Review Article

Smart Cities and Aging Well: Exploring the Links between Technological Models and Social Models for Promoting Daily Social Interaction for Geriatric Care

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Abstract

The aging global population requires a new social model to meet the growing social, economic, and physical needs of seniors. Western social models need to be reconsidered in light of examples that support communal ways of living, which are sustainable through smart city design for more supportive geriatric care systems. To address the complex problems of geriatric care in this growing aging population with specific needs related to increased lifespan and limited financial resources, the use of emerging technologies, such as artificial intelligence (AI) and the Internet of Things (IoT), should be considered. As retirement ages rise and funds for retirement continue to decrease automated and sustainable solutions need to be sought. The ethical need to consider citizens not as customers but as decision-makers and to validate the ethical nature of medical decisions made for and by individuals should also be prioritized. This study provides recommendations for a smart city design and highlights the need for reflection on the ethics, modernization, and management of geriatric care. It suggests that technological devices can benefit health system reform by facilitating problem-solving. Overall, this new model integrates communal living and non-Western values with emerging technologies to address the growing need for geriatric care and the well-being of seniors.

Introduction

The Canadian population is experiencing a significant demographic shift, with seniors currently comprising approximately 18% of the population and projected to make up one-quarter of the population by 2030 [1-3]. The increase in life expectancy projected by 2036 will likely amplify this trend in the next decade [1]. Population aging is not unique to Canada but is also a growing trend in other developed and developing countries [2-3]. The phenomenon of population aging has major social impacts and necessitates specific care and measures that extend beyond this particular age group [4]. Furthermore, the demand for care and support for the aging population is increasing while the available workforce to provide these services is decreasing. The shortage of employees has already been a significant issue in recent years and is expected to persist [5]. According to Eisen and Emes [6], the current ratio of 3.4 working-age individuals to every senior in Canada is much lower than the 7.7 ratio in 1966. Moreover, population aging has significant repercussions across all sectors of society, including savings, inflation, financial markets, and assets, thus indicating that it has a substantial impact on the economy [7]. These challenges necessitate large-scale risk management. The shortage of employees highlights the cyclical contradictions between the growing need for human supervision for the elderly and the lack of manpower to provide adequate support [8]. However, new information technologies, such as intelligent devices, have emerged to replace certain tasks previously performed by humans, predicting and anticipating needs, and solving problems using big data [9].

The smart city concept is a promising solution to address the challenges associated with supporting aging populations in Canada and elsewhere in the industrial North. These intelligent cities are a group of agglomerations that rely on

information and communication technologies (ICT) to improve citizen interaction and guarantee a better quality of life and environment despite the city's growth and development [10]. Not surprisingly, the economy is a critical component of planning such infrastructure, and cities aim to promote economic growth and development by leveraging ICT to foster innovation and entrepreneurship [11]. Therefore, such initiatives support startups and subject-matter experts (SMEs) and aim to create new job opportunities, particularly in the technology and service sectors. Projects associated with these tech-enabled cities can also enhance economic efficiency by optimizing transportation systems, energy usage, and waste management, reducing costs and promoting sustainability [12]. At the same time, the social sphere is another central component of smart city planning, and cities aim to use ICT to create connected, inclusive communities that meet the diverse needs of their citizens, including the elderly population [13].

These intelligent cities can enhance social services by providing online access to information and services, such as health care, education, and entertainment, while also promoting social cohesion through the provision of public spaces and community events [14]. Finally, the environment is a third critical aspect of smart city planning, and cities aim to promote sustainable development by leveraging ICT to reduce environmental impact and improve resource efficiency. Projects for the infrastructure can reduce energy consumption by optimizing energy use in buildings and transportation systems, promoting the use of renewable energy sources and electric vehicles, and improving waste management practices [15]. The emergence of these new hi-tech engineering concepts has opened up new innovative perspectives for enhancing the functionality of the health system, specifically for supporting the aging population. Researchers such as Ahmad, et al. [16] have noted that the intelligent city concept can be leveraged to promote health by facilitating access to healthcare services, providing assistive technologies for seniors, and optimizing healthcare delivery. Furthermore, the research of Rocha et al. [17] highlights how the design can also enhance the mobility of seniors by providing accessible transportation systems and walkable neighborhoods. Smart cities also offer the potential for successful management of sustainable urban development, as demonstrated by Wang and Zhou [18]. This success can be attributed to the emphasis on a humanist vision that prioritizes managing individuals for their well-being and inclusion, as articulated by Padrón Nápoles, et al. [19]. Such a vision is essential for promoting the well-being of all citizens, including the elderly population, and ensuring that their needs are met.

The global demographic shift towards an aging population presents significant challenges that necessitate innovative approaches to geriatric care. In this context, the exploration of smart city concepts as a potential solution to support the aging population is both timely and critical. The justification for selecting this topic stems from the urgent need to address the multifaceted demands of an increasing number of seniors who seek not only medical care but also enhanced quality of life, social interaction, and autonomy. Despite the growing interest in smart cities as a means to improve urban living, there remains a gap in research specifically focusing on how these technologies can be tailored to meet the unique needs of the elderly. This study aims to bridge this gap by investigating the application of smart city innovations in fostering environments that support the well-being and independence of the aging population.

Smart city projects, as evidenced by Duygan, et al. [20] and Kim [21], often presuppose a level of financial investment that may not be feasible in all contexts, potentially limiting their applicability in addressing the needs of the aging population across different regions. However, the significance of smart city initiatives in promoting happiness, security, and comfort for seniors, as highlighted by Zhu, et al. [22], underscores the potential of these technologies in enhancing the lives of the elderly. Given the pressing needs of this demographic, the exploration of smart city solutions offers a compelling avenue for supporting their well-being and improving their quality of life. Thus, this study is imperative as it seeks to explore smart city concepts within the Canadian context and beyond, aiming to provide insights and strategic guidance on leveraging these technologies to benefit the aging population.

This paper begins by delineating the challenges associated with an aging society and the necessity for care solutions that extend beyond traditional eldercare, benefiting the broader community as noted by Hall [14]. It then delves into the potential advantages and limitations of smart city concepts, emphasizing the need for a nuanced understanding of the expected benefits, ideological underpinnings, and possible drawbacks. The work of Niu [23] is particularly pertinent in this discussion, highlighting the critical balance between digitalization and the fundamental human need for meaningful «care.» Furthermore, this paper explores alternative models based on communal living principles and examines ideologies influencing smart city designs, aiming to align these initiatives with a humanistic vision that prioritizes inclusivity and the well-being of all citizens. By focusing on identifying ideologies and proposing ways to ensure smart city solutions effectively support the aging population, this study contributes significantly to the discourse on smart cities and geriatric care. In conclusion, the paper discusses the implications of its findings and suggests directions for future research, thereby enriching the ongoing dialogue on the role of smart city concepts in enhancing the lives of seniors in Canada and elsewhere.

The burgeoning demographic shift toward an aging population across the globe necessitates a reassessment of the traditional models of care and support for the elderly. This transformation presents a unique opportunity to leverage

smart city technologies as a means to enhance the quality of life for seniors, fostering environments that support aging in place and facilitate independence. The exploration of smart city concepts in this context is driven by the urgent need to address the challenges posed by aging societies, including the isolation and loneliness that many seniors experience, the financial and logistical strains on families and healthcare systems, and the ethical considerations surrounding autonomy and privacy.

In North America, societal norms encourage young adults to establish independence early on, often resulting in seniors living alone or with a spouse rather than with extended family. This social model has implications for the aging population, with research indicating that 60% of individuals over the age of 75 report feelings of loneliness [24]. In Canada, public policies have historically prioritized the needs of the active workforce, with long-term care facilities such as the centre d'hébergement et de soins de longue durée (CHSLD) serving as a common solution for those unable to live independently (Bourbonnais et al., 2005). The COVID-19 pandemic has cast a spotlight on the vulnerabilities and limitations of such institutional care, emphasizing the need for alternative solutions [25]. Against this backdrop, the integration of technological supports into the lives of seniors emerges as a compelling avenue for enhancing their independence and quality of life. From the early adoption of emergency alert systems to the advanced capabilities of today's smart homes and cities, technology has continually evolved to meet the needs of the elderly. These systems, equipped with AI and the IoT, offer personalized, real-time support, facilitating daily activities and social interactions, thereby mitigating feelings of isolation [26]. However, the effectiveness and acceptance of such technologies vary, with concerns around the «black box» effect of AI decision-making and the potential for privacy infringements highlighting the need for careful consideration of ethical and social implications [27].

This paper critically examines the current state of research on smart city technologies and their application in supporting the aging population. Reviewing the literature on the benefits, challenges, and ideological underpinnings of these initiatives, it aims to provide a comprehensive overview of how smart cities can contribute to the well-being of seniors. The integration of smart homes and cities into elder care strategies offers a promising pathway toward compensating for staffing shortages, anticipating needs, and delivering context-sensitive responses. However, the potential for data misuse and the unprecedented control exerted by such systems necessitate a cautious approach, balancing technological advancements with ethical considerations and the preservation of individual rights [28]. Furthermore, this review extends beyond the technological aspects to consider the societal and policy implications of adopting smart city solutions for elder care. It discusses the potential for blockchain technology to mitigate privacy concerns and explores the challenges of digital literacy

among the elderly, the role of the private sector in public policy, and the ethical dilemmas posed by profit motives in care provision. By situating smart city technologies within the broader socio-political landscape, this paper contributes to a nuanced understanding of their potential to revolutionize elder care, while also highlighting the critical need for inclusive, ethically grounded approaches to their implementation.

Materials and methods

This study adopts a mixed-methods approach to explore the feasibility and implications of implementing a smart city model for elderly support. The research design combines quantitative analyses of existing technological solutions and qualitative assessments of seniors' needs and preferences, allowing for a comprehensive understanding of the potential benefits and challenges of such models. In order to support the design of the data analysis instruments, a systematic literature review was conducted to gather data on existing smart city projects, with a focus on those incorporating elements of elderly care. Sources included academic journals, conference proceedings, governmental reports, and case studies. The review aimed to identify key technologies, models, and philosophical underpinnings relevant to the development of a smart city model for elderly support.

Surveys were distributed to seniors residing in various types of living arrangements, including independent homes, assisted living facilities, and traditional family setups. Semi-structured interviews were also conducted with a subset of survey participants to gain deeper insights into their perceptions of smart city technologies and their potential impact on elderly care. Additionally, interviews with experts in urban planning, geriatric care, technology development, and ethics were conducted to validate the findings from the literature review and surveys. These consultations helped refine the proposed smart city model for elderly support.

The study focused on several key technologies integral to the concept of smart cities and their applicability to supporting the elderly:

Artificial Intelligence (AI): Examined the use of AI in healthcare monitoring, predictive analytics for disease prevention, and personalized care plans.

Internet of Things (IoT): Investigated the deployment of IoT devices for remote health monitoring, environmental control, and enhanced safety features in the homes of elderly individuals.

Blockchain: Explored the application of blockchain technology for secure data sharing, ensuring the privacy and integrity of the medical and personal data of seniors.

The research drew on various models to inform the development of a smart city model for elderly support:

The medina model: Utilized as a philosophical framework

to incorporate communal living principles, focusing on mutual aid, social participation, and shared responsibility within the community.

Technological acceptance models: Analyzed to understand factors influencing the adoption of smart technologies by the elderly, including usability, perceived usefulness and trust.

Data security models: Employed to develop strategies for protecting the privacy and security of seniors' data in the context of smart city technologies.

Quantitative data from surveys were analyzed using statistical software to identify patterns and preferences related to technology use among the elderly. Qualitative data from interviews and expert consultations were coded and thematically analyzed to extract insights on the ethical, social, and practical considerations of implementing a smart city model for elderly support. By employing a mixed-methods approach and drawing on a wide range of data sources and technologies, this study aims to offer a well-rounded perspective on the design and implementation of smart city models that cater to the needs of the aging population, ensuring that the proposed solutions are both innovative and grounded in the reality of seniors' lives.

Results

The systematic literature review conducted as part of this study unveiled a multifaceted landscape of smart city technologies aimed at enhancing the quality of life for the elderly population. A considerable volume of the literature underscores the expanding utilization of AI and IoT in crafting health monitoring systems and emergency response solutions. These technologies are predominantly geared towards fostering an environment that supports independent living for seniors, indicating a broad recognition of the potential that smart technologies hold in addressing the challenges faced by this demographic. Notably, the research highlights the integration of AI in predictive health analytics and personalized care plans, demonstrating a shift toward proactive health management strategies. Furthermore, the deployment of IoT devices within the homes of the elderly for environmental control, safety, and remote health monitoring points to a tangible move towards creating interconnected living spaces that are responsive to the needs of their inhabitants. This trend toward the technological augmentation of living environments reflects a significant paradigm shift in how geriatric care is conceptualized within the framework of smart cities.

Survey responses and interviews with elderly participants provided invaluable insights into their perceptions and acceptance of smart city technologies. The majority expressed openness to the adoption of technologies that promised to enhance their independence and safety, albeit with reservations about usability and the potential for technology to infringe on their privacy. Concerns were particularly pronounced in relation to data security, with many participants skeptical about the sharing of personal and health-related information through digital platforms. Despite these apprehensions, there was a consensus on the potential of technology to positively impact their daily lives, provided that adequate safeguards were put in place to protect their privacy and autonomy. Expert consultations echoed these sentiments, emphasizing the need for ethical considerations and user-centric design in the development of smart city solutions for the elderly. The discussions underscored the importance of integrating the principles of mutual aid and communal living into the design of smart cities to foster a sense of belonging and community among the elderly population.

Together, these findings underscore the critical interplay between technology, ethics, and societal values in the development of smart city models for elderly care. While there is a clear recognition of the potential benefits of integrating AI and IoT technologies into the living environments of the elderly, the concerns around privacy, data security, and the preservation of autonomy cannot be overstated. The results highlight the necessity for a balanced approach that leverages technological innovations to support the elderly while simultaneously addressing ethical considerations and fostering a community-oriented model of care. This research contributes to the ongoing discourse on smart cities by illustrating the complexities involved in designing technologies that are not only effective but also aligned with the values and needs of the aging population.

Recommendations

Proposed smart city model for elderly support: As a first step towards designing a smart city model for elderly support, it is important to consider the historical context and philosophical underpinnings of the concept. The current intelligent city model is based on the Western vision of the city, as reflected in the works of Plato. According to Romeri [29], Plato's *Laws* (*Statutes*, 626) [30] emphasized the need to consider oneself always at war with others and to self-monitor in order to protect against possible aggressors and strengthen civic dynamics. The principle aligns with the objective of these sustainable designs to promote safety by controlling individuals at all levels. As Stalley [31] notes, Plato believed that victory over oneself is the most important of all, which allows for the identification of disloyal individuals who could pose a threat to the security system. The model for smart cities, therefore, is well-suited to this objective. Despite concerns about individual freedoms, the concept of the smart city is likely to continue to gain traction due to its potential to promote safety and control at all levels. However, in designing a smart city model for elderly support, it is essential to take into account the unique needs and challenges of this population.

To apply the principles of Medina to the smart city model for elderly support, a redefinition of the current social model is necessary. The proposed model is based on the idea that each member of the community should contribute to the well-being of their own and others, regardless of their social status, family situation, faith, or age. This objective aims to create a sense of belonging and shared responsibility for the construction of a community based on social and civil peace. This model ensures that all members of the community are their own political actors from birth to end and have the right to live a full life with dignity, regardless of circumstances. While this proposal may seem utopian, it is worth considering as a potential alternative to the current smart city model. By drawing on historical models such as the Medina, a sense of community and shared responsibility can be fostered among the elderly population. This sense of belonging and shared responsibility can be reinforced through the use of technology that supports social participation and interaction [32]. For example, the implementation of community-based platforms that facilitate social connections and information exchange can foster a sense of belonging and promote well-being among the elderly population [33]. In addition, the proposed smart city model for elderly support must prioritize individual privacy and data security. To achieve this, it is essential to establish a balance between data sharing and data protection. Blockchain technology, for instance, can be used to record and trace the paternity of data, ensuring its integrity and preventing unauthorized access. The technology can also limit the risks of data theft and protect data producers' copyrights, reducing the possibility of unwanted use by third parties [34].

Therefore, the proposed smart city model for elderly support draws on historical models such as Medina to create a sense of belonging and shared responsibility among the elderly population. It also emphasizes the need for individual privacy and data security, which can be achieved through the use of blockchain technology. The adoption of this proposed model would require a redefinition of the current social model and a shift towards community-based approaches to elderly care. For instance, Ilham Zbadi presents the Medina as a harmonious model of mutual aid and inclusion:

… The Medina has succeeded where most cities today have failed (geopolitical situation aside): peaceful relations between citizens of different religious confessions… There are many anecdotes testifying to the ability of the medina to live together. The Medina enjoyed a balanced political structure between centrality and local power. Indeed, it benefited from a form of local democracy [35, p.23].

Robert [36] presents the *Medina* as a model for a city of the future and he cites Gossé's work on the Medina which he defines as:

… a subtle and successful ecosystem between nature and urbanization, an astonishing ability to adapt morphology and architectural typologies, energy saving by limiting the polluting mobility of cars and the density of buildings, a participatory process and a friendly management of urban spaces, solidarity systems and a practice of equal status between people and symbolic spatial representations, all of which are just waiting to be encouraged, reactivated or reinterpreted (p.111).

In practical terms, this principle gives rise to a variety of outcomes, including intergenerational learning, where older adults educate young people in a broad sense. The practice has long been used to instill respect for seniors and develop intergenerational bonds of interdependence, fostering a sense of synergy [37]. However, in our current societies, seniors face difficulty being valued due to their exclusion from the active economic circuit and physical distance from their own families. In contrast, the principle of the Medina is based on the idea of utilizing all the human qualities of individuals to help each other in the family unit, neighborhood, and city, with the goal of continuously amending and repairing things (*Tikkun Olam*) [38]. A crucial distinction between the two models is that the Medina brings together several families, and the notion of family encompasses more than just the family unit of grandparents, parents, and children. It includes aunts, uncles, cousins, and those who are considered part of the family because they share its vision, protect it, and feel united to it. As a result, the concept of the individual has a minor place in this quasi-organic dynamic that is usually called the "Tribe."

It is, therefore, crucial that decision-making authority in the proposed smart city model for elderly support be placed in the hands of seniors, acknowledging their valuable lived experiences. This approach would allow for an active and engaged senior population, with responsibilities for municipal management and the upbringing of younger generations. The Medina model emphasizes the importance of interdependence between families and extended communities, creating strong bonds of affective and socio-economic connection. This stands in stark contrast to the idea of seniors living in isolation in institutional care, with brief weekly visits from family. In this proposed model, economic dimensions also play a key role, as younger family members contribute to the survival of extended families and rely on the guidance of their elders in managing issues with other tribes. By adopting a community-driven approach to elderly support, the proposed Smart City model would prioritize dignity, respect, and interdependence in the lives of seniors, creating a more inclusive and supportive urban environment.

Discussion

The exploration of the Medina model alongside modern smart city concepts provides a unique lens through which we can reimagine geriatric care in the context of rapidly aging populations and technological advancements. The discussion reveals a critical need to transcend traditional care models,

deeply rooted in Western individualism, which often isolates the elderly, towards more inclusive, community-oriented systems that foster intergenerational support and mutual respect. The integration of technology in this paradigm, particularly through AI and IoT, presents promising avenues for enhancing elderly care, yet it also brings to the forefront ethical considerations and the imperative for a human-centric approach in implementation.

Reflecting on the ethical, social, and technological dimensions of smart cities for elderly care, it's evident that while technology holds transformative potential, its application must be guided by ethical principles that prioritize the dignity, privacy, and autonomy of seniors. The insights from Huang, et al. [39] and Johnson et al. [40] underscore the complexity of deploying AI in therapeutic contexts, pointing to the need for frameworks that respect the nuances of human life and the diverse needs of the aging population. Similarly, the juxtaposition of the Medina model with current social structures highlights a gap in communal support and integration for the elderly, challenging us to rethink societal values and the role of technology in reinforcing or reshaping these values.

This discussion underscores the urgency of revisiting the social model of aging to not only leverage technological tools for care but also to restore the social fabric that supports seniors in a more integrated and valued manner. As McNeal and Brown [41] argue, the quest for restorative justice for seniors requires a fundamental shift in how society perceives and integrates the elderly. This calls for a balanced approach that harmonizes the benefits of smart city technologies with the need for ethical governance, community involvement, and policies that ensure equitable access to these innovations. The findings and discussions advocate for a redefined smart city model that aligns with the principles of communal support, ethical technology use and enhanced social participation for the elderly. Recommendations for smart city design and geriatric care improvements include those outlined in Table 1. By adopting these recommendations, smart cities

Figure 1: Schematic vision of the use of IoTs, Smart Homes for seniors within the Smart city.

can move towards becoming more inclusive, supportive, and responsive to the needs of their aging populations, ultimately enhancing the quality of life for seniors and fostering a sense of belonging and respect across generations. (Figure 1).

Conclusion

In order to support the successful design and implementation of a smart city to support an aging population, the social model to enhance the place of seniors in the socio-economic fabric of our communities needs to be redefined. One potential example that may be considered is the Medina model as an alternative social model that values seniors, intergenerational bonds, and interdependence. However, it is clear that the Medina model cannot be directly transposed to Western societies, and that there are ethical, technological, and managerial challenges to overcome in redefining our social model. Therefore, there is a need for a holistic approach to geriatric care that considers not only medical needs, but also social, ethical, and economic aspects that also align with the realities and expectations seniors have for independence later in life. The potential of emerging technologies, such as AI and smart cities, to address these challenges should be considered, but the need to frame their use differently and to consider citizens as decision-makers rather than customers should also be stressed. A shift towards a model that is based on knowledge, respect, ethics, and charity towards others is necessary to develop a sustainable model that seniors can be valued and enabled to age well while maintaining their place in the socio-economic fabric of our communities.

References

1. Kinsella KG, Phillips DR. Global aging: The challenge of success. Washington, DC: Population Reference Bureau. 2005; 60 : 3.http://ereserve.library.utah.edu/Annual/SOC/3650/Nathenson/soc3650globalaging.pdf

2. Buléon P, Turbout F. Aging of the Caribbean population, a mosaic of situations, a challenge for tomorrow. Caribbean Studies. 2019; 43-44. https://doi.org/10.4000/etudescaribeennes.16908

3. Preston SH, Stokes A. Sources of Population Aging in More and Less Developed Countries. Popul Dev Rev. 2012 Jun 27;38(2):221-236. doi: 10.1111/j.1728-4457.2012.00490.x. PMID: 24653544; PMCID: PMC3957219.

Table 1: Integrating Ethics and Technology: A Blueprint for Smart City Design and Geriatric Care Enhancement.

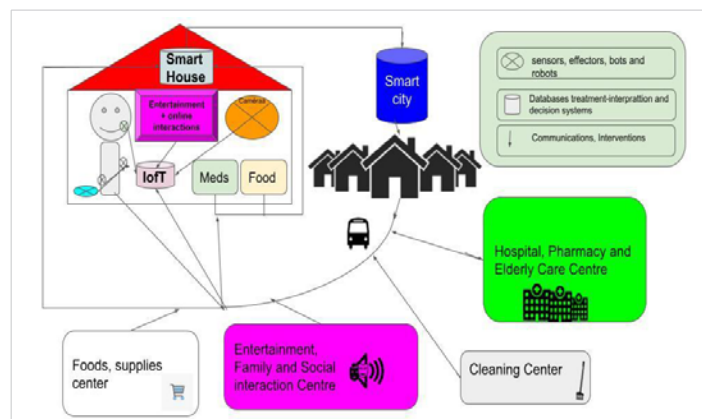| Recommendation	Description
Ethical Governance	Implementing policies that ensure the ethical use of AI and IoT technologies, safeguarding the privacy and autonomy of the elderly.
Community-Centric Design	Integrating community-based platforms and services that encourage social interaction and support among seniors, drawing inspiration from the Medina model.
Accessibility and Inclusion	Ensuring that smart city technologies are accessible and beneficial to all seniors, regardless of socio-economic status, to prevent disparities in care.
Interdisciplinary Collaboration	Encouraging collaboration between technologists, urban planners, healthcare providers, and ethicists to develop holistic solutions that address the physical, social, and emotional needs of the elderly.
Public and Private Partnership	Fostering partnerships between government entities and private sectors to support the development and implementation of smart city solutions that prioritize geriatric care.

4. Jakobi J. Aging in place reflections from Canadians. 2022. https://aber. apacsci.com/index.php/wt/article/viewFile/1653/1636

5. Bloom DE, Chatterji S, Kowal P, Lloyd-Sherlock P, McKee M, Rechel B, Rosenberg L, Smith JP. Macroeconomic implications of population ageing and selected policy responses. Lancet. 2015 Feb 14;385(9968):649-657. doi: 10.1016/S0140-6736(14)61464-1. Epub 2014 Nov 6. PMID: 25468167; PMCID: PMC4469267.

6. Eisen B, Emes J. Understanding the Changing Ratio of Working-Age Canadians to Seniors and Its Consequences. 2022; https://fraserinstitute.org/sites/default/files/understanding-changing-ratio-of-working-age-canadians-to-seniors-consequences.pdf

7. Iparraguirre JL. Other Macroeconomic Implications of Population Ageing. In: Economics and Ageing. Palgrave Macmillan, Cham. 2020. https://doi.org/10.1007/978-3-030-29019-1_9

8. Zimmerman S, Carder P, Schwartz L, Silbersack J, Temkin-Greener H, Thomas KS, Ward K, Jenkens R, Jensen L, Johnson AC, Johnson J, Johnston T, Kaes L, Katz P, Klinger JH, Lieblich C, Mace B, O'Neil K, Pace DD, Scales K, Stone RI, Thomas S, Williams PJ, Williams KB. The Imperative to Reimagine Assisted Living. J Am Med Dir Assoc. 2022 Feb;23(2):225-234. doi: 10.1016/j.jamda.2021.12.004. Epub 2021 Dec 31. PMID: 34979136; PMCID: PMC8826534.

9. Thakur N, Han CY. A review of assistive technologies for activities of daily living of elderly. arXiv preprint. 2021. arXiv:2106.12183.DOI: 10.1007/978-3-030-84459-2_4

10. Anthopoulos LG, Anthopoulos LG. The rise of the smart city. Understanding smart cities: A tool for smart government or an industrial trick?. 2017; 5-45.

11. Carayannis EG, Von Zedtwitz M. Architecting gloCal (global-local), real-virtual incubator networks (G-RVINs) as catalysts and accelerators of entrepreneurship in transitioning and developing economies: lessons learned and best practices from current development and business incubation practices. Technovation. 2005 ; 25(2): 95-110.

12. Caragliu A, Del Bo C, Nijkamp P. Smart cities in Europe. Journal of urban technology. 2011; 18(2): 65-82.

13. Neirotti P, De Marco A, Cagliano AC, Mangano G, Scorrano F. Current trends in Smart City initiatives: Some stylised facts. Cities. 2014; 38 : 25-36.

14. Hall E. Spaces of social inclusion and belonging for people with intellectual disabilities. J Intellect Disabil Res. 2010 Mar;54 Suppl 1:48-57. doi: 10.1111/j.1365-2788.2009.01237.x. PMID: 20586884.

15. Al-Hader M, Rodzi A. The smart city infrastructure development & monitoring. Theoretical and Empirical Researches in Urban Management. 2009; 4(11): 87-94.

16. Ahmad KAB, Khujamatov H, Akhmedov N, Bajuri MY, Ahmad MN, Ahmadian A. Emerging trends and evolutions for smart city healthcare systems. Sustainable Cities and Society. 2022; 80 : 103695. DOI:10.1016/j.scs.2022.103695

17. Rocha NP, Bastardo R, Pavão J, Santinha G, Rodrigues M, Rodrigues C, Dias A. Smart Cities' applications to facilitate the mobility of older adults: a systematic review of the literature. Applied Sciences 2021 ; 11(14) : 6395. DOI:10.3390/app11146395

18. Wang M, Zhou T. Understanding the dynamic relationship between smart city implementation and urban sustainability. Technology in Society. 2022; 70: 102018.DOI:10.1016/j.techsoc.2022.102018

19. Padrón Nápoles VM, Gachet Páez D, Esteban Penelas JL, García Pérez O, Martín de Pablos F, Muñoz Gil R. Social Inclusion in Smart Cities. In: Augusto, J.C. (eds) Handbook of Smart Cities. Springer, Cham. 2021. https://doi.org/10.1007/978-3-030-69698-6_42

20. Duygan M, Fischer M, Pärli R, Ingold K. Where do Smart Cities grow? The spatial and socio-economic configurations of smart city development. Sustainable Cities and Society. 2022; 77 : 103578.https://doi.org/10.1016/j.scs.2021.103578

21. Kim J. Smart city trends: A focus on 5 countries and 15 companies. Cities. 2022; 123: 103551. https://doi.org/10.1016/j.cities.2021.103551

22. Zhu H, Shen L, Ren Y. How can smart city shape a happier life? The mechanism for developing a Happiness Driven Smart City. Sustainable Cities and Society. 2022; 80: 103791. DOI:10.1016/j.scs.2022.103791

23. Niu X. The Digital Dilemma and the Healthy Nation. In International Conference on Human-Computer Interaction. Springer, Cham. 2021; 126-134. https://doi.org/10.1007/978-3-030-77820-0_10

24. Scharf T, Phillipson C, Smith AE. Social exclusion of older people in deprived urban communities of England. Eur J Ageing. 2005 Jun;2(2):76-87. doi: 10.1007/s10433-005-0025-6. Epub 2005 May 21. PMID: 28794720; PMCID: PMC5547677.

25. Parizeau MH. The COVID-19 pandemic: between social vulnerabilities and technical systems. Care at the heart of the pandemic. 2022; 65. https://www.fp.ulaval.ca/actualites/le-care-au-coeur-de-la-pandemie

26. Karar ME, Shehata HI, Reyad O. A Survey of IoT-Based Fall Detection for Aiding Elderly Care: Sensors, Methods, Challenges and Future Trends. Applied Sciences. 2022; 12(7): 3276. ; https://doi.org/10.3390/app12073276

27. Wadden JJ. Defining the undefinable: the black box problem in healthcare artificial intelligence. Journal of Medical Ethics. 2022; 48(10): 764-768. http://dx.doi.org/10.1136/medethics-2021-107529

28. Chopra S. Unmasking Power: Alternative Futures for Empowering Our Digital. 2022. Identities.ttp://openresearch.ocadu.ca/id/eprint/3937

29. Romeri L. Plato's ideal city: from the imaginary to the unrealizable. Kentron. Multidisciplinary review of the ancient world. 2008; 23-34. https://doi.org/10.4000/kentron.1594.

30. Platon (1965). (trans. from ancient Greek by Édouard des Places, S.J.), Complete Works: The Laws. Les Belles Lettres, coll. "Collection of the Universities of France" /(trad. du grec ancien par Édouard des Places, S.J.), Œuvres complètes : Les Lois. Les Belles Lettres, coll. « Collection des Universités de France »/. (626)

31. Stalley RF. Justice in Plato's Laws. French Review of the History of Political Ideas. 2022; 229-246. DOI: 10.3917/rfhip.016.0229. https://www.cairn.info/revue-francaise-d-histoire-des-idees-politiques1-2002-2-page-229.htm

32. Chen SC, Davis BH, Kuo CY, Maclagan M, Chien CO, Lin MF. Can the Paro be my Buddy? Meaningful experiences from the perspectives of older adults. Geriatr Nurs. 2022 Jan-Feb;43:130-137. doi: 10.1016/j.gerinurse.2021.11.011. Epub 2021 Dec 6. PMID: 34883391.

33. Suragarn U, Hain D, Pfaff G. Approaches to enhance social connection in older adults: An integrative review of literature. Aging and Health Research. 2021; 1(3): 100029.

34. Bernabe JB, Canovas JL, Hernandez-Ramos JL, Moreno RT, Skarmeta A. Privacy-preserving solutions for blockchain: Review and challenges. IEEE Access. 2019; 7: 164908-164940.

35. Madjda AT. Antioxidant activity of aqueous and methanolic extracts of Asperula hirsuta. 2022.

36. Robert M. The Medina, city of the future?. 2011. http://carfree.fr/index.php/2011/04/09/la-medina-ville-du-futur/

37. Kronfol NM, Rizk A, Sibai AM. Ageing and intergenerational family ties in Arab countries. East Mediterr Health J. 2016 Feb 1;21(11):835-43. doi: 10.26719/2015.21.11.835. PMID: 26857721.

38. Rosenthal GS. Tikkun ha-Olam: The metamorphosis of a concept. The Journal of Religion. 2005; 85(2): 214-240. http://www.jstor.org/stable/10.1086/427314 .

39. Huang K, Fu T, Gao W, Zhao Y, Roohani Y, Leskovec J, Coley CW, Xiao C, Sun J, Zitnik M. Artificial intelligence foundation for therapeutic science. Nat Chem Biol. 2022 Oct;18(10):1033-1036. doi: 10.1038/s41589-022-01131-2. PMID: 36131149; PMCID: PMC9529840.

40. Johnson M, Albizri A, Harfouche A, Fosso-Wamba S. Integrating human knowledge into artificial intelligence for complex and ill-structured problems: Informed artificial intelligence. International Journal of Information Management. 2022; 64: 102479. https://doi.org/10.1016/j.ijinfomgt.2022.102479

41. McNeal MH, Brown M. Elder Restorative Justice. Cardozo J Conflict Resol. 2019; 21: 91. http://law.syr.edu/uploads/docs/Elder_Restorative_Justice_by_McNeal__Brown.pdf