesa et al., 2020). It is analogous to utilizing computers to examine human intellect, but AI does not have to be limited to medically evident applications. AI ushers in a new era of information and knowledge-based civilisation, as well as global progress. In order to respond to contemporary issues, it includes creative ways of utilizing classic production components as well as new activity organization principles. While key AI milestones must be covered, recent advances in neural network research, cognitive computing, and machine learning enable previously unimagined capabilities for energy management, monitoring, and optimization. The integration of artificial

intelligence with 5G networks and sensor networks has a chance to pave the way for next-generation smart city services (Erban et al., 2020). Furthermore, it has the potential to aid in the advancement of low-carbon systems, such as fostering the growth of resource-efficient smart cities and circular economies (Fuso Nerini, 2019). Moreover, it facilitates the integration of variable renewables through the implementation of smart grids that align electrical demand with periods of ample sunlight and wind (Cozzi et al., 2017).

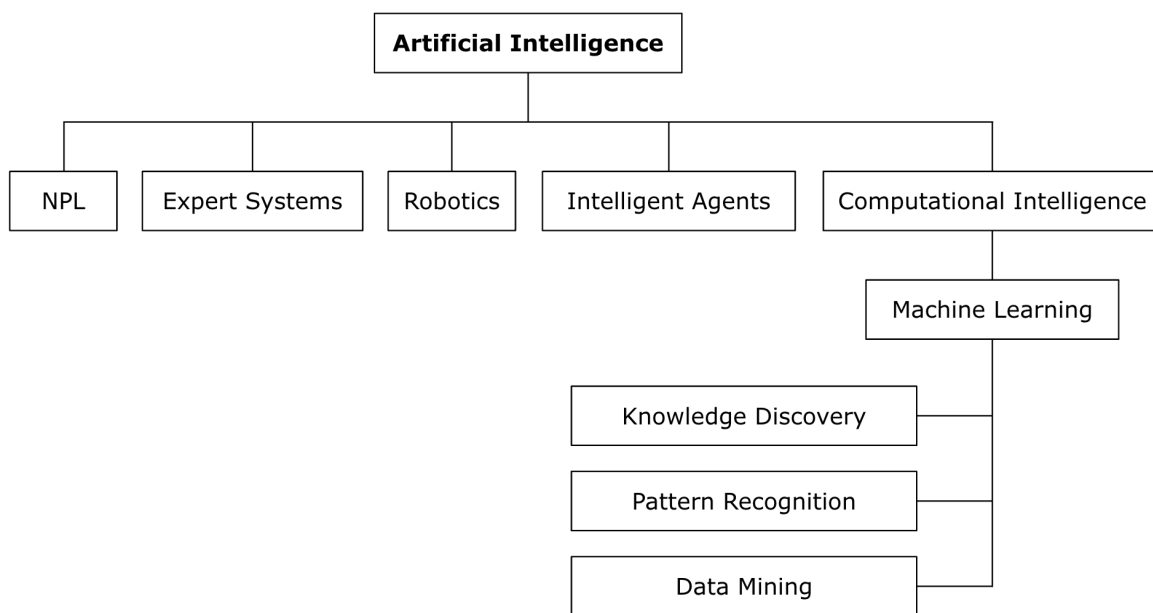


Figure 3: Key Elements of the AI Family Tree (The Basic Elements of Artificial Intelligence and Recipe for a Successful Career Kick Start, 2021)

Artificial intelligence (AI) and other digital technologies, often referred to as the Fourth Industrial Revolution, are transforming virtually every sector, encompassing manufacturing (robotics), retail (e-commerce), finance (e-payments and trading strategies), media (social networks), healthcare (diagnostics and telemedicine), education (online learning), public administration (e-governance and e-voting), and science and technology. Digital technologies possess the capacity to boost productivity, reduce production costs, decrease emissions, improve accessibility, and enhance the efficiency of industrial processes. They facilitate better market matching, utilize big data, and advance access to public services. According to the Broadband Commission (2014), these technologies can also drive resource efficiency, promote the circular economy, enable zero-carbon energy systems, aid in monitoring and safeguarding ecosystems, and play a crucial role in supporting the achievement of the Sustainable Development Goals (SDGs). Nevertheless, nations need to acknowledge and tackle risks and drawbacks by implementing integrated plans and emphasizing the principle of inclusivity, ensuring that no one is left behind. Two of the most feared risks include job losses, especially for lower-skilled workers, and the shift in income distribution from labor to capital. While new employment could displace current ones, they might also have worse working conditions and lower real wages (Manyika et al., 2017). Additional threats encompass the theft of digital identities, invasions of privacy by

government or commercial entities, discrimination stemming from personal data, the emergence of monopolies through control of big data, hindrances to inclusive decision-making processes, cyber warfare, election data breaches, and manipulation of social media (Sachs et al., 2019). Another noteworthy drawback lies in the dependence of AI-based innovations on the particular requirements and values of the countries where they are developed. In regions lacking ethical oversight, transparency, and democratic governance, the utilization of big data and AI can potentially fuel nationalism, foster animosity towards minorities, and lead to distorted election outcomes (Helbing & Pournaras, 2015).

AI benefits include automating data administration and analysis, saving costs and expanding resources through pattern recognition, supporting decision-making by analyzing big amounts of data and generating findings based on logic, reason, and intuition, and assisting decision-making by analyzing vast volumes of data and coming to conclusions based on logic, reason, and intuition (Wamba-Taguimdje et al., 2020). When combined with IoT, AI can manage and analyze large amounts of data quickly and accurately to support management decisions (Din et al., 2019). This technology has the potential to increase efficiency by automating data management, removing the need for middlemen, and enhancing profitability. Furthermore, AI can improve the stability and effectiveness of IoT, which may aid in knowledge sharing, innovation, and entrepreneurship (Duan et al., 2019). AI can detect patterns in datasets, which can help optimize data management processes, boost overall productivity, and detect cyber-attacks, coding errors, and other inefficiencies. By automating complex statistical analyses and data fusion processes, AI can speed up decision-making. This data can then be used to reduce economic uncertainty, aid business decisions, and create more responsive marketplaces to user needs and desires.

AI can automate decision-making, making AI systems more tolerant to uncertainty, especially when working surrounded by humans (Townsend et al., 2019). This can reduce the likelihood of accidents and errors while also improving the operational efficiency of businesses and industries. To improve transportation efficiency, smart control systems may track traffic, gather and analyze data, and make real-time decisions. AI systems with human-like abilities such as creative thinking, styling, instinct, innovativeness, trust, ethics, and values can be developed to perceive, understand, and make informed, reason-based decisions that benefit businesses (Muggleton, 2014).

2.5 Smart City

Cities serve as nodes where agglomeration economies can realize their full potential, resulting in a variety of cultural, economic, and social benefits (United Nations, 1996). Nonetheless, the expanding urbanization patterns give birth to a host of issues that reduce the general quality of life in cities, such as inequality, pollution, an aging population, insecurity, and a variety of other concerns (Fernandez-Anez et al., 2018). In an increasingly urbanized world, smart cities are being adopted to address a variety of difficulties (Anthopoulos, 2015; Chourabi et al., 2012; Nam & Pardo, 2011). Only through researching the city's issues and tendencies can the

conceptual model of a Smart City be formed. Citizenship and stakeholder groups provide significant issues that the various urban functioning subsystems must address (Fernandez-Anez et al., 2018). As the planet becomes more urban, cities must become smarter. The creation of creative methods and ways to deal with the problems of urban living, such as overcrowding, energy consumption, resource management, environmental protection, and so on, is necessitated by extensive urbanization (Eremia et al., 2017).

Smart Cities have recently grabbed the interest of governments around the world in their R&D efforts. Although there is no commonly agreed definition of Smart Cities, they can be defined as cities that use information and communication technologies to improve their citizens' quality of life while simultaneously offering sustainable development. Cities become more resource-aware as information and communication technologies are integrated into municipal services. These new cities with new technological applications create new commercial opportunities and act as research hubs. As a result, businesses, entrepreneurs, and research institutions flock to them (Bakc et al., 2013). A smart city, with IoT and AI, necessitates big data collection and data governance (Chen et al., 2021).

As described by Giffinger and Haindlmaier (2010), there are several factors that shape the characteristics of a smart city. According to them, six "smart" characteristics have been identified and considered to be compatible with; Economy, People, Governance, Mobility, Environment, and Living.

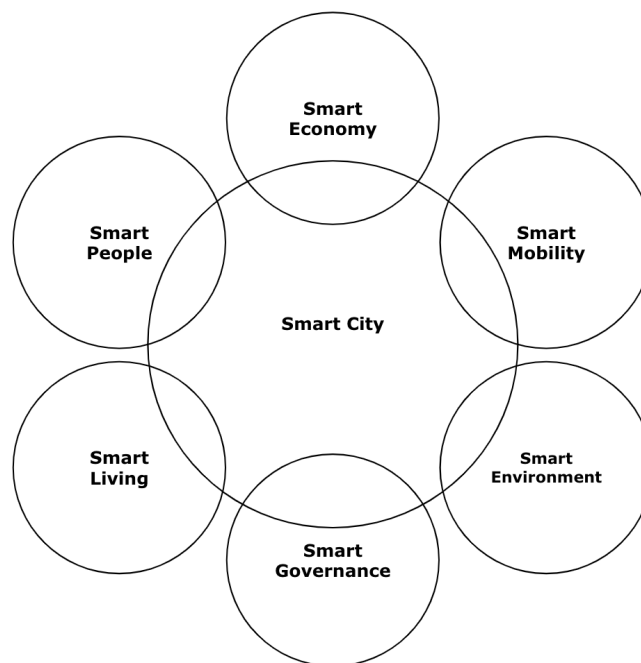


Figure 4: Smart City Characteristic Model (Giffinger and Haindlmaier, 2010)

Smart cities are increasingly being recognized as an effective solution for addressing urbanization challenges and promoting sustainable development (Angelidou et al., 2018). The Sustainable Development Goals (SDGs) of the United Nations provide a comprehensive framework

for achieving sustainable development, and smart cities have the potential to play an important role in their realization. A smart city is one that uses advanced technologies, such as artificial intelligence (AI), to improve its operations and services (Sarker, 2022). The incorporation of AI in smart cities has the potential to significantly contribute to the achievement of the SDGs by improving the sustainability, efficiency, and livability of urban systems (Allam et al., 2019). AI has many applications, including optimizing energy consumption, reducing waste, improving mobility, and improving citizens' quality of life (Obracht-Prondzyńska et al., 2022). For example, AI can aid in the prediction of energy demand and supply, the optimization of traffic flow, the management of waste collection and recycling, and the provision of personalized health and social services. Digital platforms that encourage citizen participation and engagement can also be used to provide input and suggest improvements to the city's services and operations.

Numerous studies have been conducted to investigate the potential of smart cities and AI to achieve the SDGs, with findings indicating that smart cities can play a critical role in achieving several SDGs, including clean and inexpensive energy, industry, innovation and infrastructure, and sustainable cities and communities (Parra-Domínguez et al., 2022). However, incorporating AI in smart cities can present a number of challenges, such as bias and discrimination in decision-making algorithms, as well as the protection of citizens' privacy and security (Ismagilova et al., 2020). AI algorithm development and deployment in smart cities must be fair, transparent, and accountable, and data collection from citizens must be protected by robust data protection and security measures (Javed et al., 2023).

The construction of smart city infrastructure, which serves as the foundation for the overall smart city framework and architecture, is the first phase of creating a smart city (Al-Hader et al., 2009). The infrastructure development framework, as well as the precision of identifying assets and their location, serve as a foundation for the integration of all facilities and systems that contribute to the smart city development architecture. In essence, smart city infrastructure is a critical component in the construction of a smart city. It entails developing a comprehensive framework for integrating various systems and facilities to ensure smooth operation and efficient resource management (Joshi et al., 2016). The development framework for infrastructure serves as the foundation for the entire smart city architecture, defining how various systems and facilities will be integrated, managed, and operated.

Moreover, precise asset identification and location are critical for effective and efficient resource utilization. Proper asset identification and location allows for better resource utilization and infrastructure management. Integration of facilities and systems within the smart city framework is also essential for achieving an effective and efficient smart city infrastructure. Smart technology integration is a prevalent trend in modern cities. Many cities are working to improve their intelligence in various ways (Javed et al., 2022). Environmental pollution and degradation, scarcity of resources relative to population demands, traffic congestion, increased cost of living, declining standards of living, increased poverty rates, and other societal concerns are common

challenges. Furthermore, city transformation projects necessitate careful consideration of digitization, technicalities, and unanticipated population growth due to urbanization.

A smart city is one that uses intelligence to manage its affairs (Borja, 2007). The most convincing justification for municipal governments implementing new technologies in their essential operations is managerial innovation (Moon & Norris, 2005). The level of managerial innovation influences both administrative and technological innovation (Walker et al., 2011). Innovation in smart cities necessitates high levels of knowledge exchange and integration. To ensure technologies deliver on the promise of government transformation, managing interoperability across organizations and applications is a crucial facilitator for the integration of information and knowledge across different organizations (Pardo & Burke, 2008). Business process modeling and enterprise architecture are two methods for organizing and managing innovation to transform outdated bureaucracy. Pardo et al. (2012) define the term "enterprise" as referring to the architectural scope, signifying a unique, interdependent collective composed of multiple agencies collaborating and a specified network of these organizations that share a policy area with the aim of delivering services that cannot be provided by a single agency independently. Additionally, according to a study by Giffinger and Haindlmaier (2010), smart city functions for its inhabitants, who make up a crucial part of the idea of smart cities. The Smart City's development path gives non-technological aspects careful consideration. This conceptualization is based on a more comprehensive view of the phenomena, where authors initially emphasize the importance of human capital, human infrastructure, and education for territorial development (Caragliu et al., 2009). Drawing from their study, Nam and Pardo (2011) categorized and encapsulated the defined set of Smart Cities into three primary components. These elements encompass technology (including hardware and software infrastructure), people (encompassing creativity, diversity, and education), and institutions (covering Governance and Policy).

Several recent surveys have named Barcelona, Spain, as one of the world's most advanced smart cities, and as such, it is frequently cited as a model for other cities to follow. The specific factors that contribute to Barcelona's smart city status are worth investigating and could help guide the development of other cities (Bakc et al., 2013). Barcelona is unique in that it has evolved over the last three decades from a city primarily focused on traditional manufacturing and commerce, such as textiles, to a city with a thriving knowledge-based economy, a modern tourism industry, and quality infrastructure for residents, investors, and visitors. Technology has played a crucial role in facilitating the multifaceted innovation process, which has progressed from a 2.0 model with e-government initiatives aimed at providing flexible and efficient service to a 5.0 model focused on inclusivity, productivity, self-sufficiency, innovation, and community involvement (Gascó-Hernandez., 2018). Barcelona's government leaders faced the challenge of reinventing the city's economy and social profile in order to overcome the stagnation and widespread unemployment of the 1980s.

2.6 Role of AI in Smart Cities to address grand societal challenges

It is not deniable, that one of the uses of AI in Smart Cities is to solve and overcome the challenges among the people that live in the cities, and to support a better life. It is mentioned by Appio et al (2019) that to create a better living society in smart cities, there has to be the collaboration of several parties, such as the Educational Institutions, Government, and also Public and Private organizations. The decentralized nature of smart cities needs good coordination among hundreds of players via an information and communication infrastructure that enables stakeholders to be apprised of each other's movements and facilitates active engagement and mutual support. Real or virtual communities must be constructed and managed using cutting-edge technology to improve a community's quality of life by delivering better services in the areas of health, public entertainment, and social bonding. It has also proven that social technologies play an important role in developing the quality of life in cities and there is still untapped potential for it. Indeed, the impact of social technology is likely to penetrate deeper into numerous sectors and can aid in addressing some of the world's grand concerns (Chui et al., 2012).

Cited by Dwivedi et al (2021), The growing usage of artificial intelligence is anticipated to disrupt cultural norms and function as a potential barrier within certain segments of the population. Social issues have been identified as potential roadblocks to the future deployment of AI technologies. It is heavily recognized social difficulties linked to unreasonable expectations of AI technology and a lack of awareness about the values and benefits of AI technologies (Sun et al., 2019). Several studies have also looked at the societal implications of prospective employment losses owing to AI technologies (Khogali et al., 2023). This particular topic has garnered extensive media coverage and has been argued in a number of venues.

On the other hand, Artificial Intelligence is a vague term that refers to a set of supporting technologies that are fundamentally dual-use rather than a single-function technology (Williams et al., 2020). As a matter of fact, mostly the development and advancement of AI is being held by the commercial sector, not by the governments. It can be imagined what risks are associated with the users of AI Technologies that are owned by huge companies, with certain power to manage the data. With the advent of improved data exploration opportunities, privacy has emerged as a critical social issue (Mazurek et al., 2019). Identifying, profiling, and actively influencing people's lives has become exceedingly low-cost and simple. These privacy problems have only grown as artificial intelligence systems have become more advanced. In this context, AI refers to the improved ability to collect, analyze, and combine massive volumes of data from various sources, hence enhancing the capabilities of technology owners (Tene et al., 2012). Eventually, Artificial Intelligence can conduct specific jobs without supervision, considerably improving analysis performance. These characteristics of artificial intelligence allow it to affect privacy in many ways. AI may predict secret information from non-sensitive data types using advanced machine learning algorithms (Moran et al., 2023). Typing patterns on a keyboard, for example, can be used to deduce emotional states such as anxiousness, self-confidence, melancholy, and worry. Even more threatening are the

potential uses of personal data such as activity logbooks, location data, and similar data to examine political opinions, sexual orientation, and even general health.

Despite all of the risks described above, using and being dependent on the AI technology provided by giant companies also brings out some benefits. Most of the time, giant companies that are already applying AI as their technology already have the expertise and also experience in managing it. This automatically gives less error in the process of experiencing the AI technology. Large corporations frequently provide entire AI ecosystems that integrate various AI technologies, services, and platforms. These ecosystems offer a uniform and seamless experience for developers, organizations, and end users, making AI adoption and integration into existing workflows and systems easier. This integration has the potential to speed up the development and deployment of AI solutions while also making them more accessible and user-friendly.

3. Methodological Framework

3.1 Research Context

Exploratory research is a type of study that is commonly used when there is no existing research on a specific topic or when the research is limited. This type of research can be useful in identifying potential research questions and hypotheses that can be investigated further in subsequent studies.

According to Swedberg (2020), exploratory research is frequently used in social sciences to gain a better understanding of a specific phenomenon or behavior. This can be accomplished through a variety of methods, such as interviews, case studies, and observations. In this study, the researcher chose to collect qualitative data through expert interviews and a case study using a semi-structured approach. The use of interviews in this study allows for a more in-depth understanding of the attitudes, behaviors, and experiences of the people being studied. In general, qualitative research is an effective method for investigating complex social phenomena because it allows for the collection of rich and detailed information that can provide insights into the subject of study. Moreover, this study will explore more about the perspectives, experiences, and knowledge of people that work in the Public and Private sectors and Educational Institutions. It is essential to collect data through interviews with continuous sub-questions to once again, retrieve rich and detailed information. A qualitative approach is recommended as the best and most effective way to inspect and investigate this research. This method will allow the researcher to examine the subject's nuances and identify patterns, themes, and trends that may emerge.

Sector	Candidate Position	ID	Sex	Duration
Private Sector	Owner	C1	M	51 mins
Educational Institution	Professor in Strategy and Innovation	C2	M	65 mins
Educational Institution	Ph.D. Candidate	C3	F	48 mins
Educational Institution	Ph.D. Candidate	C4	M	N/A
Private Sector	Urban Profile Facilitator	C5	M	35 mins
Private Sector	COO	C6	M	35 mins
Private Sector	Artificial Intelligence Developer	C7	M	N/A
Educational Institution	Senior Researcher	C8	F	31 mins

Table 3.1: Interview sample design

3.2 Research Questions

The objective of this research is to gain a deeper understanding of the mission-oriented ecosystem and the interplay between the public sector, private sector, and educational institutions in realizing sustainable development goals related to smart cities and communities through the use of AI. It will also explore how to deploy AI-based technologies effectively to meet the 2030 agenda. Additionally, this research will investigate methods to evaluate and accelerate the implementation of such technologies. It will examine various cases in Belgium, the Netherlands, Spain, Austria, Greece, and Indonesia. This will be accomplished by addressing the following research questions:

1. **How does the relationship between the public sector, private sector, and educational institutes affect Mission-Oriented Innovation to reach smart cities and communities by using AI?**

This question seeks an answer to the comparison between the previous situation of the mission-oriented innovation ecosystem before 2015 and how the relationship between the public sector, private sector, and educational institutes played an important role in facilitating the adoption of these goals and tackling the obstacles after 2015 towards accomplishing sustainable cities and communities by using AI.

2. **How to successfully implement Artificial Intelligence as a tool to achieve smart city development?**

This question aims to look for ways in which AI can serve as a powerful tool to develop smart cities. Given this research question, this study further intends to investigate how AI is implemented in cities correctly. It also looks at how citizens get facilitated by the AI technologies provided in the cities. This question also aims to search for obstacles in implementing AI technology. Additionally, this second question will lead to a comparison between different countries in Europe and Asia in terms of how they become better and more developed smart cities.

3. **How to evaluate mission-oriented innovation's impacts to reach sustainable cities and communities by implementing AI to develop smart cities?**

After the implementation, it is imperative to know the factors that affect the implementation success and the main KPIs that need to be met. During the implementation process, It is necessary to fix some conditions as well as some related to ethical considerations with regard to AI technology.

4. **How to accelerate the 2030 agenda by using Mission Oriented Innovation to reach sustainable cities and communities by using AI?**

This research question seeks solutions for accelerating the process to achieve sustainable cities and communities within the remaining seven years, given that we have passed half

the way to achieving the 2030 agenda. During the process, ineffective approaches can be fixed and evaluated to meet the 2030 agenda in time.

3.3 Methodology Approach

This research uses semi-structured interviews to collect primary data to gain some key points. The researchers conducted the interviews to understand how the relationship between the public sector, private sector, and educational institutes has changed mission-oriented innovation, the implementation of AI to reach smart cities and communities, the evaluation of mission-oriented innovation that affects smart cities, and how to accelerate the 2030 agenda. All of those objectives are also compared between the progress towards reaching smart cities and communities. The sample population was selected based on their city of residence, and also their position and experiences in their organizations. The first approach to the interview process began with some introductory questions to know about their profile and also their role in the organizations. All candidates were specifically chosen using LinkedIn and also some connections that the researchers have. The researchers reach the respondents by sending them email about a brief introduction and overall review of the study and the interview questions. In total, there were 8 respondents as the source of data collection in this research.

3.4 Data Collection

With the fast development of digital technology in communication that eases people in communicating via online, some of the interviews were conducted using Google Meet, and also Zoom. Some of our respondents were not in Hasselt and some were outside Belgium. Thus, online meetings were considered in order to keep the interviews on track. Face-to-face interviews help to create an atmosphere in which the respondent is open, and the interviewer can take into account the participant's nonverbal communication (Ritchie, 2013). However, even by using Online interviews, the results that are acquired are still as credible and valid as conducting it face to face. In addition to the data gathered through interviews, current academic research was taken into account throughout data collecting.

Since this research is to aim for broad and depth knowledge from each respondent, an open approach and semi-structured interview were conducted to the respondents. The respondents were allowed to share their concepts and perspectives but still based on the researcher's questions. The interview started with warm-up questions to know more about the respondents role and identity. It's important to be collected as a matter of their point of view. After several warm up and general questions given, the researcher started to ask deeper and more specific questions to explore the insights and knowledge from the respondents. The questions were segmented into several parts based on the research questions related to this study. For every research question, the researcher made some sub-questions into detail to ask the respondents. Before the interview was conducted, the respondents were given the questions in advance so that they could read and prepare the questions that they might want to ask the researchers.

3.5 Data Analysis

The audio recordings that are taken during the interviews must be transcribed before the interviews can be processed, organized and interpreted (Sutton et al., 2015). The essential thing in conducting a qualitative interview is to step on the respondent's point of view and understand their perspective. In analyzing the data, it is crucial to stay true to the respondents and not give any subjective interpretation from the researcher's side. The researchers are seeking out their voices so that they can be understood and noted on for others to acquire knowledge from (Sutton et al.,2015). Thematic coding or also known as thematic analysis is used in order to identify the text by defining words and phrases structure. Coding, in its most basic form, is the process of defining and identifying one or more sections of text or data objects that embody the same theoretical or descriptive idea (Gibbs, 2007). This procedure is critical because it allows researchers to create a framework of thematic concepts about the data they are investigating.

Researchers can categorize and index the material by associating several passages with a term for that notion, making it easier to spot patterns and develop relevant conclusions. To elaborate, coding entails the methodical analysis of data to find and categorize themes, patterns, and correlations. This technique involves the researcher to carefully examine and analyze the data, looking for passages that represent a specific notion or concept. Once discovered, these passages are assigned a unique identifier or name that acts as a reference point for all text or data pertaining to the same idea or concept.

Therefore, there are 3 steps conducted for the data analysis process. Starting with reading the texts to discover general information then followed with trying to dig deeper into the information given. Next on, the researchers reduce and shorten the text by coding to show the topic of its text by using shorter phrases. The coding tree table will be shown below.

STEP 1	STEP 2	STEP 3
RQ1: Role of Public Sectors in Achieving Sustainable Cities and Communities	The relation between public sector, private sector and educational institutes	Collaborating with educational institution and private Sector
		Money and funding as obstacles
		Human resources (Experts) as an obstacle
		Providing policies and regulatory framework
	Mission-oriented innovation ecosystem and AI	Complexities in public body bureaucracy
		Huge role of AI in prediction
		Too many dependencies in algorithms
		Privacy concerns as challenges in using AI
RQ2: Implementation of AI in Smart Cities:	AI implementation in cities	MOI allows all kinds of policies to be more effective
		The implementations are not well communicated
		Not everyone are open with new technologies and changes
		Implementation of AI in cities are in questions
	Successful implementation of AI in smart cities	Concern regarding affording negative sides of AI implementation
		Successfulness of AI implementation hugely affected by financial and human resources
RQ3: Evaluation of AI Implementation in Smart Cities	Measuring the effectiveness of AI implementation in smart cities	The role of government
		Cost of the system and what in return
	Aligning AI use with SDGs	Defining relevant indicators
		Involvement of experts
RQ4: Acceleration Towards the 2030 Agenda	Improving urban growth and sustainability	Measurement in general
		Some cities are underfinanced to handle population growth
	Challenges and solutions for using AI to achieve the 2030 agenda	Mismatch between infrastructures and population growth
		The lack of awareness among individuals regarding the necessity for change
		Defining sub-goals and measures to achieve the overall goal

Table 3.2: Coding tree

4. Findings

The findings of this dissertation, which investigates the use of artificial intelligence (AI) in smart cities to achieve sustainable development goals, are presented in the following section. This project intends to provide insights on the potential of AI technologies in shifting urban environments towards a more sustainable and inclusive future by an in-depth analysis of literature, case studies, and expert interviews. The study's findings shed light on the multidimensional role of AI in tackling the complicated difficulties that cities around the world confront. As urban populations continue to grow fast, cities face increasing demands to meet the requirements of their citizens while also striving for sustainable development.

The findings highlight the obstacles and issues related with the application of AI in smart cities. Financial restrictions are a serious impediment, as deploying AI technologies necessitates significant expenditures in infrastructure, data management systems, and experienced human resources. The shortage of a professional workforce fluent in AI raises hurdles for cities seeking to properly exploit new technologies. Furthermore, to enable responsible and equitable AI deployment, ethical concerns about privacy, algorithmic biases, and openness in decision-making processes must be addressed.

In this perspective, incorporating AI into smart city programmes is a promising strategy to optimizing urban services, improving resource efficiency, and improving inhabitants' general quality of life. The findings highlight the great potential of artificial intelligence-enabled solutions for optimizing urban services and systems. Cities can process and analyze huge volumes of data acquired from diverse sources thanks to AI technologies such as data analytics, machine learning, and predictive modeling. Cities may get meaningful insights from this data by using it to improve transportation systems, optimize energy usage, improve waste management, and deliver personalized and context-aware services in sectors such as healthcare and education. These AI-powered solutions have the potential to alter traditional urban service delivery while also helping to accomplish sustainable development goals.

Furthermore, the findings illustrate how to analyze the entire AI implementation process and what aspects influence it. It is critical to ensure that the entire process remains in line with the Sustainable Development Goals, rather than just squandering time on the wrong road, which will result in nothing but a loss of resources and time. Furthermore, with the clock ticking and the deadline approaching, it is critical to ensure that everything is on track and, if feasible, that the process be accelerated. With the passage of time, there are numerous missions to do.

The explanation of the findings will be presented and related to the result of the interview sessions conducted with 8 of the respondents chosen by the researchers. Part of the dialogue referring to the findings will also be included in this chapter.

4.1 Relation of public sectors, private sectors, and educational institutions

A number of areas are crucial in achieving smart cities and communities by utilizing and integrating AI (Allam et al., 2019). Each of the public, private, and educational sectors are responsible for certain things. It's critical to establish a network and avoid developing anything exclusively because it's better to have a variety of viewpoints. The interviewee indicated that collaborating with various sectors to build smart cities will speed up the process and enable achievement of the 2030 Agenda on schedule. The interviewee also notes that there has been a significant change between now and before the announcement of the sustainable development goals in 2015. Numerous sectors have reacted and shown a great deal of awareness in order to work together and complete the task.

4.1.1 Collaborating with private sector and educational institutions

Based on the interview sessions with the respondents of this research, the researchers find that almost all of the organizations where they work with, actively collaborating with other organizations such as universities and even other private sectors. It's also mentioned by the interviewees that work in the educational institutions, that their organizations contribute on this mission by providing and conducting research, also focusing daily activities by implementing and supporting the missions such as trying to be environmentally friendly.

"I was the initiator of the urban living lab radar. And if you take a look at the urban living lab breda.nl, then you will find that it's, it's amazing what happens now, I think, an average of 300 students are working every time and every day in this huge project now. We're now not even talking about the regions, but also about different cultural parts, you know, in the city of Breda, and you see that, let's say the low developed parts, city of Breda, the more let's say social housing is developed. And people are brought together and people are invited ,citizens are involved." (C1)

According to the conversation with one of the interviewees, it's clearly stated that the interviewee's organization is actively working with other parties such as students and also citizens of the city. By involving many parties, it has shown that the willingness to change and to reach the mission is quite huge.

"... the way that the university works in day to day activities, also contributes to sustainable development goals, I would say, for example, number 13, to climate action. So we have all kinds of internal policies. So for example, KU Leuven as the policy where we are strongly encouraged to take the train to conferences if they are less than 500 kilometers away. So last week, I went to school in France, and I took the train, I didn't fly there. So that's an example of how in everyday life, I would say, in the execution of our jobs that we also take the SDGs into account." (C2)

It's also clear that universities actively support and engage each stakeholder to also contribute and take part in this mission of sustainable development goals. By applying it on a daily basis, it's believed that the process in achieving the missions can be accelerated. This shows that each sector has their own role and task in achieving the missions, which collectively will impact the

whole process of each city and country. Despite the downfall, so far if everything is maintained and organized with clear rules and regulations, then supposedly there will be no problem.

4.1.2 Money and funding as obstacles

There are several challenges to overcome in the process of creating smart cities, using AI technology, and achieving the objectives. Money and funding were cited by a few interviewees as the main and most significant barriers. It's essential to have enough funding because it serves as the key building block for creating and facilitating the multi-high tech facility cities. Additionally, data and knowledge play a role in these elements that make developing smart cities difficult.

"Nowadays, and specifically in Greece, I believe that money is the main obstacle" (C4)

When the researchers examine the other side of the globe and adopt the viewpoint of developing nations like Indonesia, it offers yet another fascinating perspective. Although money is still the biggest barrier, technology itself takes a while to spread.

"Yeah, in Indonesia maybe the obstacle is from the price, because that's very expensive. And not only expensive, I think we must wait for a long time to get the technology to come to" (C5)

The researchers can readily draw the conclusion that money and funding are the biggest barriers based on the interviewees' comments. There is a strong argument that, in general, the city needs to give the organization adequate cash to perform additional study and implement the technology, which is rather expensive. But in terms of a long-term investment, it can be claimed that all of the funds and money used to achieve this goal were worthwhile. On the other hand, looking at the other side of what happened in Indonesia, there are other challenges besides money and funding. The supply chain system for technology can be said to be a little bit complex and will take a long time. There might be several factors affecting that, but this gives the researcher another point of view that there are other things that occur, depending on the country.

4.1.3 Human resources as an obstacle

Another significant challenge highlighted by the interviewees in achieving sustainable cities and communities is the scarcity of experts specifically focused on sustainability. The availability of individuals with the necessary knowledge and expertise to address sustainability issues was identified as a major obstacle. This sentiment was echoed by an interviewee who emphasized the importance of not only accessing relevant data but also having experts who can effectively organize and analyze that data.

"... there are three [obstacles], there is the funding, the data, and also the people with knowledge. The research is to get to the data, and then you have to have the people with knowledge to organize the data." (C3)

Furthermore, another interviewee highlighted the struggle faced by cities in employing experts for sustainability initiatives, despite having sufficient financial resources to support such endeavors. This indicates that financial constraints may not be the sole barrier to progress; rather, the lack of appropriately skilled experts poses a significant challenge in implementing transformative measures toward climate-neutral cities.

"That is one thing that our city has to face now as a major obstacle. They have now the financial resources to employ experts familiar with starting this transformation to a climate-neutral city, but they really struggle with finding the right experts, although they have the money for it." (C8)

The insights gained from the interviews conducted with individuals associated with educational institutes, including a Ph.D. candidate and a senior researcher, emphasize the importance of expertise in promoting sustainable urban development. The lack of experts who possess knowledge and skills in sustainability practices and strategies hinders the efficient use of funding and resources for achieving sustainable transformations.

4.1.4 Providing policies and regulatory framework

One of the challenges to achieving the SDGs cited by interviewees is the provision of policies and regulatory framework. Mission-oriented policies do not simply throw money at issues; they do so in defined ways (Mazzucato, 2018). At the same time, they must promote bottom-up experimentation and learning in order to nurture the innovation process itself through dynamic feedback loops and serendipity (Rodrik, 2004). However, according to one of the interviewees, a senior researcher at an educational institution, most activities are defined top-down, particularly in terms of projects.

"... So there are more or less project-based activities, but not on a daily basis." (C8)

Public bodies are responsible for defining policies and regulatory frameworks in a way that allows for bottom-up experiments in terms of defining issues, finding innovative solutions, and implementing technology, which could be accomplished by defining policies governing the relationship between public and private bodies, as well as educational institutions. However, according to another interview, this impediment is observed again, where public bodies are still in charge of identifying the issues, which changes this strategy back to a top-down approach.

"the main problem for the cities adopting new technologies is that it's always as long as a public administration to define the issue, to define the policies when it's needed. And then implement the needed solution to technology and manage it." (C6)

While it is crucial for public bodies to facilitate a collaborative environment that involves private bodies and educational institutions, the interviews indicated that public bodies often retain sole responsibility for issue identification and policy definition. This reverts the strategy back to a top-down approach, hindering the full potential of bottom-up innovation.

4.1.5 Complexities in public body bureaucracy

It's also mentioned by the interviewee that the administration of implementing and applying the new technology is often not easy and takes time. The whole process of it, also being an obstacle in this matter. This type of phenomenon happens closely with how the government arranges the bureaucracy and manages it in the fastest way possible. Things must be sorted into priorities, which one firstly needs to be done and worked at. By remembering that the agenda in reaching all of the goals is becoming closer and closer, thus it will help to motivate government in speeding up the process and eliminating unnecessary bureaucracy.

"One thing that that I imagined is specifically a problem with respect to sustainable and smart cities, is legislation. Bureaucracy, these things? I mean, cities are very slow moving environments. I mean, there's so there is a lot of things that the air city and so you cannot start with a clean slate, right? So it's different from doing like an experiment where you have everything is under your control. While if you look at a city, there are like so many things. One is the typical city, that I think it's very hard to set up experiments and so on, because this is an environment that is very difficult to control. I think that from a scientific point of view, that is probably one of the main challenges..." (C2)

This explanation from one of the respondents showed that the city is a complex place, with tons of bureaucracy related systems that are going on and will take longer time to conduct any implementation of technologies and do a trial on it.

4.2 Mission Oriented Innovation Ecosystem and AI

By enabling sophisticated data analytics, automation, and wise decision-making, AI may dramatically impact and accelerate the Mission Oriented Innovation ecosystem in the context of smart cities (Bibri et al., 2020). Smart city systems generate massive amounts of data, which AI-powered technologies like machine learning, natural language processing, and computer vision can process and analyze to produce real-time insights and useful intelligence (Sarker, 2022). In the Mission Oriented Innovation ecosystem, decision-makers are empowered to make data-driven, evidence-based decisions, which in turn produces more effective and focused solutions for the mission-oriented problems facing smart cities (Calzada, 2020). Additionally, AI can support automation and optimization in many areas, including urban planning, energy management, and transportation, enhancing resource sustainability and efficiency within ecosystems for smart cities. Incorporating AI into the Mission Oriented creativity ecosystem opens up new possibilities for creativity, collaboration, and multidisciplinary thinking in addition to improving problem-solving speed and accuracy (Dwivedi et al., 2021). The Mission Oriented Innovation ecosystem can accelerate the transition to smarter, more sustainable cities by utilizing AI's ability to exploit data-driven insights, improve resource allocation, and encourage an innovation culture.

4.2.1 Huge role of AI in prediction

Commonly said that AI is very useful and one of its primary functions is to conduct prediction of things. The ability of AI to analyze enormous amounts of data, spot patterns, and draw valuable insights allows it to predict future events with varying degrees of accuracy. Artificial intelligence (AI) is able to sort through complex data, identify hidden correlations, and make accurate predictions across a variety of fields using cutting-edge machine learning algorithms and neural networks. AI's predictive capabilities enable us to make more informed decisions, manage risks, optimize processes, and even imagine alternative scenarios that could change our future. These predictive capabilities range from weather forecasting and financial market trends to disease diagnosis and customer behavior. The dynamic nature of human society and the inherent limitations of data, however, make it important to keep in mind that while AI excels at prediction, it must be used with caution because context, ethics, and human judgment are still crucial for properly interpreting and utilizing these predictions.

"Namely, that AI should improve predictions that we are interested in as a society. So as I said before, so AI has been described as as a prediction machine. So the main benefit would be is to have, let's make it very specific to more accurately predict all kinds of variables, and at the very detailed levels of the neighbourhood level that are relevant to create sustainable cities, traffic flows, temperatures, crime rates, and so on, and so on. So that is that, I think, is the main benefit that we would expect from AI because it would allow all kinds of policies to be more effective, do the right things and be more efficient." (C2)

AI has the ability to improve decision-making processes and build more sustainable cities through enhancing predictions in a number of fields. The creation of efficient policies can be influenced by the ability to precisely anticipate variables at a detailed level, including traffic patterns, temperatures, crime rates, and other pertinent aspects. As a result, resources may be allocated more effectively, and decision-making by policymakers may be facilitated, ultimately benefiting society as a whole. The ability of artificial intelligence to improve forecasts is viewed as a valuable tool to maximize results, foster efficiency, and guarantee that the appropriate actions are implemented.

4.2.2 Too many dependencies in algorithms

It is also said that those who used AI and those who generated it relied on it and trusted the algorithms too much. Even when implemented on a high-tech system and with a high level of intelligence, AI can still make mistakes and act improperly. While AI algorithms provide insightful and accurate forecasts, relying too much on them without careful consideration can have unexpected repercussions. Assuming AI is faultless can result in unquestioning faith in its suggestions, omitting the importance of human context and judgment. Additionally, biases found in training data might be transmitted into AI algorithms, enhancing discriminating and unequal social norms. When applied improperly, AI systems might amplify these biases and sustain unfair

results. When using these tools, people and organizations must be aware of the limitations of AI, use prudence when making decisions, and follow transparent and moral procedures.

"Like, if I'm black, and if I live in a certain area of the city. And if it turns out that this AI system that the police's using means that I also have 10 times more chance of being checked by the police. And obviously, I'm not going to be in fear, obviously the opposite. So I think that's a big issue with AI. And yeah, of course, all the typical things, so there'll be just talked about so so lack of resources. So the big companies, they they have resources enough to implement AI. But when you look at the typical city there, I think, a totally different set of stakeholders." (C2)

This is one of the examples that shows the usage of AI which is misconducted and shows that accidents can happen and are unbeneficial for the society. It is crucial that AI must be developed better with further resources in order to diminish this type of problem. In order to gain trust from the society and citizens, it is necessary to fix the AI Algorithms and still need assistance from the human capital to validate and double check the result from the AI algorithms. This episode highlights the need for ongoing growth and improvement in the area by providing a sharp illustration of the potential negative outcomes when AI is misused. It is essential to allocate more funds to improve AI algorithms in order to reduce such issues and encourage safe usage. In order to increase confidence in society, AI algorithms must be rigorously tested, validated, and transparently disclosed. To evaluate and double-check the outcomes produced by AI algorithms and ensure fairness, human oversight is still necessary. We can create a more solid and dependable framework that reduces the dangers of misconduct and enhances the societal advantages of AI technology by combining the strengths of AI and human intelligence.

4.2.3 Privacy concerns as challenges in using AI

Not all people are aware of the objective and mission to reach the Sustainable Development Goals, which in some cases will include and become sensitive with privacy matters (Al Nuaimi et al., 2015). Most people don't accept this condition and feel like the government is crossing the line of people's privacy data. The widespread application of AI technologies frequently entails the gathering and analysis of enormous volumes of personal data. Although this data is essential for developing accurate forecasts and training AI models, it also poses serious privacy issues. The rights of individuals to privacy are at danger due to the possibility of misuse or unlawful access to sensitive information. Furthermore, data aggregation and profiling-based AI systems may result in the development of extensive profiles, perhaps intruding upon personal liberties and autonomy (Ishii, 2019). It's crucial to strike a balance between using AI's capabilities for societal good and protecting people's privacy. Strong privacy laws, open data management procedures, and the use of privacy-preserving methods like anonymization and differential privacy are all necessary to address these issues.

"Cities will be more pressured to provide better quality services, increase efficiency and diminish associated costs, increase the level of productivity, and address congestion and environmental issues. Developers can help alleviate some of the anxieties of smart city residents by adding transparency and

education to their solutions. By developing with the community in mind and considering how they might respond to new technology, companies can gain trust from the people their solutions are intended to help.” (C4)

It draws attention to the mounting demands placed on cities to raise service quality, increase effectiveness, save costs, boost productivity, and deal with problems like traffic and the environment. In this situation, developers can significantly help calm residents' concerns about living in smart cities. Developers may close the communication gap between the community and technology by giving transparency and education top priority in their solutions. Trust and acceptance can be cultivated by designing solutions with the community in mind and by anticipating their reactions to new technology. Developers can better adapt their innovations to particular contexts by being aware of the requirements and concerns of locals. This helps to ensure that the solutions reflect the goals and values of the neighborhood. Additionally, actively engaging residents in the development process and providing them with feedback channels can promote a sense of empowerment and ownership. Developers can help smart city technology be successfully adopted and accepted by putting an emphasis on openness, education, and community cooperation. This will ultimately improve the lives of inhabitants and encourage a more sustainable urban environment.

4.2.4 MOI allows all kinds of policies to be more effective

Mission-oriented innovation has the ability to significantly improve the effectiveness of many policies across multiple areas (Edquist et al., 2012). Policymakers may develop a targeted and purpose-driven approach to problem-solving by defining ambitious targets and directing innovation efforts toward specific societal concerns. Mission-driven innovation promotes collaboration among various stakeholders, such as researchers, industries, and communities, to achieve a common goal. This collaborative endeavor brings together skills, resources, and knowledge from several sectors, resulting in the development of new solutions that can more effectively handle difficult challenges. Furthermore, mission-driven innovation encourages a long-term perspective, concentrating on long-term impact rather than short-term gains. It promotes the alignment of policies, laws, and investments to achieve desired objectives, maximizing resource allocation and promoting efficient and effective interventions. Policymakers may promote transformative change, address social concerns, and provide substantial benefits to communities and society at large by leveraging mission-driven innovation.

“AI algorithms analyze data from various sources to optimize energy consumption, identify patterns, and improve management of energy resources, reducing carbon emissions.” (C7)

4.3 AI Implementation in Cities

Several conclusions and thoughts regarding the implementation of AI in cities resulted from the interview sessions with various subjects. Different opinions and points of view were stated, with some similarities and considerable differences. The researchers identified a wide range

of viewpoints, experiences, and expectations from local authorities, inhabitants, and AI application experts. The potential benefits of AI in improving city services, increasing efficiency, and tackling urban difficulties were common topics. However, there were dissenting voices, raising concerns about privacy, equity, and the necessity for human oversight in AI-powered systems. These diverse opinions highlight the complexities of integrating AI in cities and the significance of taking into account many perspectives to guarantee inclusive and effective deployment. Further examination of the interview data showed useful insights that can be used to guide future AI initiatives and policy-making, highlighting the need for ongoing study and debate in defining AI implementation in urban contexts.

4.3.1 The Implementations are not well communicated

AI implementation is critical, and some of them are well implemented and used on a daily basis in the setting of smart cities. However, one of the respondents said that no one is aware of, or even recognizes, the existence of AI in their neighborhood. This demonstrates a lack of communication and socialization towards citizens regarding how AI exists and is offered to help and assist things, with the implementation and growth of AI being misunderstood in most circumstances. This can gradually become an issue for people and, of course, the government if their own citizens are unaware of what is going on in their city and how smart their city is. It can be said that communication to the citizens is very important in this stage to mitigate any other possible risks and thoughts from the citizens itself. Lack of trust in the government can happen eventually if the people realized how the governments wanted to keep things by themselves and not involve the citizens in this AI development. Privacy concerns will arise remembering in some cities it already was there even before the AI implementation itself.

"I guess, of course, AI plays a big role. my parents live in Antwerp a smart city. So yeah, yeah. So there's a sign saying like, Okay, you're entering the smart city. And then that's it. You just see that sign and you're entering the smart city. And then I was reading on that recently, and I discovered there's this lantern pulse, and indicate there's a light and that light is a color. If it's red, it means it's going to rain or something. Yeah, yeah. So this is like a smart city, Enter. And the thing is, and I've been living with my parents there for 30 years, I didn't know. And that's so stupid that there's this system telling you it's going to rain, but nobody knows. Yeah, yeah, I would say it's really cool. But also you're not like sharing this with the people who live there. There's nobody who knows. Okay. Yeah. So I think a lot more could be done." (C3)

Based on the explanation of the respondent, it explained that after several years of the technology in the city, then people realized about the functionality of the technology. It seems like a minor thing but it actually reveals how it hasn't been communicated well to the citizens. It's just an example of one thing but what if there are other things, which can be said to be more useful and important to be known by the citizens and yet still being a mystery for them about the functionality of it.

4.3.2 Not everyone are open with new technologies and changes

Individuals' anxiety and aversion to new technologies in cities are prevalent, and it is a natural human response. This is especially visible in the development and deployment of AI in metropolitan areas, where citizen participation is essential. However, not everyone is ready for this shift. According to one of our interviews, many are afraid of change and may be unaware of the need to adapt in today's world. Global digitalization is inevitable and active engagement will become more important in the future years. Individuals must grasp the importance of embracing technology innovations and using them wisely. This demands people becoming aware of and accepting of change. In order to create additional chances at this stage of digitalization, people will need to adapt. To avoid additional mind-closing about technological growth, it will be the first on the list to handle everything responsibly and share everything transparently.

"I think there is an awareness of a change is needed, the changes needed. That's one thing. And there is an awareness of technology, we need to use technology in a smarter way. And I don't know if there's a strong connection between those two, but it goes hand in hand in developing a city, so yeah, I got good results from that." (C1)

In certain situations, individuals may possess knowledge and awareness regarding new technologies and ongoing changes. However, the crucial factor lies in their level of interest and receptiveness towards these changes. This aspect is closely linked to the role of the government in effectively communicating the advantages and disadvantages of technology. It is essential for individuals to understand the potential contributions they can make and the benefits they can receive through technology, as well as how it can enhance their lives and provide assistance.

"So in my city as they have to start to implement it yet, I would say is, from my point of view, very important And is good information. So not just implementing it, but really informing citizens before the implementation. Okay, what is the benefit? While? What will be done? What can AI? Or how can AI support? I think that's a very important thing that citizens are informed before in a good way." (C8)

Since it is not easy to "penetrate" and influence the citizens about the new technologies, it is highly important to communicate about what this technology is all about and how it works before the implementation itself. It hopefully will help the citizen to understand more and be more open with the changes and not being very resistant about it.

4.3.3 Implementation of AI in cities are in question

During the researcher's interview procedure, it became clear that the application of AI technology has not yet occurred in various cities. This raises serious concerns about the function and necessity of AI in such situations. While AI has proved its potential in a variety of disciplines and cities throughout the world have begun to embrace its applications, the lack of AI adoption in specific cities warrants deeper investigation. Limited resources, competing goals, or concerns about the ethical and social ramifications of AI may all lead to reticence in implementing this technology. Understanding the causes for the lack of AI deployment in these places is critical for

assessing the possible benefits and downsides, as well as determining whether the role of AI is truly indispensable.

"Well, not too many at the moment. It's still new and maybe it still needs more development." (C5)

"So the answer is no. I haven't experienced this. Or maybe, maybe they use it. But to be honest, I doubt it." (C2)

In some smaller cities or developing countries, it appears that the AI implementation has not really been sped up and worked on towards its capacity. It's in the argument that small cities and developing countries are more in need of AI and may take a longer time for the citizens to absorb and fully embrace the changes. Despite all the perspectives of how AI has not been implemented, the researchers also found that some actually really benefited from the technology and it's well implemented in their cities.

"They use AI in police situations, searching people, but most people saying these things. AI is huge, the traffic and the results of steering the traffic to another side, right? There are so many things that AI is, I think in an ambulance even when they move to a crossroads everything happens by technology, and so thinking these kinds of things. So these are only the small things. So yeah, I realized that it's used a lot more than we do." (C1)

Based on this, it is evident that AI is very valuable and can be deployed effectively. It has a significant impact on residents' daily lives and is quite useful. Further study can be undertaken to extend the adoption of AI, and to ensure that it is implemented efficiently, research on the most advantageous ways of applying this technology in cities must be conducted. Cities with high crime rates, for example, must be assisted with AI in the field of security. Because it demonstrates the direct impact and benefits of employing technology, this precise implementation will eventually show and contribute to citizen satisfaction. This will gradually lead to the citizen's openness and desire to change and adopt new technology.

4.3.4 Concern regarding affording negative sides of AI implementation

The interviewees explicitly articulated that the integration of AI applications in the context of smart cities, with the aim of achieving sustainable cities and communities, is not without its drawbacks. Privacy concerns emerged as the predominant recurring issue raised by the interviewees, underscoring the criticality of addressing the ethical dimensions associated with the implementation of AI technologies in urban settings, particularly with regard to safeguarding individuals' privacy.

"People just don't like to be monitored too closely. Okay, so it's real, it's related to their privacy concerns." (C3)

The interviewees highlighted additional limitations associated with the deployment of AI applications in urban contexts. Concerns were raised regarding network hacking, potential job

displacement, and the management of personal data. These concerns underscore the necessity of considering these factors during the planning and implementation stages of AI technologies in cities. Moreover, the significance lies in proactively addressing these challenges by formulating appropriate solutions that mitigate risks and ensure the responsible use of AI in smart cities. An interviewee, serving as an urban profile facilitator, proposed the adoption of cybersecurity policies as a potential solution during the implementation of AI applications in urban settings. This approach aims to address the risk of network hacking, which poses significant privacy concerns. By incorporating robust cybersecurity measures into the implementation process, the potential vulnerabilities associated with AI technologies can be mitigated, thereby safeguarding privacy and enhancing the overall security of urban environments. Cybersecurity is the practice of safeguarding a nation's information society's existence and continuity, ensuring and defending its information, assets, and critical infrastructure within the realm of cyberspace (Canongia & Mandarino, 2012).

"The potential risks may be network hacking, but it might be mitigated by having a cybersecurity policy." (C5)

During a separate interview, an additional aspect was raised, highlighting the potential consequence beyond privacy concerns associated with AI implementation. Specifically, the risk of job displacement and the emergence of novel employment opportunities for individuals impacted by AI technologies were discussed. This phenomenon represents a recent trend whereby various job roles have been affected, leading to employee layoffs or substitutions as a consequence of AI integration observed in recent years.

"There is a risk of losing jobs, or at least a lot of people that will need to change from a very different job. Not always easy, but manageable. So as I stated, this can be a significant risk." (C6)

In another interview involving an Artificial Intelligence Developer, the discussion revolved around the concept of the "black box." It was acknowledged that AI, by its nature, functions opaquely, posing difficulties in comprehending its internal mechanisms (Bearman & Ajjawi, 2023). To address this challenge and promote the responsible and ethical implementation of AI in sustainable city development, efforts have been made to transform AI applications into transparent "glass box" models. Additionally, fostering collaboration among stakeholders is regarded as a viable approach in this context. By fostering cooperation and knowledge-sharing between different parties, such as developers, policymakers, and researchers, a collective understanding can be formed, leading to more responsible and transparent AI practices in sustainable city development.

"Although AI has enormous potential, implementation has certain risks associated. These risks primarily revolve around ethical considerations related to the lack of explainability and the black box effect, and the potential for bias in models resulting from improper training processes. To effectively mitigate these risks and ensure responsible and ethical deployment of AI in sustainable development and cities, collaboration among stakeholders becomes crucial." (C7)

When exploring the downsides of incorporating AI applications in the development of smart cities, it becomes imperative to strike a balance between the negative and positive aspects.

Achieving this equilibrium involves conducting a thorough assessment of optimal areas for AI utilization and carefully considering the intended applications. By judiciously identifying the most suitable contexts for AI implementation and setting clear goals, the positive impacts of AI can outweigh the associated drawbacks.

"There might be positive effects of AI, of course. But you have also, let's say, negative side effects, and therefore I would say, AI is great. But we should not step in the direction to say, okay, everything should now be done with AI, because it should only be applied where it is really useful." (C8)

Based on insights from the interviews, several strategies were identified to address this challenge. These include proactively informing citizens about AI implementations in advance and conducting validation processes and phase checks to assess the feasibility and impact of these initiatives. By adopting such approaches, stakeholders can ensure transparency, accountability, and the meaningful integration of AI technologies in smart city contexts.

"Informing citizens before the implementation is very important." (C8)

"Potential risks in using AI, are biases in the use of AI. To mitigate it, there must be some validation phase to check whether it makes sense or not." (C2)

Integrating AI applications in smart cities presents opportunities and challenges. Privacy concerns, network hacking risks, job displacement, and responsible data management need to be addressed. Strategies such as robust cybersecurity policies, transparent AI models, stakeholder collaboration, informed citizen engagement and validation processes can mitigate these challenges and ensure responsible AI deployment in cities. Striking a balance between positive and negative aspects and implementing these strategies will advance smart city development.

4.4 Successful Implementation of AI in Smart Cities

So far, implementing AI has been a hurdle, but making it successful is an additional challenge (Große-Bley et al., 2021). Not to mention citizens' concerns about privacy and whether or not technology should be used in public. Several factors are being considered as instruments to measure success based on the interviews that have been performed. People and money, for example, play vital roles in aiding the growth of AI implementation; keep in mind that they are both related and cannot work without the other. It goes without saying that the basis and basics of all actions in the process require resources that are not always readily available. These factors influence the rate of progress as well. This part will discuss mainly about the implementation process of the AI technology in Smart cities, and will be continued in the next part related to how to know and measure if it is really successful.

4.4.1 Successfulness of AI implementation hugely affected by financial and human resources

Referring to the interview sessions with the respondents, it demonstrates that adequate financial investments and the availability of qualified human resources are critical for the successful integration of AI technologies in urban areas. Financial resources, such as data infrastructure, hardware, and software, as well as ongoing maintenance and updates, are required to enable the procurement and implementation of advanced AI systems. Furthermore, money is essential for R&D activities that promote innovation and improve the efficiency and efficacy of AI applications in smart cities. Human resources are equally crucial in AI implementation. For planning, creating, and administering AI systems in smart cities, skilled specialists such as data scientists, AI experts, engineers, and urban planners are required. These people have the ability and experience to evaluate complicated urban data, create AI algorithms, and incorporate AI technology into existing municipal infrastructure. Furthermore, they play an important role in guaranteeing ethical concerns, privacy protection, and appropriate usage of AI in urban settings. Investing in the education and training of a broad and interdisciplinary workforce is critical to the growth and long-term viability of AI-driven efforts in smart cities.

Money without manpower or the necessary professionals will result in another project failure. The knowledge requires the necessary professionals to aim successfully and move the implementation forward so that it is completed on time and in accordance with the 2030 agenda. It is also critical that all stakeholders perform their roles and participate in the project's progress. Lower-level governments can also play an important role in educating individuals about how technology plays an important role and cannot be avoided in this digital era.

"... You need the right companies that have the expertise, have the resources that can implement those things? So these are definitely important." (C8)

"Yeah, so the factor is human resources and financial resources." (C5)

It is clearly stated by our respondents that it is crucial to have the right person, the right experts in developing and implementing the technology. Moreover, the money that is involved and needed in the project is not a small amount. To not waste it for unnecessary things is very crucial. It is not that there are unlimited resources to conduct the implementation successfully. In light of the information above, it is also validated that both money and manpower or human resources play crucial roles in the success of technology implementation in smart cities. Making a technology investment at this point is one big step that can't be done without maximum effort, since the people should be aware of the limitations.

4.4.2 The Role of Government

As the body and organization with the most responsibility and power in technology implementation and development, the government's position can be said to have a significant impact on the process (Stahl et al., 2018). Starting with the creation of legislation and policies for using AI to make citizens' lives easier, the government also plays an important role in ensuring that privacy concerns are not violated (Tucker, 2018). The government's top aim is to ensure that individuals understand technology, how it works, and how it may help them in their daily lives (Floridi et al., 2018). Gaining their trust is an important aspect of successfully implementing AI technology. In other words, it is correct to imply that besides the governments, citizens also take a big part as the key stakeholders.

"The very first factor that can succeed AI and Sustainable development is Regional leadership, for example the Mayor of the city,. That's the first thing, the commitment of the regional leaders. That's supported by other stakeholders, such as academics, entrepreneurs, and communities." (C5)

"... you have the local governments, you have education, you have entrepreneurship. And I think those four groups you grew up right." (C1)

In some cases, which are also mentioned by one of the respondents that lives in a more less developed country, it is implied that the role of regional leaders or government in smaller regions are also affecting the process of implementation. It is simply because they have the closest relationship with local communities and citizens. Especially in very large countries or cities, everything must be started small and from the bottom. To make sure the others that this implementation is safe enough and brings benefits, it must start from a small circle and go up wide. By being an example to others, will ease the process of implementation and increase the trust of the citizen.

4.5 Measuring the Effectiveness of AI Implementation in Smart Cities

Implementing AI technology in cities is already a difficulty, but how will it be understood whether it is successful or not? The implementation's purpose is to improve performance and make the city a better place for everyone. By regularly reflecting on the process and identifying areas for improvement, the implementation will steadily improve. Not only that, but it is also crucial to determine which parts are necessary and which are not. It will greatly accelerate the process of achieving the 2030 Agenda by being effective and efficient. This section will also explain how to deploy the technology and what it provides in return. The results of this analysis will reveal how it genuinely works and how successful it is, or whether it is too expensive to spend with little return. To eliminate bias and really assess effectiveness, the indicators must be re-checked and re-defined. It is critical to compare before and after deployment using precise and appropriate indicators.

4.5.1 Cost of the System and What in Return

In light of the information gathered from the interview sessions with the respondents, there are a few reasons that demonstrate that in order to estimate the efficacy, it is necessary to determine how much money is required to execute the technology. Knowing how many and how much has been spent will allow you to determine whether it is effective or not. For example, the costs of delivering and investing in technology are expected to be worth the benefit given back to the city and to the citizens and residents of the city. Those are the criteria to consider if it is implemented accurately, effectively, and is worth the investment. Apart from the other measurement instruments, this type of measurement is one of the most significant, as stated by some of the other responders.

"So so if I were a mayor of a city, let's think about it that way. And if I want to know whether it makes sense, or whether the AI is actually working well in my city, with look at the difficult parameters that I always look at, what does the system cost? What is the return? So are the number of traffic jams is that actually going down? is the number of burglaries in houses in my city going down? I mean, these are things that are not strictly speaking, directly related to AI as such, these are outcome parameters. And I would look at these outcome parameters." (C2)

"Measuring this, I guess you would have to do it over time. Now seeing how much money has been saved after you have used this, yeah, there's kind of no other way to know. Um, every year they measure different previous surfaces of Flanders and now it's like 14% 15%. Every year this percentage goes up. I guess if you make a big change, this would change over time. " (C3)

"So far, I have Measure it by comparing the absorption of budget used in the Smart City programme and its achievement from the initial target, especially for programme that use AI in their activities such as transportation management, disaster risk management, and we compare about the absorption of the budget." (C5)

By comparing how much money was spent or absorbed in terms of cost and the outcomes obtained in a specified time frame, it is possible to determine whether the implementation was effective enough and whether the technology should be continued in the future. Because if it does not yield a positive return, all of the money spent on the investment will be for naught. As a result, there should be no need to continue using the technology.

4.5.2 Defining Relevant Indicators

One of the interviewees said that the necessary and precise instruments must be utilized to accurately measure the success of technology in smart cities. In order to avoid undesirable outcomes, the indications should be double-checked. Is it relevant enough, or is it already in the correct place? For example, what indicators are relevant to measuring the effect? Is it related to emissions? Is it something else entirely? As a result, the situation prior to implementation, after implementation, and the indicators employed are critical. Following that, a comparison should be made to truly quantify the effectiveness.

"...you need to define indicators that are relevant. So which indicators are relevant to see an effect? Is it emissions? Is it more qualitative things? Like how satisfied are citizens with the implementation? So you need to define indicators? First, you have the situation before the implementation, you should evaluate the indicators chosen before that, and then do the same after the implementation. So we have the comparison before and after the assessment, and then you see, okay, is that really the effect that you try to achieve or not?" (C8)

When the outcomes before and after execution are compared, and the result is in accordance with what the city intends to achieve, the project can be considered successful. If not, there should be an evaluation and a room for input on the implementation process.

4.6 Aligning the Usage of AI in Sustainable Development Goals

It is critical to ensure that AI technologies align with the Sustainable Development Goals (SDGs) in order to achieve smart cities that are sustainable, inclusive, and egalitarian. The Sustainable Development Goals (SDGs) give a widely recognized framework for solving the world's most critical social, economic, and environmental concerns. Smart cities may optimize their positive influence and contribute to the larger objective of sustainable development by connecting AI technology with the SDGs. The usage of AI technology, which can be called something new in this digital era, sometimes brings up biases and is not in line with the goals that wanted to be reached, which is the Sustainable Development Goals. It is very essential to keep and to always make sure that during the process, it all still in line with the goals. By aligning usage of AI in smart cities with the Sustainable Development Goals, there will be some challenges that can be mitigated, and risks that can be diminished. For instance, by not breaching and violating the ethical and privacy related matters of the citizens. It all wrapped in the 17 goals of Sustainable Development Goals.

4.6.1 Involvement of Experts

Respondents mentioned that there must be someone with better knowledge and experience, or can also be called experts, who monitor the projects and are open to having discussions about it in order to ensure that the entire process of using AI technology is aligned with the Sustainable Development Goals. In other situations, the process may be out of sync and deviating from the aims and objectives, in which case the specialists can assist in bringing it back into alignment and straightening the course. According to one of the respondents, a Ph.D. student, there should be a report to the supervisor, as well as feedback and the ability to consult with them. Involving specialists from the start is also critical so that the monitoring process runs well and does not break down in the middle of the process.

"So in these ways, they do measure and track if it's actually if I'm doing a project that is going to help the world so in those methods, I guess by monitoring by research, there's a board voting and giving me advice and guiding me a certain direction giving me assignments." (C3)

This demonstrates that there is a close monitoring mechanism in place for individuals who work on this project to ensure that everything is in line with the aims and only results in positive outcomes. There is also a board that votes and gives advice to ensure that the research is neither prejudiced or misdirected.

"...So really cooperate with experts in this field, also really integrate citizens, how they perceive the plan, AI application, what they think about it, because then you also see how the perception of citizens of other people is, and this also helps you in deciding is this really ethical enough? This has to start already for you."
(C8)

According to this respondent's answer, one important thing to do is to combine experts and to try to see things from many viewpoints. It is also mentioned that the citizens should be informed about the project and how they feel about it. Given that people may have differing viewpoints, particularly citizens who will be directly influenced by technology implementation, their point of view is critical and may bring value to the development and implementation of the technologies. This should be done to minimize future misunderstandings and unpleasant complaints from citizens.

4.6.2 Measurement in General

According to one of the respondents in this study, being sustainable in accordance with the goals requires a lot of work, and there are sometimes blindspots that people are not paying attention to. There are sacrifices made in order to reach the goals or objectives, and it might be argued that this is not fair to the other party who must make the sacrifices. Creating an impact is not as simple as flipping a coin, but there must be more consideration of what takes into account, prices to pay that are not only quantifiable but also by all means. Finally, it is critical to consider the big picture, assess everything that plays a role, and accept responsibility for completing missions. This also implies that instead of focusing solely on one objective, look for others. Saving and attempting to complete one objective while sacrificing the other is detrimental to the overall performance of this process.

"If you take a look at cities, and there has to be a balance in what is done in the cities, a balance between all the goals and well, it's like give me give me an answer. An example, if a city should decide to go for 100% electric cars. They support children labour, because in the accumulator of every Tesla, as we accumulate in every accumulator is Let's say the mineral what's the name is cobalt and Cobalt is coming from the mines in Congo and Congo children are getting it out of the mines. So in this balance, it's all important to find, to find the right balance between how to use it, how to implement those bills. If you translate it to AI, it might help if the goals of the old accumulators and the telephone, the cell phones and these kinds of things, it's coming back and reused or something like that. So measuring in general, they are involved in measuring in general, what happens and what comes back and what's recycled, and how circular the city is, might be important and really helpful to make people aware of what they do." (C1)

In light of the information given above, it explains how trying to achieve and reach one goal, will sacrifice the others. It is a huge point to work on, that to keep the alignment of using the

AI technology and the Sustainable Development Goals are actually going together on the positive sides and not going south. Socializing this and let people know about the process is also important, so that they know what they are working on is not for nothing.

"...So in the end, we have to make sure that the KPIs were talking before that so we're setting In my perspective, and I'm applying AI to reach these operational benefits to improve the mobility to make it easier to move from A to B to C, they tend to have less cash going to the city, whatever it's the goal for what you're doing. Okay? This is an operational world, it's not a goal of the technology itself, it's a wall of the traditional wall, that you are actually connecting a solution to how you think this Neverland that is the definition. So always important that every time you are using this technology, in general, it's applied to something that you want to improve stability. And obviously, for me, this isn't always a spot to give the city itself that decides, Okay, I want to implement this technology, this type of technology to solve this issue. Okay, then I make sure that this is aligned with the country." (C6)

Once again mentioned by another respondent, that rather than focusing primarily on technology concerns, a holistic approach is required. This viewpoint emphasizes the importance of evaluating the technology's overall benefits while conforming to the values expressed in the Sustainable Development Goals. It highlights that achieving partial success by completing a small number of goals while ignoring others and failing to complete the most important objectives does not result in a satisfactory conclusion.

4.7 Improving Urban Growth and Sustainability

It is clear that the 11th SDG which is Sustainable Cities and Communities is promoted by sustainable urban growth. Cities may improve accessibility, reduce congestion, and improve the general quality of urban life by implementing smart urban planning, efficient land use, and integrated transportation systems. Sustainable urban growth also includes the creation of green areas, the preservation of cultural assets, and the provision of affordable housing, all of which contribute to the SDG 11 aims. But it is also explicitly visible that in order to speed up the process and to work in line with urban growth, cities can not develop by themselves. With the growing population that happens in lots of cities, there should also be financial resources that support the process of handling it. Improving the infrastructure, and facilities needed are very important in this case to manage urban growth. Unfortunately, based on the interview session with the respondents, the limited resources in terms of financial support are not sufficient to handle the growth of the population. This issue about urban growth comes up as an urgency in the context of cities, especially the one with a large number of populations. Thus, it is understandable that governments has their own agenda and planning. But, it is also crucial to handle this issue as soon as possible before the condition is impenetrable.

4.7.1 Some Cities Are Underfinanced to Handle Population Growth

Based on the insights provided by the interviewees, it is apparent that the achievement of sustainable cities and communities is hindered by the challenge of insufficient financial resources.

As highlighted by the interviewees, cities, including Brussels and Athens, face limitations in terms of funding, making it difficult to progress toward the 2030 agenda and implement initiatives aimed at sustainable urban growth. The availability of adequate financial support is crucial for cities to adopt and implement AI infrastructures and address the various aspects of sustainable development. Without sufficient financial resources, cities may struggle to improve infrastructure, manage urban growth, and provide essential facilities and services necessary for sustainable urban development. Thus, the issue of inadequate funding emerges as a significant obstacle that needs to be addressed to accelerate progress toward sustainable cities and communities.

"A city like Brussels, I think everybody agrees that it's under-financed." (C2)

"Nowadays, and specifically in Greece, I believe that money is the main obstacle" (C4)

Sufficient financial support is vital for cities to embrace AI infrastructures and effectively tackle different facets of sustainable development. Inadequate funding creates barriers to enhancing infrastructure, managing urban growth, and delivering essential facilities and services required for sustainable urban development and accelerating toward the 2030 agenda.

4.7.2 Mismatch Between Infrastructures and Population Growth

The interviewee's perspective sheds light on the issue of a mismatch between infrastructure development and population growth, which poses significant concerns for the city's future. As the population continues to expand, the interviewee emphasizes that the infrastructure required to support the growing number of residents is not keeping pace. This disparity raises fears that, without adequate infrastructure development, the city will face substantial challenges in the coming years. This insight underscores the importance of aligning infrastructure planning and investment with population growth to ensure the sustainable development and well-being of the city and its residents.

"Infrastructure for supporting these new citizens is not growing in the same amount as population growth. And this is something we fear for our city that in some years, this mismatch will definitely lead to great difficulties in our city." (C8)

Failing to bridge this gap may result in significant challenges for the city in the future. Thus, prioritizing the alignment of infrastructure planning and investment with population growth becomes essential to ensure the long-term sustainability and well-being of the city and its residents.

4.8 Challenges and Solutions for Using AI to Achieve the 2030 Agenda

The integration of artificial intelligence (AI) holds immense potential for advancing sustainable cities and communities, which aligns closely with the objectives of the 2030 Agenda. However, leveraging AI effectively to achieve these goals presents certain challenges. This section

explores the key challenges encountered when deploying AI in the context of sustainable urban development, based on insights from conducted interviews. Additionally, it examines potential solutions to address these challenges. The findings highlight the importance of raising awareness among individuals regarding the imperative of embracing change, effectively communicating the benefits of AI within the framework of sustainable cities, and defining sub-goals and implementing measurable actions to facilitate the realization of the broader agenda. By proactively addressing these challenges and implementing appropriate strategies, AI has the potential to serve as a catalyst for sustainable urban development and contribute to the attainment of the 2030 Agenda's objectives.

4.8.1 The Lack of Awareness Among Individuals Regarding the Necessity for Change

During the interviews conducted, it became apparent that a significant obstacle hindering progress toward the 2030 agenda is the prevailing lack of awareness concerning the need for change. This observation was consistent across interviewees from diverse regions, including Asia and Europe. One interviewee pointed out that this lack of awareness could stem from individuals still holding onto traditional mindsets and feeling unfamiliar or hesitant about embracing the digital world. The persistence of these attitudes presents a challenge in effectively harnessing the potential of AI technologies and implementing sustainable practices. Therefore, raising awareness, promoting digital literacy, and fostering a mindset shift among individuals are crucial steps to overcome this barrier and drive progress toward the 2030 agenda for sustainable cities and communities.

"The main challenge in Indonesia is to change the mentality of the conventional population into a digital society. A lot of people still have the traditional mindset and don't want to change to a more digital world." (C5)

As highlighted by the interviewees, effective communication plays a crucial role in addressing the challenge of driving change toward sustainable cities and communities. A proposed solution, derived from the interviews, emphasizes the significance of clearly communicating the goals, benefits, and overarching mission to the public. By demonstrating tangible results and showcasing the benefits of achieving sustainable development, individuals are more likely to be motivated to shift their mindset on this issue. Furthermore, the interviewees emphasized the importance of transparently communicating the sources of technological advancements and assuring people that the responsible use of technology will not pose harm to them. It is essential to engage in open and honest dialogue, providing convincing explanations and demonstrating the positive impact that technology can have on their lives. The interviews also highlighted the pivotal role of continuous communication and engagement with people to socialize the mission effectively. Once individuals grasp the significance of sustainable cities and communities, concerted efforts should be made to support them in changing their mindset and embracing the shared goal. By fostering understanding, addressing concerns, and providing necessary guidance, the journey towards sustainable cities can be advanced with the active participation and commitment of the public.

"I think it's really the biggest challenge is to make people aware of the need for change. I think that's the biggest challenge. ... Sometimes you have to see it, and then you believe it." (C1)

"I think as long as you can clearly argue with results come from and that it really benefits people, then it's easy, but if it's a bit fuzzy work results come from, and if you suspect that it might actually harm you." (C2)

"I guess socially, people need to kind of adjust their thinking. change their mindset, So if we can kind of, you know, spread this out to the public, change their opinion a little bit, convince them that it's actually good." (C3)

The interviews highlighted the significant barrier of limited awareness regarding the need for change, hindering progress toward the 2030 agenda for sustainable cities and communities. Overcoming this obstacle requires effective communication to raise awareness, promote digital literacy, and foster a mindset shift among individuals. Transparently demonstrating the benefits and responsible usage of technology is crucial in gaining public trust and support. By addressing the awareness gap and engaging the public, we can accelerate progress toward sustainable cities and communities.

4.8.2 Defining Subgoals and Measures to Achieve the Overall Goals

One interviewee highlighted a challenge related to European funding versions and their emphasis on innovation. They expressed that there is sometimes a lack of awareness regarding existing solutions that can effectively address certain issues. Despite their potential to solve problems, these solutions may go unnoticed or unrecognized due to the prevailing focus on innovation. This observation underscores the importance of considering and exploring both innovative and existing effective solutions when striving to achieve the desired outcomes. By broadening the perspective and embracing a balanced approach, it becomes possible to leverage a wider range of strategies and measures in pursuit of the overall goal.

"For the European funding versions, they want everything to be very innovative. But at the end of the day, sometimes there are all solutions are so that can solve or address some issues. And they just don't know." (C6)

Another interviewee emphasized the importance of not only focusing on the overall goals but also considering the sub-goals and the specific measures required to achieve them. This perspective highlights the need for a comprehensive approach that acknowledges the significance of defining and pursuing sub-goals as stepping stones toward the ultimate objective. By identifying and implementing targeted measures aligned with these sub-goals, cities can effectively progress toward the overarching goal of sustainable development. Integrating this insight with the previous observation regarding the awareness of existing solutions, it becomes evident that a balanced approach, encompassing innovation as well as proven measures, is essential for driving meaningful progress toward the 2030 agenda and sustainable cities and communities.

"We are always talking just about the overall goals, but we forget about the sub-goals and the real measures we need to take to achieve the sub-goals and then come to the overall goal." (C8)

The interviews shed light on the challenges and considerations associated with achieving the 2030 agenda for sustainable cities and communities. The insights revealed the need to strike a balance between innovation and existing effective solutions. While innovation is important, it is equally vital to recognize and leverage proven measures to address specific issues. Additionally, emphasizing sub-goals and defining actionable measures is crucial for making progress toward the overall goal. By adopting a comprehensive approach that integrates various strategies and ensures awareness of existing solutions, cities can effectively advance toward sustainable development and successfully meet the targets of the 2030 agenda.

5. Discussion

5.1 How does the relation between public sector, private sector and educational institutes affect Mission-Oriented Innovation to reach smart cities and communities by using AI?

Based on the findings of the research, which included multiple interviews with respondents, it was established that prior to the introduction of the Sustainable Development Goals as a Mission Oriented Innovation, there was little knowledge of the global crisis and the urgency with which it must be controlled. However, in the recent situations there is already more development and improvement towards the methods in achieving the Sustainable Development Goals, and fortunately being done by collaboration of public and private sectors, also with educational institutes. It is also described that Universities work on reaching the goals by conducting daily activities integrating the missions themselves in order to follow the missions.

According to Jütting (2020), the study of mission-oriented innovation ecosystems reveals that the public sector plays a more prominent role. In several subtypes of mission-oriented innovation ecosystems, governments go beyond their conventional regulatory role to actively construct and orchestrate ecosystems. This finding is consistent with the government's broad change in mission-oriented innovation policy (Mazzucato, 2018). It is hence confirmed in the findings that the government has a crucial role, playing as the policymakers. In the process of realizing the concept of smart cities, it shows that there are several challenges that need to be addressed, such as money and human resources. It is not a surprise those two things can be said as the most powerful factors affecting the process toward the goals. Despite not being mentioned earlier in the literature study, the finding shows that indeed it has been a main obstacle. The investment in technology innovation required huge amounts of money and it appears that in some developing countries, it is still not in the picture. Even worse, the spreading itself will take a while considering the huge size of the countries.

The next challenge found during the research, the availability of experts also plays an important role in achieving the goals. This suggests that financial limits may not be the only impediment to development; rather, a fundamental problem in implementing transformative initiatives toward climate-neutral cities is a shortage of adequately skilled experts. It is also supported by Hák et al (2016) that experts and scientific support are required to create and/or deploy appropriate techniques for enhancing the frequently overlooked indicator trait - relevance. This finding is also supported by the fact that these perspectives come from an ongoing Ph.D. Student and a Senior Researcher which makes these points more valid. According to Frandoloso and Gasparetto Rebelatto (2019), universities have a significant responsibility in shaping societal transformation and developing individuals who can actively contribute to the achievement of the Sustainable Development Goals (SDGs). This encompasses both theoretical advancements and practical initiatives, highlighting the crucial role universities play in driving sustainable development efforts.

Next, there is a challenge that is also sourced from the finding of this research, which is the policies and regulatory framework. It was mentioned in the finding that it is needed to have a bottom-up experiment process that needs the collaboration of public and private organizations, along with educational institutions. This bottom-up approach is indeed very important to innovate and also to know where the problems are and how to solve them during the experimentation. But on the other hand, the participation of the government and public buddies who are in charge of defining the issue, reverse the whole thing and make it back into a top-down approach. Over the past decade, the European Commission's stance on sustainability has undergone a significant shift. Previously, its approach was guided by the principle of subsidiarity, which aimed to avoid involvement in policies that could be adequately addressed at the national, regional, or local level (May et al., 2017). However, the impact of this change in attitude does not appear to be fully integrated into the current context.

As autonomous bodies, international bureaucracies have an impact on global governance processes (Widerberg & Van Laerhoven, 2014). One of the respondents presented a case that was also highlighted in the conclusion that the administration, along with the public bureaucracy, is often cumbersome and takes time to process and implement technology. This condition needs extra solutions in order to streamline the procedure and make it less complex. Given the importance of government and its role in achieving the Sustainable Development Goals, it is critical to reduce this level of complexity. This is supported further by the fact that bureaucracy can be a barrier to technological innovation because most new discoveries reflect a shift in how things are done (West, 2005).

Referring to the finding of the research, there is also a case when the government depends too much on AI technology and on the algorithm which results in misconduct of its actual usage. This shows that it is not wise to be completely dependent on technology even if it is something that the government runs. This issue can be a huge thing and will directly affect the citizens to be more untrustworthy with the government. Moreover, it will drive them to be more resistant and not want to accept the technology. On the bright side, the whole situation of Mission Oriented Innovation plays an important role in making the policies in overall terms more effective (Edquist et al., 2012). This triggers the collaboration of multiple players such as the Public sector, Private sector, and also educational institutions. They are more oriented to the common goals and increase the connectivity between all parties involved.

Based on the research findings and interviews conducted, it is evident that the collaboration between the public sector, private sector, and educational institutions plays a crucial role in achieving mission-oriented innovation for smart cities and communities using AI. The involvement of these stakeholders has led to increased awareness of the urgency to address global challenges and has contributed to the development of methods and approaches for achieving the Sustainable Development Goals (SDGs). The government's role as policy-makers and orchestrators of innovation ecosystems is significant, while universities have a responsibility to shape societal

transformation and develop individuals capable of driving sustainable development efforts. However, challenges such as financial constraints, limited availability of experts, and the need for effective policies and regulatory frameworks remain. Addressing these challenges requires bottom-up experimentation and a balanced approach that leverages the strengths and contributions of all stakeholders involved. By fostering collaboration and connectivity, mission-oriented innovation can lead to more effective policies and meaningful progress towards sustainable cities and communities.

According to the research by Gascó-Hernandez(2018), analyzing the case of Barcelona as a Smart City, Barcelona worked with a diverse group of local and regional stakeholders, particularly businesses and universities, to develop and implement its smart city strategy. Despite differences in the management strategy of various programmes, the city gained considerably from public-private partnerships and coordination with other governmental organizations. This supports the fact that collaboration has proven to provide positive outcomes for the development of Smart Cities project, and also confirms that collaborative actions across parties are needed and indeed very essential to be successful.

5.2 How to successfully implement Artificial Intelligence as a tool to achieve smart city development?

Referring to the researcher's finding, as basic as implementing Artificial Intelligence is already part of a challenge. But to make sure the implementation is successful, will be another level. The AI technology itself already has a lot of challenges to just be accepted by people and with their own perceptions. Some do not really get and understand very well the benefits, and advantages and only look at the downside of technologies. Despite those conditions, the role of government is considered very important to deliver good and detailed information through specific communication to the citizens. It is crucial to inform the citizens about how the technology will work and how it will assist and ease them in their daily activities. This hopefully will reduce more risk in the late responses from the citizens and their awareness about the existence of the technology, like the one that was explained in the finding.

Despite people's preparation for new future technologies, there appear to be others who are unaware of the changes and even refuse to embrace them. The overall findings suggest that individuals commonly exhibit reluctance to embrace change and adapt, as evidenced by various articles highlighting the frequent resistance encountered when introducing new technologies to users (Venkatesh et al., 2000). Extensive research has explored the connection between the adoption of new technologies and resistance to change. Studies have demonstrated that user resistance significantly impacts the implementation of information technology (Cooper and Zmud, 1990), while factors like uncertainty and changes in job content have been identified as underlying reasons for resistance to adopting new technologies (Jiang et al., 2000). It is reasonable to say that this is a major issue that seriously threatens the process of technological growth in cities. According to Krajo et al (2019), not only large corporations and businesses play a significant part

in achieving the Sustainable Development Goals, but also small and medium-sized firms must be willing to adapt to new changes in the modern technological era. This will directly affect the process of reaching Sustainable Development Goals.

On the other hand, AI implementation is still unequal and unbalanced in most instances. According to the researcher's findings, not all respondents can explain and relate to the application of AI because they have not personally encountered it, at least not in the cities where they live. This begs the issue, is AI implementation actually too sluggish and should be accelerated in light of the 2030 deadline? Indeed, it is critical to focus on this issue, because the implementation of AI truly benefits society, according to the conclusions of this study, as indicated by one of the respondents. Crime may be effectively dealt with with the assistance of AI technology. So it is comforting to know that there are many things that AI can actually perform.

The challenges and constraints related to the integration of AI applications in smart cities highlight the importance of addressing these issues in order to achieve responsible and ethical AI technology deployment. The conversion of ethical values into technical procedures can be accomplished by employing a variety of tools and methods at various phases of a project's lifespan. These strategies enable the practical application of ethical standards, ensuring that the essence of ethical principles is effectively transformed into the operational aspects of technical mechanisms (Morley et al., 2020). Privacy appeared as the most common issue among interviewees, emphasizing the need of protecting individuals' privacy when deploying AI in urban environments. To reduce privacy issues, one responder proposed implementing strong cybersecurity regulations that include measures to prevent network hacking and secure personal data. Another major issue mentioned throughout the interviews was the possibility of job displacement as a result of AI integration. As stated in the study, AI technologies have the potential to disrupt many work roles, resulting in layoffs or substitutes. It underlines the necessity of controlling this risk by easing persons' transitions into new career prospects and recognizing the problems that come with such shifts.

Another issue in implementing AI technology is the opaque aspect of AI, also known as the "black box" effect. The lack of explainability and potential biases in AI models necessitate careful consideration in order to maintain responsible and transparent behavior. One potential approach to address this is to promote "transparent model reporting" by providing documentation that outlines the performance characteristics of the models (Mitchell et al., 2019). However, it is important to note that governance strategies centered solely on documentation may run the risk of being detached from the actual sociotechnical processes involved in innovation practices they aim to document (Burr & Leslie, 2023). One way to promote responsible AI practices in sustainable city development is by transforming AI applications into transparent "glass box" models. This transformation necessitates collaboration among stakeholders, including developers, policymakers, and researchers, to foster a collective understanding. Additionally, there is a call to strengthen regimes of "auditability," (Mökander & Floridi, 2021; Raji et al., 2020) "traceability," (Kroll, 2021) and "reviewability" (Cobbe, 2021) to ensure effective governance in responsible AI research and

innovation. These measures emphasize the significance of oversight, accountability, and transparency in governing AI technologies.

The significance of evaluating suitable regions for AI implementation and carefully considering its intended applications is emphasized. This ensures a balance between the potential benefits and drawbacks of integrating AI technology. The positive effects of AI can outweigh the related negatives provided appropriate situations are identified and explicit goals are established. Several techniques are given to address the highlighted difficulties based on insights from the interviews. Proactive public participation and communication are among these tactics, as are validation processes and phase checks to analyze the viability and impact of AI efforts, and fostering transparency and accountability in AI implementation.

A few elements derived from the researcher's results play a significant influence in the successful use of AI technology in smart cities. It is fair to state that technology necessitates significant investment, whether quantitative or qualitative. Manpower and money are two critical aspects that have a direct impact on the process. It is also said multiple times that those two things are intertwined and cannot exist without one another. Tons of money will yield no or even negative results if not carried out by the correct person or professionals. A large number of experts without financial support will render them ineffective. As a result, those two elements are required.

The role of the government is inevitable in the successful implementation and overall process of these Sustainable Development Goals. Local government plays a pivotal role in both the direct and indirect aspects of sustainable development. Their direct involvement encompasses enacting laws and regulations, providing essential infrastructure, ensuring security and a safe environment, addressing crime and terrorism concerns, maintaining stability, and facilitating international cooperation. Additionally, local government's indirect involvement includes providing support to private sectors and offering incentives to encourage their development within the locality. This multifaceted engagement enables local governments to actively contribute to sustainable development and effectively communicate technological advancements to residents and communities (Gorica et al., 2012). It is also stated in the current study that local government or regional leaders have a considerable impact on communicating technology facts and specifics to residents and communities. They have the closest interaction with the population and are most likely to tell them of every detail and make them aware of technical advancements. Indeed, it is justified that when creating, implementing, and assessing relevant projects, no smart city can engage its residents merely as recipients of its interventions, but also as partners in determining the type of city they wish to live in (Gascó-Hernández, 2018). Not only speaking in terms of theoretically, but it happened in the case of Barcelona as a Smart City and it has already proven to be one of the best and set as an example for other cities.

The successful implementation of Artificial Intelligence (AI) as a tool for smart city development requires addressing various challenges and constraints. It is crucial to overcome the resistance to change and ensure effective communication between local governments and citizens

regarding the benefits and functionalities of AI technology. Moreover, careful consideration should be given to the ethical and societal implications of AI integration, including privacy concerns, job displacement, and the opaque nature of AI systems. To promote responsible AI practices, stakeholders need to collaborate in transforming AI applications into transparent models and strengthening governance strategies such as “auditability”, “traceability”, and “reviewability”. Evaluating suitable regions for AI implementation and considering its intended applications play a vital role in striking a balance between the positive and negative aspects of AI integration. Additionally, the role of the government, particularly local governments, is crucial in enacting laws, providing infrastructure, ensuring security, and supporting private sector development to contribute to sustainable development and facilitate technological advancements. By addressing these factors, AI can be successfully implemented as a valuable tool in smart city development.

5.3 How to evaluate mission-oriented innovation’s impacts to reach sustainable cities and communities by implementing AI to develop smart cities?

There are ways to assess the evaluation process and to determine whether everything that has been done has been successful. According to the researcher's results, the cost of the system and what comes back as a consequence could be one of the measurement tools. It is critical to consider how much money is invested in developing technology and how much money is returned. This evaluation tool determines whether it is worthwhile to spend the money. According to Sachs et al (2019), there are numerous instruments available to measure the outcome, including the Global Partnership for Sustainable Development Data. As a result, there is still a gap between all of the data acquired, which should be filled by combining official and unauthorized data. This should serve to supplement the measurement method for evaluation.

There are also biases in the use of the indicators, as described by one of the interviewees. It is addressed that recognizing and establishing the appropriate indications is critical. This demonstrates the possibility of misunderstanding and misleading outcomes when using incorrect or faulty indicators. So the next stage is to compare the situation before and after applying the indications to determine whether or not it is successful. In a case study regarding Bristol’s smart city agenda by Lockwood (2020), city stakeholders collectively identified three new priorities: connectivity, environment, and homes and communities. These priorities establish a shared framework of targets and indicators that encompass various dimensions of sustainability, aligned with the United Nations' sustainable development goals. These goals encompass connectivity, economy, environment, health and wellbeing, homes and communities, and learning and skills as main thematic boards, followed by different sub-themes for each thematic board. By defining clear targets for each indicator, cities like Bristol can effectively measure and track their progress towards sustainable development. This approach allows for a comprehensive assessment of the city's performance across multiple dimensions, enabling policymakers and stakeholders to identify areas that require improvement and allocate resources accordingly. Also based on the case study and practical experiences on Barcelona as Smart City, it is mentioned that they had a numerical calculation on how much is in return for the Smart City project. According to Gascó-Hernández

(2018), it is shown that Between 2011 and 2014, the projects contributed €43 million to the city's economic activities. Not only in the financial point of view, the smart-city projects were also predicted to save 9,700 tonnes of CO₂ and 600,000 liters of water per year at the time. This is an excellent measurement tool for determining if projects are effective or not, and it is recommended that it be utilized as a model for other communities.

During the implementation phase, it is sometimes not in accordance with the Sustainable Development Goals, and more emphasis is placed on the technology itself rather than the overall goals that were intended to be attained. That is why it is critical to ensure that AI implementation is in line with the Sustainable Development Goals. Lockwood (2020) emphasizes that while technology plays a crucial role in driving change, it should not be seen as the ultimate objective. Instead, the focus should be on the broader vision of creating an inclusive, sustainable, and vibrant city. Technology serves as a valuable tool in empowering individuals to shape their future and transform the envisioned goals into tangible reality within the context of Bristol's smart city development. In this process of achieving sustainable development goals, no one can be left behind (Sachs et al., 2019). Regarding the findings and respondents' experiences, it is adequately stated that the presence of experts plays a significant role in monitoring the path of AI implementation so that it is in line with the overall missions. It is envisaged that by being monitored and performing regular updates and communication, the performance of persons who work on these goals would remain on track. Perspectives from various groups of individuals are also required to perceive things from various angles. For example, individuals can be informed about the ongoing project and asked for their opinions and suggestions on how it might be improved, as they will be the ones directly impacted by the innovations in the future.

Finally, the findings suggested that performing the measurement in general is critical. To achieve success on one side of the goals, no sacrifices must be made. In definition, all parties must benefit from the process, and returning to the preceding point, no one should be left behind. It is once again emphasized that it is not wise to overlook the other sections, either accidentally or deliberately. This demonstrates the importance of measuring things from a broad perspective and in the context of the larger picture.

Evaluating the success of AI implementation in achieving sustainable development goals requires careful consideration and measurement. Assessing the cost-effectiveness of the system and analyzing the return on investment can serve as valuable evaluation tools. Additionally, recognizing and establishing appropriate indicators is crucial to avoid biases and misleading outcomes. Comparing the situation before and after applying these indicators helps determine the success of the implementation. The case of Bristol's smart city highlights the importance of defining clear targets for each indicator, enabling effective measurement and tracking of progress. Aligning AI implementation with the Sustainable Development Goals and involving experts and diverse perspectives ensures that no one is left behind in the pursuit of sustainable development. Ultimately, a comprehensive and broad perspective is necessary to measure success and ensure that all parties benefit from the process.

5.4 How to accelerate the 2030 agenda by using Mission Oriented Innovation to reach sustainable cities and communities by using AI?

In order to achieve the 2030 agenda on time and complete the missions, it was mentioned in the findings that one first step that can be conducted is by improving urban growth and sustainability. But in order to achieve that, there should be enough funding to boost up and realize the process. As described by one of the respondents, it appears that the condition in some cities is that they are underfinanced. To build the proper infrastructure and to handle the growth, there should be enough funding and again it is mentioned that money is one important factor in this case. Regarding the financing of the 17 Sustainable Development Goals (SDGs), numerous initiatives have been initiated, primarily under the guidance of various United Nations entities. These initiatives aim to establish key principles that will guide the allocation of resources necessary to support the achievement of the goals, thereby synchronizing global economic policies and financial systems with the 2030 agenda. It's projected that there's a significant annual funding shortfall of USD 5-7 trillion globally until 2030 to fulfill the SDGs (UNEP Finance Initiative, 2017). Another study conducted by Carpentier & Braun (2020) reinforces the notion that achieving the Sustainable Development Goals (SDGs) by 2030 requires a significant increase in the speed and scope of implementation, as well as a genuine commitment to principles of inclusion and sustainability. This includes the integration of sustainable finance practices, which play a crucial role in supporting initiatives that contribute to the realization of the SDGs. Sustainable finance is defined as "finance to support sectors or activities that contribute to the achievement of, or the improvement in, at least one of the relevant sustainability dimensions" (Migliorelli, 2021). By addressing the substantial annual funding gap and integrating sustainable finance practices, we can accelerate progress toward a more inclusive and sustainable future.

According to World Urbanization Prospects published by the United Nations (2018), the global urban population is anticipated to surpass 5.1 billion individuals by 2030. There is also another issue brought in the findings related to the unbalanced condition of the population growth and how the facilities can handle it. This issue is supported by the statement that defines how facilities are not growing as fast as the population in the cities, and eventually, this will arise as a problem in the future, and possibly become a long-term issue for cities. In a study by Wang et al. (2017), he emphasizes the challenges cities encounter due to their expanding size and rapid population growth. These challenges encompass issues such as traffic congestion, environmental pollution, and ecological degradation, all of which pose significant obstacles to achieving sustainable development. The urgency of addressing this issue comes in priority knowing the risk if it is not mitigated immediately.

Moving on to the next challenge that occurs and happens in every city or even country, is that people are not aware of the changes and are resistant to it. Also supported by one of the statements from the respondents and discussed in the findings, is that a lot of people are illiterate about technology and yet have a traditional way of thinking, afraid of the technology and what it is capable of. It was also mentioned the importance of communication with the citizens about the

benefits and how it works with the technology. This can be said as the fundamental problem that need to be addressed since this will lead to many things including the implementation of AI technology in cities. It was described by one of the respondents that it is crucial to gain the trust of the citizens and thus it is very important to communicate and operate everything as transparently as possible.

The respondent expressed concern about a lack of knowledge about available solutions that can successfully handle certain difficulties. They emphasized that, while these solutions are capable of alleviating problems, they may go overlooked or unappreciated due to the current emphasis on innovation. This insight emphasizes the significance of examining and investigating both novel and current successful options when attempting to accomplish the desired results. It becomes possible to use a broader range of methods and actions in pursuit of the overall aim by extending the perspective and accepting a balanced approach. This suggests that, while innovation is crucial, the value of old solutions should also be recognized. By focusing entirely on innovation, the risk of disregarding tried-and-tested tactics that could be equally beneficial is increased. It is critical to raise awareness and provide a venue for current solutions to receive the respect and support they deserve. Cities can improve their prospects of solving pressing issues and achieving sustainable development by combining a variety of techniques.

In addition to the overarching goals, it highlights the importance of identifying sub-goals and the precise actions required to attain them. According to the respondent, there is often too much emphasis on the broad goals while ignoring the sub-goals and the essential means to achieve them. This viewpoint emphasizes the importance of taking a holistic strategy that recognizes the importance of creating and pursuing sub-goals as stepping stones toward the ultimate goal. This underlines the significance of breaking down overarching goals into attainable sub-goals and developing targeted ways to achieve them. It underlines the importance of a well-planned and structured approach that considers the precise actions necessary at various phases of advancement. Cities can efficiently navigate their way toward sustainable development by understanding the importance of sub-goals and implementing applicable measures.

Achieving the 2030 agenda requires addressing funding gaps and integrating sustainable finance practices to support urban growth and sustainability. The anticipated global urban population surpassing 5.1 billion by 2030 highlights the urgency of tackling challenges such as traffic congestion and environmental pollution. Effective communication is crucial to overcome resistance to technological changes and gain citizen trust. Balancing innovation with the recognition of existing solutions is essential to maximize results. Additionally, emphasizing sub-goals and targeted actions is vital for successful sustainable development. By combining a variety of techniques and adopting a holistic approach, cities can navigate their path towards a more inclusive and sustainable future.

6. Conclusion

In light of the findings of this study and research, there are numerous aspects, both positive and negative, that play critical roles in the use of AI to achieve Sustainable Development Goals as Mission Oriented Innovation. First and foremost, cooperation from the public and private sectors, as well as educational institutions, is required, as are joint actions. It has been demonstrated that positive progress has occurred in recent years, with people and organizations becoming more aware of and paying attention to these missions. The perspectives from different bodies and organizations make it more general in the perception on how to approach the missions successfully.

It can no longer be ignored that money and human capital are two critical components that every city must invest in in order to properly use AI in Smart Cities. Those two variables must accompany the missions if they are to be successful and hit the "deadline" on time. Those two components really play important roles in successfully implementing Artificial Intelligence in the smart cities. Despite all the support, it is also good to keep in mind that there are several challenges that come within. Solving and mitigating issues such as privacy concerns is at the top of the list since it is the one of among other factors that affect the successful implementation of this AI technology. Proper education and communication with the citizens are also two significant factors to bring these changes into the society. By just forcing it to happen, will not solve the problems that already exist, thus will bring more continuous effects towards the implementation process. In fundamental, the education and communication to the citizens are needed to make them aware of the changes, the whole existence of the Sustainable Development Goals, and why it is important to achieve those goals. People must know the urgency of it and not take it as something unimportant and keep delaying things.

Making sure every process and effort given to successfully implement the missions is also needed. Called as the evaluation process, by looking and analyzing at how much the cost of the investment and how much in return can show whether it is worth it or not. The result will show if the implementation is effective enough or not. If everything is in line with the missions and also aligns with the Sustainable Development Goals in general, then it is a good thing to keep continuing the process. But if it is not, then an evaluation must be conducted. It is crucial to not only focus on succeeding one part of the story but also in general achieving the overall missions.

To begin, improving urban growth and sustainability is critical to achieving the 2030 agenda and completing the missions. As many communities are currently underfunded, adequate financing is required to support and fulfill this process. Building adequate infrastructure and resolving population growth imbalances are critical concerns that will necessitate financial resources.

There is a need to address citizens' lack of understanding and reluctance to change. Many individuals are unfamiliar with technology and have traditional values, which makes AI technology

and other breakthroughs difficult to deploy. Effective communication and transparency are required to acquire citizens' trust and educate them about the benefits and operation of technology.

It is critical to recognize and investigate both novel and current solutions to problems. While innovation is important, there is a risk of disregarding tried-and-true approaches that might be just as effective. Raising awareness and giving support for current solutions is critical to maximizing their potential in addressing pressing concerns and attaining long-term growth. The study underlines the need of creating sub-goals and taking specific steps to achieve overall goals. A comprehensive plan that understands the significance of sub-goals as stepping stones to the ultimate objective is essential. For effective progress toward sustainable development, large goals must be broken down into realistic sub-goals, and tailored measures must be developed at each stage of development.

6.1 Theoretical Implications

This dissertation's findings, which highlight financial limitations and limited human resources as the primary hurdles in integrating AI in smart cities, have significant implications for future research on this subject. These implications can influence and lead future studies, allowing academics to delve further into specific elements and offer creative solutions. The first is about Alternative Funding Models. The identification of financial constraints as a major obstacle suggests that alternate funding mechanisms for AI implementation in smart cities should be investigated. Future research could look into innovative financing mechanisms such as public-private partnerships, crowdsourcing platforms, impact investments, and foundation or international organization awards. Evaluating the feasibility, effectiveness, and scalability of these models can give policymakers and city planners significant insights.

The second potential research topic is Cost-Effectiveness Analysis. Future studies may explore undertaking complete cost-effectiveness studies of AI applications in smart cities, based on the idea that financial considerations are crucial. This study could investigate the economic impact of implementing AI technologies by weighing both the short-term and long-term costs. Researchers may give decision-makers vital information to optimize resource allocation and justify investments by measuring the return on investment and assessing the cost-effectiveness of AI solutions.

Another potential research topic is regarding social acceptance and trust. To ensure that AI technologies are successfully integrated and used, research into social acceptance and trust in AI technology inside smart cities is of the utmost importance. Future studies should concentrate on comprehending public attitudes, views, and worries about AI as well as establishing successful tactics for fostering public confidence and participation in decision-making. This requires examining different communication tactics, public awareness campaigns, and participatory techniques that respond to public concerns, dispel myths, and promote a sense of ownership and shared responsibility. Cities can build trust, increase the general public's acceptance of AI technology, and

realize their full potential for societal good by fostering open and inclusive communication. The ultimate goal of these projects is to increase social acceptance and support for AI initiatives, opening the door to the implementation of smart cities and communities.

Finally, a future study on Human Resource Development. Given the significance of talented human resources in the effective adoption of AI, future research can concentrate on techniques for establishing a talent pool that matches the specific needs of smart cities. Investigating educational programs, vocational training efforts, and workforce development strategies that bridge the skill gap in AI-related professions could be part of this. Exploring successful ways for knowledge transfer and capacity building inside municipal governments and institutions can also be a valuable subject of study.

6.2 Managerial Implications

According to the conclusions of this study, there are a few actions that can be taken as a result of the finding of this dissertation. It is suggested by the researchers to start immediately providing more information, and education related to AI technology to the people in cities, without any exceptions. In this context, people who live in small cities also need to know about what is going on with the latest technology trends, how it is already applied in the big cities, and how the government actually wants to create a better place to live and define smart cities. It is the first basic step that can be done to make people aware of the changes and how they will affect their way of living in the cities. By giving them detailed information, advantages, and disadvantages, it is hoped that people will start to realize and be open to the new technological era and not always try to be resistant to it. They have to be aware that this is something inevitable and if not now, there will be another time coming to them bringing all of these changes. When they realize how important that is, it will be too late for them to adopt it.

After the first step is successful, then the process of implementation can be boosted, and put all efforts in speeding up the process, supported by financial matters and experts in doing so. Those two factors play an important part in succeeding in the Sustainable Development Goals. Not to forget the smaller cities with fewer citizens, which also has the same urgency as the big cities. Especially in smaller cities, it will take more time to penetrate the technology since there is a possibility that the citizens are still not aware of the new digital and technological era. During the implementation process, conducting regular check and evaluation sessions of the implementation is also very crucial. The researchers strongly believe and suggest that to keep measuring what the technology investment gets in return, will help to decide whether it is good or not to keep the AI technology implementation in the long term.

Continuous collaboration between several different parties from multiple backgrounds such as Government, Public and Private sectors, and also Educational institutions will always be an important section and part of this AI implementation in reaching Sustainable Development Goals. Those three parties, each have their own responsibilities, roles to play, and how to assist this

whole process with their own specialization. It is strongly recommended that the collaboration is not only during projects but also during day to day basis interaction and deeply integrated into the activities. To effectively address the relationship between the public sector, private sector, and educational institutes in the integration of AI technology in smart cities, collaborative efforts and partnerships among these parties are crucial.

The public sector, including local governments and public agencies, can take the lead in establishing frameworks and policies that promote AI adoption and facilitate collaboration with the private sector and educational institutes. They can create incentives and funding mechanisms to encourage public-private partnerships, research collaborations, and knowledge-sharing initiatives.

The private sector, including technology companies and industry associations, can contribute by actively engaging with the public sector and educational institutes to develop AI solutions tailored to the needs of smart cities. They can also support educational institutes by providing resources, mentorship programs, and internship opportunities for students to gain practical experience in AI-related fields.

Educational institutes, including universities and research institutions, play a critical role in equipping future professionals with the necessary skills and knowledge in AI. They can collaborate with the public and private sectors to design curricula and training programs that align with the needs of the industry. Additionally, educational institutes can establish research centers or innovation hubs that facilitate interdisciplinary collaborations and knowledge exchange among academia, government, and industry.

To successfully integrate AI technology in smart cities, it is recommended to take proactive actions to promote the integration of AI technology in smart cities. Providing comprehensive information and education about AI to citizens, regardless of the size of their cities, is crucial to foster awareness and acceptance of technological advancements. Building on this, efforts should focus on accelerating the implementation process through robust financial support and expertise. Regular evaluation and monitoring of the implementation, along with measuring the return on investment, are essential for long-term success. Furthermore, continuous collaboration among the public sector, private sector, and educational institutes is vital for effective AI integration in achieving sustainable development goals. Each party has distinct responsibilities and specialized contributions that can be leveraged through collaborative partnerships. Through proactive engagement with stakeholders, creation of frameworks and policies, and encouragement of cross-disciplinary collaborations, smart cities can effectively utilize the potential of AI for sustainable development and enhancing the quality of life for their residents.

6.3 Limitations and Further Research

During this research conducted, there are a few limitations that the researchers found. As international students, the researchers did not speak and conducted the interview using the native

language of the respondents, which most of them speak Dutch. So there are probably some things that can not be explained explicitly and as clearly as using the native language. The next one is, most of the respondents for the interview process came from developed countries, while only a few come from developing countries. This shows that things can be differently related to the challenges based on the developing countries' characteristics, which have not been researched by the researchers. It is important in the future to conduct research in developing countries since there might be other factors that play an important role as a challenge in implementing AI technologies and the researchers can gain a more diverse point of view. The economic condition, political condition and also social conditions of each country are distinct and each of them has their own situation. These kinds of conditions must have different approaches and specific methods to handle. It is also a limitation for the researchers that could not get much access to interview people from the governmental sectors. It is also possible since the researchers do not have any connections with people from governmental organizations.

In further research, it is also possible to measure and compare the progress before and after the financial matters and human resources are improved based on this research. To analyze further, is it really important to improve those two factors, or are there other affecting factors in implementing the AI technologies. By including people from the government sector, it will also help to see the perspectives from their sides and how they will handle things based on their points of view. It is very important that the government as policymakers are also aware of this situation and discuss every next step with the other organizations from the public and private sectors as well as educational institutions.

6.4 Recommendations

A series of interrelated policy proposals should be adopted to promote the objective of promoting collaborative innovation and accomplishing Sustainable Development Goals (SDGs) inside smart cities. The improvement of Data Sharing and Accessibility Policy is a critical pillar. Smart cities may leverage the potential of collaborative innovation and informed decision-making by adopting and advocating regulations that promote open and safe data sharing among varied stakeholders, ultimately moving sustainable development projects forward.

To ensure that this breakthrough is used ethically, Ethical AI and Regulation Policy must be implemented. This entails the creation of extensive regulatory frameworks as well as ethical principles for AI technology. Such safeguards will not only ensure ethical and transparent AI deployment, but will also protect individuals' rights and promote social values, ensuring that technology matches with the larger aims of sustainability and communal well-being.

Another key part is the formulation of a funding policy, which serves as the financial foundation for smart city development. These policies foster public-private partnerships and create a clear vision for the seamless integration of AI into smart cities' long-term development

objectives by developing sustainable and forward-thinking funding mechanisms. This approach not only promotes innovation but also secures the resources required to effect meaningful change and achieve the SDGs.

These efforts are complemented by enforcing a strong Monitoring and Evaluation Policy. This technique maintains accountability, examines cost-effectiveness, and pushes evidence-based improvements by instituting policies that require regular examination of AI applications. This constant monitoring and evaluation process is critical for maximizing the advantages of smart city programmes, optimizing resource allocation, and fine-tuning policies for the maximum positive influence on long-term urban development.

These policy ideas, when taken together, establish a coherent framework that uses data accessibility, ethical AI practices, funding strategies, and rigorous evaluation procedures. Smart cities may pave the way for collaborative innovation, ethical technology progression, and demonstrable progress towards the Sustainable Development Goals by enacting these policies, ultimately generating more sustainable, resilient, and prosperous communities for the future.

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Addendum 1: Interview Questionnaire

A- Warm-up questions:

1. What are your titles and position in this organization/university?
2. Can you briefly describe the sector of your company/organization that you are working at?
3. Are you familiar with the concept of mission-oriented innovation and also, the UN's sustainable development goals (SDGs)?

B- Main questions:

RQ1: Role of Public Sectors in Achieving Smart Cities:

1. What are the main roles of your organization/university in achieving sustainable development goals in your city/country?
2. Is your organization/university actively collaborating with the private sector regarding reaching the SDGs?
3. What are the main obstacles for your organization/university to reach SDGs and 2030 agenda, especially the goal concerned with sustainable cities and communities?
4. How can you and your organization/university facilitate meeting the 2030 agenda and sustainable cities and communities, especially by using AI?
5. Have you witnessed any changes in the role of the public sector to reach sustainable and smart cities from 2015 until now?
6. How does the public sector utilize AI in the mission-oriented innovation ecosystem to achieve sustainable cities and communities?
7. How does the use of AI impact the mission-oriented innovation ecosystem?
8. What are the benefits and challenges of using AI in the mission-oriented innovation ecosystem to achieve sustainable cities and communities?

RQ2: Implementation of AI in Smart Cities:

1. Do you know that AI plays a big role in some cities?
2. In the context of your city, have you ever experienced AI technologies in your daily activities in this city? If yes, what is it?
3. Do you find it to have a big role in terms of Sustainability?
4. In what specific ways AI can contribute to achieving the SDGs and sustainable cities and communities?
5. Do you think AI technology is implemented effectively in your city?
6. Could you provide some examples of how AI is currently being used to support sustainable development and cities, and what are the potential benefits and challenges associated with these approaches?
7. What are some potential risks associated with using AI in sustainable development and cities, and how can these risks be mitigated?

8. As a citizen, Is there any suggestion on how AI can be implemented better in your city?
9. What are the factors that contribute to the successful implementation of AI in Smart city development?
10. What are the key stakeholders involved in the successful implementation of AI in Smart city development?

RQ3: Evaluation:

1. How do you measure the effectiveness of AI implementation in your city regarding sustainable development in smart cities and what are the factors to measure it?
2. How do you ensure that the AI systems implemented in smart cities are ethical and responsible enough?
3. How do you ensure that the use of AI in smart cities aligns with the UN's Sustainable Development Goals?
4. Does the process of AI development already involve other organizations and also stakeholders to share knowledge and best practices for using AI to achieve sustainable development goals?

RQ4: Acceleration towards the 2030 Agenda:

1. In your opinion, Do you think the city will have enough capacity to handle the population growth in the urban area in the next 5-7 years? If yes, how do you think the improvement should be? If not, what should be changed to accelerate the process?
2. In your perspective, what steps do you take to address any negative impacts on Mission-Oriented Innovation projects on social, environmental, and economic sustainability?
3. What are the key challenges in using AI to accelerate progress toward the 2030 agenda, and how do you think they can be solved?

Addendum 2: Chapter Separation

CHAPTER	WRITER
PROBLEM STATEMENT	STANLEY GAVINO
LITERATURE REVIEW	STANLEY GAVINO & SEYED EBRAHIM SOBHANI
RESEARCH METHODOLOGY	STANLEY GAVINO & SEYED EBRAHIM SOBHANI
FINDINGS	STANLEY GAVINO & SEYED EBRAHIM SOBHANI
DISCUSSIONS	STANLEY GAVINO & SEYED EBRAHIM SOBHANI
CONCLUSIONS	STANLEY GAVINO & SEYED EBRAHIM SOBHANI