



# Organisational and Citizen-oriented Code of Conduct for a Sustainable, Age-friendly, and Multigenerational Neighbourhoods in the Digital era: An Integrated Literature Review

Obinna Kelechi Oliaku

2022 Laurea



Laurea University of Applied Sciences

**Organisational and Citizen-oriented Code of Conduct for a Sustainable, Age-friendly, and Multigenerational Neighbourhoods in the Digital era: An Integrated Literature Review**

Obinna Kelechi Oliaku  
Global Health & Crisis Management  
Master's Thesis  
May, 2022

Obinna Kelechi Oliaku

**Organizational and Citizen-oriented Code of Conduct for a Sustainable, Age-friendly, and Multigenerational Neighbourhoods in the Digital Era: An Integrated Literature Review**

Year	2022	Number of pages	70
------	------	-----------------	----

---

This paper is aimed at constructing an ethical code of conduct document for the Smart and Healthy Ageing through People Engaging in Supportive Systems (SHAPES). This is to support the third sector and citizens in co-creating values sustainably for age-friendly, and multigenerational neighbourhoods in the digital environment. The goal of the study is to enhance the participation of the older adults and the third-sector players into the co-creation of ethically sustainable digital service systems.

The paper uses the method of integrative literature review to construct a selected scope of perspectives from ethics, multigenerational neighbourhoods, and digital environment studies to arrive at an acceptable ethical code of conduct. The reason is because both the design, development, and deployment of these digital solutions to a greater extent affects the wellbeing of an overwhelming majority of the older adult's population. In this study however, the patients as a population are older people between the age of 65 years and above. Note also that the word "patient" is used interchangeably with older adults.

This paper brings to the limelight the need for a comprehensive support network that will involve the producers, third sector operators, family or carers, and citizens, in a Multistakeholder and Multidisciplinary Decision Making (MMDM) framework. It also recommends the institution of a new party like Older Adults Digital-technology Adoption and Advocacy Forum (OADAAF). This new party will be responsible for guiding and protecting the interests of the older adults, when issues relating to co-creational approaches, ethics, and impact analysis of the age-friendliness of the digital ecosystem are at the center stage. The idea is to ensure ethical sustainability, through continuous education and sensitisation, constant training to increase awareness, with a view to encouraging helpful responses, and informing older adults about the available support options that would ensure their inclusiveness and overall wellbeing.

**Keywords:** Age-friendly neighbourhoods, Ethically sustainable, Digital infrastructure, Multigenerational, Older people, Co-creation.

## Contents

1	Introduction .....	5
2.	Background .....	7
2.1	Ethical dimension of SHAPES project.....	8
2.2	EUPATI toolbox for health technology development .....	11
2.3	Age-friendly communities in the digital era .....	13
2.4	SHAPES ethics in comparison to EUPATI tools .....	14
2.5	The difference between co-creation and product development.....	17
2.6	Digitalisation and co-creation .....	20
3	Goals, objectives, and research questions of the integrative literature review .....	21
4	Methods.....	21
4.1	Integrative literature review as a method.....	22
4.2	Inclusion and exclusion criteria .....	25
4.3	Data search and review .....	26
4.4	Quality assessment.....	28
4.5	Data analysis.....	29
5	Results .....	31
5.1	Description of the included studies.....	32
5.2	What kind of neighbourhood is age-friendly, sustainable, and ethical? .....	39
5.3	Process to gain an age-friendly, sustainable, and ethical neighbourhood .....	40
5.4	The structures required to get an age-friendly, sustainable, and ethical neighbourhood .....	41
5.5	Barriers for the implementation of age-friendly neighbourhood .....	42
6	Discussion.....	47
6.1	Strengths and limitations of this study .....	55
6.2	Ethical Consideration .....	55
6.3	Implications for practice and future research .....	56
7	Conclusion.....	56
	References.....	58
	Figures .....	64
	Tables .....	64

## 1 Introduction

The advent of digital technologies and its ethical impacts and effects on the well-being of older adults in a rapidly changing multigenerational world, makes it critically imperative for relevant stakeholders to construct a comprehensive Code of Conduct that can assist both the third sectors and the citizens in co-creating a sustainable value for an age-friendly neighbourhoods, since to a great extent, the design, development, and deployment of these digital solutions affects the lives of overwhelming majority of the population especially the older adults from age 65 and above (Cath, Wachter, Mittelstadt, Taddao & Floridi 2018). In this paper, “patient” is used interchangeably with older adults.

In the contemporary society, corporate code of conducts has been adopted by a considerable number of public establishments for diverse reasons, either to avoid public bad image or to disentangle self from those bad publicities, it is on record that the past three decades has witnessed a series of scandals that has soiled the image of known leading corporations, which led to their various executives entangled in civil and criminal litigations. It is however in response to these myriads of potential problems and to mitigate them, that code of conduct becomes imperative. Unfortunately, despite the general adoption of these codes, little guidance exists about whether, when, and how they should be implemented. (POPESCU 2016.)

United Nations estimates, according to a data from World Population Prospects 2019 (United Nations 2019), that by 2050, 1 in every 6 people globally will be over the age of 65 years, this contrasts with 1 in every 11 around 2019. This longevity revolution is not peculiar to a particular society, as it a universal trend, though some seemed more advanced, whereas others are still in pre-stage. As a result of the increasing level of life expectancy and reduction in the levels of fertility, there is an unprecedented change in the age structure of the global population. There were 727 million persons aged 65 and above in 2020, predominantly women, and the projection is that over the next three decades, the global population of older persons would more than double, hitting over 1.5 billion in 2050, whereas the quota of the population universally 65 years and above is projected to increase from 9.3% in 2020 to around 16.0% in 2050. (UN-WPA 2020.)

In European Union (EU) member state, EFTA and candidate country, the quota of the population 65 years old and above is growing. Within the last decade, the increase ranges from 5.3 percent points in Finland, 4.8 percentage points in Liechtenstein and 4.6 in Czechia and Poland, to 1.1% points in Germany, and 0.5% points in Luxembourg respectively. Generally, within the last decade i.e. (2010-2020) there was observed a staggering 3% points

increase for the entire EU (Eurostat 2021). Incidentally, a substantial number of these older adults live in their private homes and communities, without a properly designed environments that conforms to their unique needs and capacities to cope with the increased global digitalization with its obvious ethical challenges.

The impact of digitalization requires new approach and mechanisms to sustain common ground and common sense in our public conversation (ALLEA 2021). The older persons' living arrangements and family supports in no doubt have become an issue of great concern policy-wise, especially for those countries that are currently witnessing an advanced phase of ageing population. The hope of achieving the United Nations Sustainable Development Goals (SDG) particularly as it concerns to ending poverty in all its form everywhere (SDG1), ensuring healthy lives, and promoting well-being for all at all ages (SDG3), cannot be achieved without placing more emphasis on the most vulnerable, with special reference here to older persons, and by understanding the interconnections between their living arrangements, social-economic status, their health and well-being (UN-WPA 2020). It is in appreciation of the foregoing that the goal of this study which is to enhance the participation of the older adults and the third-sector players, into the co-creation of sustainable values becomes pertinent. Hence it is of utmost importance to construct a Code of Conduct documents for Smart and Healthy Ageing through People Engaging in Supportive Systems (SHAPES) organisation to assist these relevant stakeholders to co-create sustainable values for an age-friendly, and multigenerational neighbourhoods in this digital era.

Though SHAPES deals exclusively with digital ecosystems, but one key domain among the eight domains of the WHO in achieving an age-friendly cities or neighbourhoods is "Social Participation". This third domain can never be realised without the convergent of digital and physical infrastructures (outdoor spaces and buildings). Suffice it to highlight at this juncture the WHO definition of age-friendly city or neighbourhood, as a city with policies, services, settings and structures support that makes active ageing possible for people by appreciating the broad range of capacities and ingenuity inherent in the older people; anticipating and responding flexibly to ageing-related needs and preferences; protecting those who are most vulnerable; and promoting their inclusion in and contribution to all areas of community life. (WHO 2007.) All areas of community life in this context, no doubt includes the physical infrastructures which has a remarkable influence on the emotional and psychological wellbeing of the older adults in adaptation or otherwise of the digital infrastructures, and the business of co-creation generally.

## 2. Background

The necessity of this code of conduct that will assist the third sector organizations and the older adults in co-creating values for a sustainable multigenerational digital ecosystem can never be overemphasized, hence it is pertinent that organizations like SHAPES 2020, and other various stakeholders act responsibly, and encourage ethical deployment of the various digital solutions, conscious of the prevailing challenges their wrong use and possible proliferation portends. Every responsible organization desirous of growth and socio-economic acceptance must see the building of trust with relevant stakeholders as a prerequisite, therefore they must ensure that their digital services or solutions are not harmful and abusive to the specific users but must be seen as safe and free from error by the target population. Such solutions are also expected to be equitably accessible, fair and an instrument to promote inclusion. (Deloitte 2019.) It is a common knowledge that involvement of the citizens in co-creation, has resulted in increased transparency, trust and mutual respect between them and the relevant organizations (Warner, Haerry, Klingmann, Hunter & May 2018).

However, in this study, the author will draw a comparison between SHAPES ethics and European Patients Academy on Therapeutic Innovation (EUPATI 2021) tools, to determine which kind of values they have, and how they could be of help to the actualization of the three basic principles of ethics: Benefits, harm, and justice. EUPATI through its trained fellows are patient experts on the full spectrum of medicines research and development (R&D), this is in addition to disease specific expertise, technical knowledge in R&D and regulatory affairs. (Hunter et al. 2018.) For the benefit of this study, the patients as a population are the older persons.

SHAPES is an acronym for Smart and Healthy Aging through People Engaging in Supportive systems. This European Union's Horizon 2020 research and innovation program funded project, leverages on a pan-European Innovative action plan which seeks to build, pilot, and deploy a large scale, EU-standardized open platform. In an endeavour to facilitate a long-term healthy and active ageing, and maintenance of an excellent standard of life, SHAPES combines a broad range of multidisciplinary solutions to achieve their objectives. Its combined care and open, EU-standardized platform was established essentially on four components: home, behavior, market, and governance. Moreover, SHAPES digital solutions comprise of assistive robots, eHealth, sensors and wearables, Internet of Things (IoT), equipped devices, mobile applications (apps), big data analytics and utilizing AI. (SHAPES 2020.)

Others are cognitive stimulation and rehabilitation, conversational assistants and chatbots, Covid-19 responses tools among others. These solutions are brought to SHAPES by numerous

partners, and the solutions are being modified and improved within WP5 digital solutions (i.e., adaptation and integration of various digital solutions for SHAPES). The realization of ethical requirements influences technical solutions and services, in addition to the organizational dispositions of SHAPES is an integral component of the SHAPES integrated care platform, digital solutions, marketplace, and ecosystem. Hence ethical requirements contribute to both the software engineering process, and to the formation of SHAPES governance, businesses, and ecosystem, including support processes. All these are aimed at meeting with the SHAPES project's user requirements and needs. These are further integrated to support the diverse pilot themes, where they define the associated case use within SHAPES pan-European pilot campaign, in furtherance, they were finally evaluated by older persons, informal and formal caregivers across our European pilot sites. Instructively, it is during this pilot phase that SHAPES users are shown how to operate the digital solutions, and they would spend reasonable time test-running them to assess whether the solutions are positively affecting their everyday lives. (SHAPES 2020.)

The uniqueness of SHAPES (2020) platform is its design and sustainability for all older individuals, that nurtures inclusiveness, smart and healthy ageing. Its ecosystem is a network of relevant users, and critical stakeholders working in partnership to scale-up the platform and multifarious digital solutions. SHAPES endeavour to anchor a market proposition that centers on connecting demand-and supply across health care delivery, and encourages the co-creation of economical, effective, and trustworthy solutions, while maintaining a code of conduct value and principles anchored on dignity, autonomy, participation, justice, solidarity, and freedom. To be sure, the purpose of the ethical requirements, and the SHAPES code of conducts is to help ensure that SHAPES initiative becomes an ethically responsible endeavour, and a positive innovation for specific end users and service providers, as well as for the society. Alongside user requirements, ethical requirements are particularly important when developing and taking into use those solutions linked to fundamental rights, especially when the target group is older person.

## 2.1 Ethical dimension of SHAPES project

As contained in the final SHAPES ethical framework (D8.14, SHAPES 2020), SHAPES solution comprises of both SHAPES digital, marketplace, integrated care, and SHAPES ecosystem. The final version of SHAPES Ethical framework is built on the previous SHAPES ethical framework (D8.4) which was submitted in April 2020 in seventh month of SHAPES-project. And the aim of SHAPES deliverables is in two folds: One to provide a better understanding of the relevant ethical aspects of SHAPES solutions, and secondly to illustrate the requirements for SHAPES ethical technology, business model, procedures for user support, governance, and ecosystem



they should embrace. The ethical framework and its requirements however are to make sure that SHAPES would eventually be an appropriate innovation for both the end-users, service providers and the larger society. The final SHAPES ethical framework is anchored on the support processes and use cases related to convention of the rights of persons with disabilities, EU policies, lifelong learning among others. (SHAPES 2020.)

SHAPES code of conduct moreover was designed to disseminate the core values, principles, and ethical guidelines for its amalgamated care policies. The essence of SHAPES platform in a nutshell is to promote inclusive, smart, and healthy ageing. According to the assumptions co-created in the SHAPES consortium, home is not only a building, but encompasses having a sense of belonging, a place and a purpose in the neighbourhood, and a critical aspect of the support offered to the community is care-giving, and ensuring that older persons are empowered to have a say on how and whom to obtain care from, this is in line with the principles of “Co-creation” where individuals needs and preferences inspires and provides more knowledge to the SHAPES platform. This platform is secure and reliable; hence it ensures that users enjoy the level of anonymities which they desire. Generally, SHAPES fosters ethical, equitable and inclusive values, which they hope to achieve through excellent platform administration. Through direct engagement with both the local and national governments, SHAPES advances and scales-up ethical practices, by ensuring that the larger systems and policy framework is imparting on and learning from the platform. (SHAPES 2020.)

From the older persons and other end-users’ perspective, SHAPES draws its central frameworks and theories within social ethics that are relevant in the planning and building of SHAPES platform from the Charter of Fundamental Rights of the European Union (EUCFR), under the umbrella of the Convention on the Rights of Persons with Disabilities, biomedical ethics, the ethics of care, and the capabilities approach (2008). The EU Fundamental Rights as provided in Article 2 of the Treaty on the European Union (TEU), states that the EU is “founded on the values of respect for human dignity, freedom, democracy, equality, rule of law and respect for human rights of persons belonging to minorities.” These values also as stressed in Article 2 “are common to Member States in a society in which pluralism, non-discrimination, tolerance, justice, solidarity and equality between women and men prevail.” (TEU 2012, 17.) The emphasis on minority in this study are the older persons who are mostly the beneficiaries of SHAPES digital ecosystem, as all fundamental rights are guarded, and advocates also applies to them.

The EU moreover “places the individual at the heart of its activities by establishing the citizenship of the Union, and by creating an area of freedom, security and justice” (EU CFR 2016, 395). However, the aims of the EU charter are to “strengthen the protection of fundamental rights in the light of changes in society, social progress and scientific and technological developments” (CFR 2016, 395). Suffice to state that EU CFR consists of seven

titles and 54 Articles, and the following are its six significant titles: Dignity (Articles 1-5); Freedoms (Articles 6-9); Equality (Articles 20-26); Solidarity (Articles 27-38); Citizens' Rights (Articles 39-46); and Justice (Articles 47-50). It is also worthy to note that the EU CFR includes the right to data protection and the rights of the elderly (CFR 2016). All these legal provisions are central to all activities of SHAPES and carefully guided in its conducts.

To assist the third sectors and the citizens to be able to create value in the digital era however, it is pertinent to appreciate human capabilities that are anchored on the principle of human dignity and of a life that is worthy of it, as propounded in Nussbaum's capabilities approach, which recognizes the trinity of capability, need, and difference in values (Nussbaum 2011). The fundamental values of any co-creation business that is assumed age-friendly in our digitalized multigenerational neighbourhood should focus on ensuring that citizens live a healthy life to the end of their very old age, enjoy good reproductive health, and to have adequate shelter. Others are the possibility of free movement, and safe from all manners of violent assaults, being able and giving the opportunity to use their imaginations, thoughts and lived experiences to produce works and events according to their own choice and needs, having unrestricted support for human association and interactions that can have important and positive impacts in their development, treated with dignity on the basis of equality and non-discrimination, freedom of affiliation and control over their environments. (Nussbaum 2011, 7-9.)

In a functional and sustainable multigenerational neighbourhood, as the covid-19 experience has shown, all citizens must strive for the good of others, as that has an equal reciprocity in their individual lives. According to Nussbaum (2011), "a person cannot imagine a life without shared goals and shared lives with others". And the shared goals and lives with others can only be possible in a conducive and age-friendly environment where all the requisite resources that enables healthy ageing in a digital era are guaranteed. Healthy ageing according to World Health Organisation" is about creating the environments and opportunities that enables people to be and do what they value throughout their lives" (WHO 2020). What this means in real terms is creating a conducive environment that are in tandem with the demands of the new digital system, which are within the reach of the older people and at the same time able to support their diverse needs and capacities.

These environments consist of the home, community, and the larger society, including all other factors such as the built environment, people and their relationships, attitudes and values, health, and social policies, not deducting the systems that support them and the services that they implement (WHO 2020), hence an age-friendly environment should be such that support and preserve the inherent functional ability and capacity of people of different ages. According to an Agile Ageing Alliance Neighbourhood of the future report (2021), "the environments in which we live can favour health or be harmful to it", since it has immense

influence on functioning, and our vulnerabilities to potential harms, and other health and socio-economic well beings.

## 2.2 EUPATI toolbox for health technology development

European Patients Academy on Therapeutic Innovation (EUPATI) that has been involved in creating value through co-creation is a multi-stakeholder public-private partnership, originally launched by the IMI-EUPATI project (2012-2017) and hosted by the European Patients' Forum (EPF) from 2017 to 2020. EUPATI currently established as an independent non-profit foundation based in the Netherlands. The program has been very successful in providing education and training, aimed at increasing the capacity and capability of patients and their representatives to understand and contribute meaningfully to (R&D) in medicine, and to improve the availability of information related to medicine to the patients and other stakeholders. It does so by conducting its established Patient Expert Training Program which has trained more than 200 Patient Experts known as (EUPATI Fellows), and with 200 more currently enrolled via the EUPATI Open Classroom. In addition, it provides an open-access multilingual Toolbox that has served more than 4 million users in 13 languages around the world to date. (EUPATI 2021.) All over EUPATI, the term "patient" references general age groups across conditions. EUPATI does not place much emphasis on disease specific issues or therapies, rather on the procedures of medicine development generally (Hunter et al. 2018).

There is a significant passion for exploiting patients or older people's knowledge and experiences throughout the cycle of research and development (R&D), in other to benefit them, the companies, and authorities superintending in medicine and technological developments are motivated to engage them because their unique life experiences and peculiar conditions, including their care and medications are significantly beneficial to the success of the R&D. (Hunter et al. 2018.) EUPATI works in collaboration with various patient organizations, high institutions, not for profit organizations and pharmaceutical companies, and provides education and trainings to enhance skills and for capacity building, to enable patients to be meaningfully committed in all stages of medicine development. In recognition of dearth of Europe-wide regulations for stakeholders that wish to support the involvement of patients, EUPATI has addressed lacuna by establishing a set of four guidance documents that consists of industry-led research and development, ethics committees, regulatory authorities, and health technology assessment (HTA). (Hunter et al. 2018.)

Health technology assessment (HTA) is a collaborative procedure that appraises the information concerning medical, social, political, cost-effectiveness, as well as legal and ethical issues for the utilization of various health technologies. The essence of embarking on

these assessments is to bring issues on its potential impacts on both end-users and health ecosystem, to the knowledge of policy makers. However, there is a consensus that existing codes of practice for patients' involvements with diverse stakeholders do not broadly accommodate the full scope of research and development (R&D). In view of that, the European Medicine Agency (EMA 2021) has developed an all-encompassing framework of interaction with patients and consumer organizations since 2016. (EUPATI 2021.)

According to EMA (2021) on capacity-building, in order for patients' contributions to be relevant, they must have a thorough appreciation of the agency's statutes and what is expected of them during the evaluation process. EMA however made available training programme that is tailored towards individuals' unique participatory needs, which is further augmented by an individualized one-on-one support for the clients that are involved in specific activities (EMA 2021). However, the EUPATI guidance documents' objective is to support the integration of patient's participation across the whole process of research and development with regulatory bureaus, health technology assessment bodies and drug manufacturers. Adherence to this guidance document is subject to the individual's discretion depending on peculiar circumstances, extant national legislation, or special needs of individual interconnection, hence the adoption for individual needs should be strictly guided by professional best practices. These guidance documents individually advocate working methodologies and procedures, and spelt out activities and scope of patient's involvement, the guidance documents also suggest focus areas where opportunities for patient's involvement abounds. (EUPATI 2021.)

As part of their efforts to ensure effective patient involvement in R&D, EUPATI has to their credit four guidance document publications which covers health technology assessment bodies, ethics committees, regulatory processes and pharmaceutical industry-led medicines research and development. Those guidance documents individually propose working methods and processes and propounds areas of patient involvement, which are incorporated in two major areas i.e., medicine R&D, and patient engagement in the toolbox. For sustainability, the guidance documents are required to be reviewed and appraised occasionally to reflect transformation and legislation. However, according to Haerry et al. (2018), EUPATI is guided by specific values like: Relevance, fairness, equity, legitimacy, and capacity building. (Table 1). This is in line with a citizen-centred approach in co-creating a sustainable value.

<p><b>RELEVANCE:</b> Patients have the understanding, viewpoints and unique lived experiences that could impart exceptionally to the crucial aspects of regulative ventures</p>
<p><b>FAIRNESS:</b> Patients possesses corresponding rights to assist the regulative activities in the same way as other stakeholders, and they also possess the manifest knowledge, viewpoints, and lived experiences that facilitates a worthwhile involvement</p>
<p><b>EQUITY:</b> Patient’s collaboration in regulative ventures promotes equity, by striving to recognize the various needs of the patients with unique health impediments, weighing against the harsh potential demands of regulative ordinances and recommendations</p>
<p><b>LEGITIMACY:</b> Patient’s collaboration encourages those that are overwhelmed by regulative pronouncements to take part in regulative endeavours; by promoting transparency, credibility, and accountability throughout the process of decision-making</p>
<p><b>CAPACITY BUILDING:</b> Patients collaborative procedures tackles all impediments concerning patients in all regulative pursuits and initiates a structure that facilitates capacity building for both patients and regulative bodies to cooperate</p>

Table 1: EUPATI values (by Haerry et al. (2018) as modified by the Author).

### 2.3 Age-friendly communities in the digital era

Age-friendly communities or neighbourhoods (AFC) according to the World Health Organisation’s (WHO 2007) definition are communities with policies, services, surroundings, and structures that support and enable people towards active ageing by: recognising the wide range of capacities and resources among older adults; anticipating and responding flexibly to ageing-related needs and preferences; respecting their decisions and lifestyle choices; protecting those who are most vulnerable; and promoting their inclusion in and contribution to all areas of community life. (WHO 2007.) According to WHO (2007) there are eight recognisable yardsticks to assessing the age-friendliness of communities, i.e., (1) outdoor spaces and buildings; (2) transportation; (3) housing; (4) social participation; (5) respect and social inclusion; (6) civic participation and employment; (7) communication and information and (8) community support and health services.

Since the launch of Global Network of Age-friendly Cities and Communities (GNAFCC) in 2010 by WHO, the body has witnessed an expeditious growth in its membership, which has come above 1000 cities and communities all over the Global North and South by 2020, and the membership have identified with the commitment to tailor their structures to the demands of the ageing population, giving priority to the WHO eight recognisable yardsticks to assessing the age-friendliness of communities (Buffel & Walsh 2020).

Despite how novel the need to have an age-friendly neighbourhood, this paper argues that the aim will be defeated without making the social aspect all-inclusive, for example putting all the necessary machineries in motion to ensure civic and social participation of the underrepresented in the society, i.e., people with diverse health conditions, especially in an era of sophisticated digital ecosystem. To address this potential exclusion of these vulnerable segment of the society in the co-creation of services and digital ecosystem, EUPATI introduced a multi-stakeholder representation in the partnership, such as patient organisations, academia, not-for-profit organisations, and pharmaceutical companies among others (Haerry et al. 2018), this is to ensure that they play active role in the research and development (R&D).

EU's Fundamental human right (EUFHR 2007, 17-35) states: "It results that none of the rights laid down in this Charter may be used to harm the dignity of another person, and that the dignity of the human person is part of the substance of the rights laid down in this Charter. It must therefore be respected, even where a right is restricted." This has been the pivot of SHAPES digital ecosystem, appreciating the fact that attaining the healthy ageing goals of the United Nations Sustainable Development Goals (UN-SDG 2030) in a digital era and environment can only be possible when human dignity is promoted and ethical quality of life invigorated. In a way, the manner of approach and day to day interaction with the older adults defines the extent their dignity is protected, this makes it imperative that in co-creation and sundry research and development activities, due attention must be paid on the issue of human dignity.

#### 2.4 SHAPES ethics in comparison to EUPATI tools

Flowing from the above expositions, SHAPES promotes the right to life by aiming to improve the health of older persons and thus enabling a better and longer life, hence their ethical framework provides a secure and reliable platform, which guarantees that users enjoy the level of anonymities that they desire. In general terms, SHAPES fosters ethical, equitable and inclusive values, that will possibly be achieved through excellent platform administration. By means of direct engagement with both the local and national governments, SHAPES promotes and scales-up ethical practices, by ensuring that the larger systems and policy framework is

conveying to and learning from the platform. (SHAPES 2020, 3.) In their own part, EUPATI's guidelines ensures proper ethical consideration as it concerns the cooperation amongst multi-stakeholders and patient advocates by putting up proper machineries to checkmate "conflict of interest" in a more transparent manner in their presentations and views. In practice, they made sure that both patients' organisations, and other interest groups are adequately represented in the EUPATI partnership. These multi-stakeholders and patients' collaboration through reviews, and public consultations, enacted series of policies and guidelines for patients' involvement in medical research and development (Spinder & Lima 2018).

In SHAPES, researchers are expected to sort for and secure the review of the local ethics committees who in turn analyse the consent documents and information leaflets, ensuring that researchers sensitise the participants to be aware of the binding ethical and legal requirements, there is also a procedure including self-check lists for that. Additionally, they are enlightened on ethics as it relates to pilots and co-creation, while approval must be secured from the local ethics committee. EUPATI offers tangible recommendations for ethically correct, trustworthy multi-stakeholder guidance task force, feedbacks from workshops, webinars, and surveys on patient's experiences and anticipation in ethical review of clinical research project involvements in addition to extensive public consultation (Klingmann et al 2018).

To be sure, when involving older adults or end-users' in research and development. Ethical reviews are very essential to ascertaining whether their needs are met, and attainable, hence in a way to ensuring that the right to integrity of the older adult are protected, SHAPES pays special attention to free and informed consent on issues of research, and associated consequences on their living condition. Moreover, during the pilot phase, SHAPES users are shown how to operate the digital solutions, they are also made to spend reasonable time in test-running them to assess if the solutions are positively affecting their everyday lives. (SHAPES 2020.)

However, in EUPATI toolbox, patients are in privileged position to illustrate the outcomes that matter to them, to confront presumptions about their health expectations, and to advice regulatory processes about the possible positive or negative effects of contemporary and existing technologies (Haerry et al. 2018). In a way to ensuring that right to the integrity of the older adult protected, SHAPES pays special attention to free and informed consent on issues of research, and associated consequences on their living condition. In the light of the foregoing, the unique aspect of the EUPATI's guidance toolbox is the recognition of the patients' values (Figure 1), which includes Relevance: i.e., acknowledging the endowed knowledge of the patients, their unique perspectives and experiences that imparts to ethical considerations. Fairness: recognizing patients equal right with the stakeholders to advance ethical clinical review, given their knowledge and experiences that empowers them to engage

productively. Equity: By seeking to understand the various needs of the patients or older persons with peculiar health related problems, their participation in ethical review process contributes to equity. And there is a well organised, extensive, scientifically reliable, and user-friendly educational documents put in place by EUPATI basically to educate patients on the procedures of medicines (R&D).

This ensures that patients (older adults), patients' experts, and advocates are adequately empowered with the requisite information for deeper understanding to be able to work with other relevant authorities, and health care professionals in such a way that it will be beneficial to both the patient and neighbourhood. (Spinder & Lima 2018.) Finally, the focal point of EUPATI's on the general process of health technology development is to strengthen the capacity and ability of patients through education and training to enable them effectively to contribute to medicine (R&D) with various stakeholders (Haerry et al. 2018, 230). This is illustrated in Table 2.

SHAPES ETHICS	EUPATI TOOLS
SHAPES promotes the right to life by aiming to improve the health of older persons	EUPATI's guidance toolbox is the recognition of the patients' values, which includes Relevance, fairness, and equity
SHAPES fosters ethical, equitable and inclusive values, that will possibly be achieved through excellent platform administration	EUPATI's general process of health technology development is to strengthen the capacity and ability of patients through education and training
SHAPES promotes and scales-up ethical practices, by ensuring that the larger systems and policy framework is conveying to and learning from the platform	EUPATI's guidance ensures proper ethical consideration as it concerns the cooperation amongst multi-stakeholders and patient advocates
In SHAPES researchers are expected to sort for and secure the consent of the local ethics committees	In EUPATI there is a well organised, extensive, scientifically reliable, and user-friendly educational documents basically to educate patients on the procedures of medicines research and development (R&D)
SHAPES pays special attention to free and informed consent on issues of research, and associated consequences on their living condition	In EUPATI toolbox, patients are privileged placed to illustrate the outcomes that matter to them, to confront presumptions about their health expectations, and to advice regulatory processes
SHAPES users are shown how to operate the digital solutions and made to spend reasonable time in test-running them to assess if the solutions are positively affecting their everyday lives	EUPATI offers tangible recommendations for ethically correct, trustworthy multi-stakeholder guidance taskforce

Table 2: Comparison between SHAPES ethics and EUPATI toolbox.



## 2.5 The difference between co-creation and product development

This sub-topic will discuss the disparities between co-creation and product development methods. Product development process supports a traditional approach where the product manager plays all the pivotal roles, from ideation, concept testing and many more, by either wholly or partially isolating the customer segment. Product developments undergo five phases: Opportunity identification, concept generation, concept and project evaluation, development, and finally the launching of the products to the end-user. Figure 1.

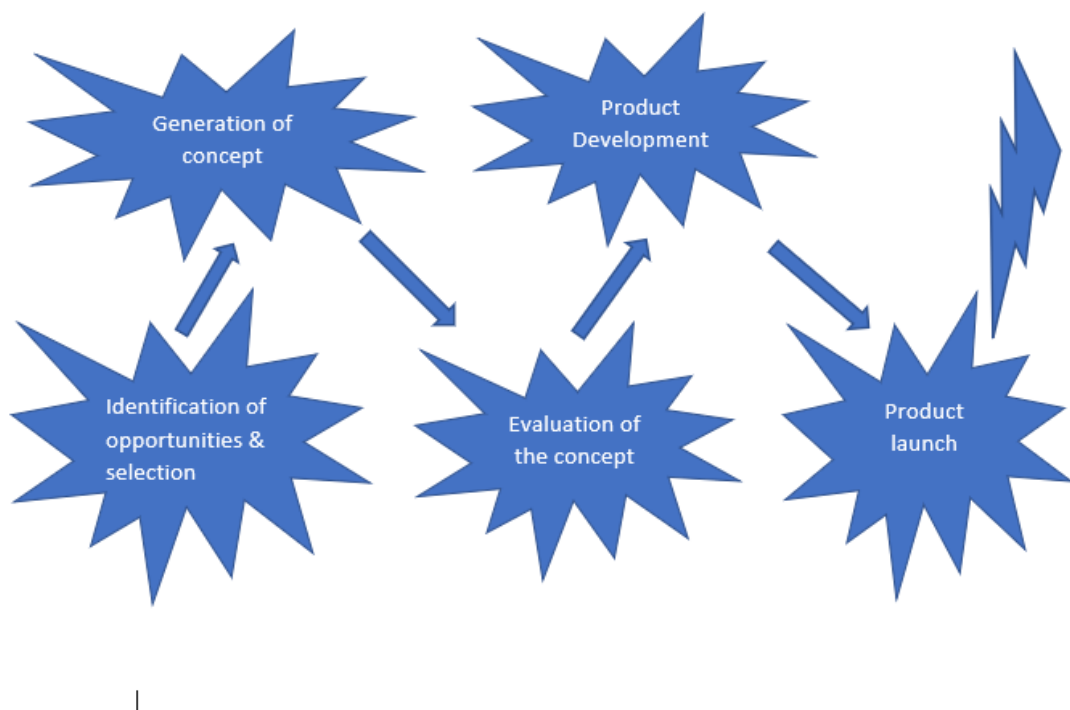


Figure 1: 5 Phases of the new products process (Slide Team 2022). Picture modified from 5 Phases of the New Product process Power Point show.

However, co-creation offers the most favorable method for developing this kind of patient centered solutions. In their study, Mandolfo, Chen and Noci (2020) identified co-creation as a venture that engenders a new paradigm from the traditional role new product development managers play, which also incorporates remote research and planning, plays the role of promoter of knowledge exchange between the company and the end-users. The study further suggested that co-creation align together citizens, firms, third-sector players, as well as public sectors to identify and find solutions to issues that relates to the service ecosystem, Ateetanan and Shirahada (2016) concluded that “the viewpoint of co-created value from the

multi-stakeholders are supreme significance". Multi-stakeholders comprise of investors, firms, digital solution providers like SHAPES, the third sector players, and governments.

However, as plausible as the idea of multi-stakeholder-patient collaboration sounds, the studies (Mandolfo et al. 2020; Ateetanan & Shirahada 2016) were very silent on key issues of ethical code of conduct. Like in EUPATI's guidelines proper ethical considerations like Non-Maleficence, Equality, Independence-objectivity-neutrality, Integrity, Declaration of conflicts of interest, Anonymity, Consent as it concerns the cooperation amongst multi-stakeholders and patient advocates, proper machineries were putting in place to checkmate "conflict of interest" in a more transparent manner in the presentation and views. While making sure that both patients' organisations, and other interest groups are adequately represented in the EUPATI partnership. These multi-stakeholders, patients by way of reviews, and public consultation approach, promulgated series of policies and guidelines for patients' involvement in medicine (R&D) (Spinder & Lima 2018).

Co-creation incorporates a broad-spectrum of activities that includes suggesting ideas for the development of new products or services, or enhancing existing ones, through the validation and support of the design phase, assessment of the idea and alternatives, or advancing the clarification of launch campaign (Mandolfo et al. 2020), hence it challenges the public sector to put service users at the forefront, which enables them to initiate a truly multilateral collaboration, by applying service dominant (S-D) logic, "the logic of togetherness where actors use their applied knowledge and skills (competence) to provide benefit to another and to benefit themselves, based on relationships, mutual trust, and win-win exchange" (Joiner & Lusch 2016). Because co-creation is more patient centered, there is need for stakeholder to make resources available, and collaborations very easy, for co-creational activities and for organizations that are facilitating co-creation.

It is therefore pertinent that managers develop appropriate co-creation practices to increase identified motivations and curtail possible barriers (Mandolfo et al. 2020). One of the identified barriers according to Mandolfo et al. (2020) is how companies can manage a large-scale co-creation activity. Ateetanan and Shirahada (2016) in their study opined that "the viewpoint of co-created value from the multi-stakeholders are supreme significance". Multi-stakeholders comprise of investors, firms, digital solution providers like SHAPES, the third sector players, and governments. In no doubt, the development and adoption of ICT-based platforms (Internet, Facebook, Zoom, Microsoft teams etc.) has become a veritable tool to mitigate these perceived barriers. The study also recognized the importance of a diversified ICT literacies of stakeholders and suggested that the virtual approach be modified properly (Ateetana & Shirahada 2016).

The study also opined that collaboration of online and social media tools can settle the constraints of space and time of stakeholders' engagement (Ateetanan & Shirahada 2016). However, the study failed short of propounding the best ethical approach towards actualizing the adoption of ICT tools in an environment where the vulnerable especially the older adults are mostly the recipients of these digital ecosystem, to enable the patients within their facility or residence or neighbourhood respond and support the development of that solution. It was in a bid to close an identified gap in the prevailing code of conduct which covers the practices of patient's involvement with diverse stakeholders in the broader scope of research and development R&D, and related processes, that EUPATI embarked on development of guidance documents for pharmaceutical industry-led medicines R&D, ethics committees, regulatory authorities, and health technology assessment (HTA), (Haerry et al. 2018).

Acknowledged that internet-based health information enables co-creation of values among consumers (Older adults) and overall health ecosystem, it is noteworthy also to appreciate how this easy access to information is radically changing the hitherto skewed network that has been the norm within consumer-provider communication. Widespread amongst the online or internet-based sites are those where consumers can easily extract ready feedbacks to their queries from providers. Examples of such existing sites are HealingWell.com, Dailystrength.org, PatientLikeMe.com etc., which various consumers deploys to support each other. (Joiner & Lusch 2016.) As good as these online platforms looks in social network and support system, the fact remains that these vulnerable population are exposed to access both the credible and non-credible sites, which might be detrimental to their well-being, and compromise their privacy and information security. Hence the need for a multi-stakeholder approach to stem it in a more ethical way.

Individual privacy is a fundamental human right that must be guaranteed especially in a digital neighbourhood where citizens deploy various services through latest technologies that are linked via a wide-ranging networks and systems to communicate with one another, which are obviously prone to attacks from hackers that are likely to intrude into their personal privacy. (Ijaz, Shah, Khan & Ahmed 2016.) More emphasis on the role of social networking should be placed by digital ecosystem service providers like SHAPES on the privacy and information security of the older adults as the world gravitates towards rapid digitalization of various neighbourhoods, by deploying and integration of artificial intelligence (AI) to digital solutions that can shield these vulnerable adults from potential compromise of their privacies. Privacy concerns connected with the social networking rests squarely on the identification of information offered by that individual, the receivers, and the manner of its utilization (Ijaz et al. 2016).

It is also imperative for governments to develop the will to support organizations like the third sectors who are into co-creation, that are inclined towards patient centered solutions to be able to approach, educate and convince the older adults on the need to support the development of specific solutions that will positively impact their well-being and healthy living. In the light of this, it is important that firms recognize the needs, proclivity and what motivates the prospective co-creators as to provide the suitable incentives that will encourage their participation (Mandolfo et al. 2020). Most organizations obviously lack the requisite knowledge of how best to engage service users, especially when it comes to the older adults. Apart from digital application, there is need to pay more attention on initiating similar structured processes to strengthen the organizational value as well as the user value. (Ahlin & Snyder 2021.).

## 2.6 Digitalisation and co-creation

As the population of older adults is rapidly growing globally, various Assistive Technologies (ATs) like information sharing and telecare, monitoring health and safety, communication support, long-term care, and independent living, perhaps are principal promoters for the elderly care solutions, and response to their well-being (Ateetanan & Shirahada 2016). In their study, they proposed a framework to advance the encapsulation of the service-dominant logic (S-D logic), and open innovation towards a consolidated service roadmap. Service roadmap is an amalgamated technological organizational tool, that centered on service system design, which highlights macro-level arrangement for a determined future period. The study however argued that, whilst vital technology roadmaps endure, there is a negligible emphasis on service roadmap, which is essential for stakeholders and the providers of elderly care services to fashion out suitable value proposition in contemporary and ensuing market. (Ateetanan & Shirahada 2016.)

One important value proposition that appeals to the older adults is the usability of the technology. Older adults prefer technology that is user-friendly, and not time-consuming in the usage and for information on using, hence Spann and Steward (2018) suggests that” for mHealth to be genuinely useful it has to be reliable, unobtrusive and integrable into people’s lives”. Buttons and keyboards of such digital devices including the screens must be big enough for older adults with cognitive impairments to use. This makes it pertinent that developers, providers, and policymakers need to carry the older adults along in both decision making and developmental processes of health technologies, before they are incorporated into their lives (Spann & Steward 2018). This will enhance a sense of security for the older adults in embracing the utilization of digital solutions and give them a sense of belonging.

### 3 Goals, objectives, and research questions of the integrative literature review

The goal of the study is to enhance the participation of the older adults and the third-sector players into the co-creation of ethically sustainable digital service systems.

The objective of the study is to construct a Code of Conduct documents for SHAPES that could assist the third sectors and citizens to co-create a sustainable value for an age-friendly, and multigenerational neighbourhoods in the digital era.

The research questions for the integrated literature review are:

- (a) What kind of neighbourhood is age-friendly, sustainable, and ethical?
- (b) What is the process like to gain an age-friendly, sustainable, and ethical neighbourhood?
- (c) What kind of structure is required to get an age-friendly, sustainable, and ethical neighbourhood?
- (d) What are the barriers for the implementation of ethical Code of Conducts in co-creating an age-friendly, sustainable, and multigenerational neighbourhood?

### 4 Methods

The process of the study commenced in October 2021, as the topic and method were considered after proper negotiation with key stakeholders in SHAPE project. The author settled with this topic because of his professional background as a social worker, and the value of the wellbeing of people anchored on justice for the vulnerable members of the society, the need to protect them from harm, and ensuring that they maximized benefits in utilizing certain solutions in this digital era. The author also has extensive experience from working with the older adults in the elderly homes as a practical nurse, this to a great extent placed him in a better position to articulate and construct a comprehensive ethical Code of Conduct that can help both the third sector and the citizens to co-create values that are age-friendly and sustainable in a digital era like this.

The choice of integrative literature review as a method for the study was informed due to its effectiveness in obtaining a broad view of the study topic. There is currently not enough ethical code of conduct guidelines for digital ecosystem providers in this era of digitalization, to empower and protect the interest of the third sectors and citizens, especially the older adults, in putting their lived experiences to bear in co-creating age-friendly solutions. There is also no structure in place to galvanize a multidisciplinary and multi stakeholder collaboration that would create a veritable atmosphere and conducive ground where the older adults with various health challenges will feel respected, wanted, safe and sense of

autonomy. Though there exists some code of conducts before this research, but the letters are not all encompassing as to protect and uphold all elements of human rights where trust and data security are essential issues for consideration.

Additionally, the third sector has been dormant in the process of co-creation, a development that has created a huge gap in interfacing with governments and relevant stakeholders to ensure quality and people-centered policy formulation. In the light of the foregoing, integrative literature review was selected as a research method for this study, owing to its effectiveness in obtaining a more extensive perspective of the study topic. The study however was due for finalization by April 2022. Timetable in Appendix 1.

Population	Third sector and the older people using digital solution, and future users of SHAPES ecosystem
Intervention	Constructing ethical Code of Conduct, to support the third sector and citizens in co-creating value sustainably
Comparison	Comparison between relevant literatures on the topic with EUPATI recommendations
Outcome	Report on constructing SHAPES Code of conduct document for third sector and citizens to co-create a sustainable value for an age-friendly, multigenerational neighbourhood in the digital era

Table 3: PICO Model: The study question is designed using PICO.

#### 4.1 Integrative literature review as a method

Integrative literature review (ILR) is a part of research studies, that are sometimes used as a fragment of a study or in whole as research a research method, with an aim to bring about a new frameworks and perspective (Richard 2005). One of the reasons integrative literature reviews was chosen as a method for this study is to have the capability to generate new knowledge about the topic reviewed, and identify gaps in current research concerning ethical, sustainable, age-friendly neighbourhoods in the digital era, with a view to construct a comprehensive ethical Code of Conduct for SHAPES that can assist the third sector and citizens to co-create values. Integrative literature review as a research method also allows the use of mixed methods, inductive studies, and collection of data through quantitative and qualitative together. (Whittemore & Knafl 2005).

Integrative literature review gives a vivid exposition of how similar topic under review has been earlier examined, and the unique evidence-based findings of the researcher (Holopainen, Hakulinen-Viitanen & Tossavainen 2008). In other to achieve key objective of integrative literature review, the need for clear definition of the problem(s), the purpose and method can never be overemphasized, hence according to Whittemore (2005), the primary study's standard must be accurately assessed and duly integrated in analysing and interpreting the findings.

Going forward, to ensure an evidence-based literature review, and in line with the methodologies as introduced in Whittemore and Knafl's (2005) which focuses on the research problem i.e., constructing a Code of Conduct documents to assist the third sector and the citizens to co-create a sustainable value for an age-friendly, and multigenerational neighbourhoods in the digital era, the author made sure that the research questions and purpose are clearly defined. A meticulous integrative literature review specifies the disposition of the discipline of the chosen topic, collaborate to the theory development, and possesses the uninhibited viability to the application and policy (Whittemore & Knafl 2005). Despite the seeming challenges in merging collected data from multiple research designs during the analysis phase, which is one of the unique characteristics of integrative literature reviews, it no doubt has a substantial prospect of enhancing the profundity of the study conclusion. (Stolt et al. 2015; Whittemore 2005.)

However, there are five stage of integrative literature reviews according to Whittemore and Knafl (2005). These includes (i) a problem formulation stage, (ii) a literature search stage, (iii) data evaluation stage, (iv) data analysis stage, and (v) presentation stage; Figure 2.

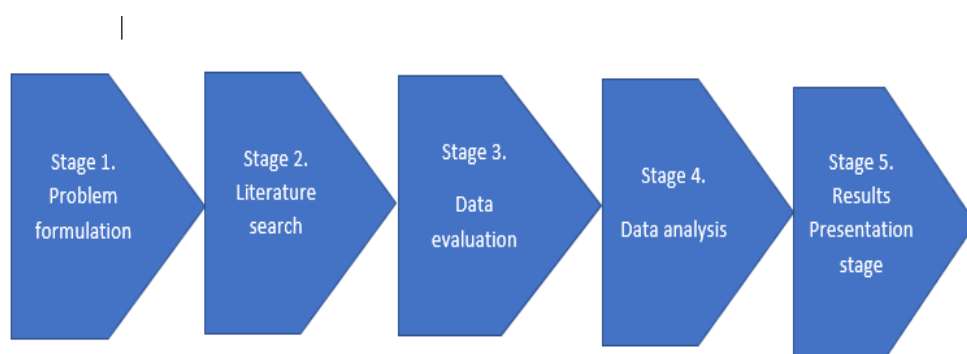


Figure 2: 5 Stages of an integrative literature review (according to Whittemore and Knafl (2005) as modified by the Author).

During the problem formulation stage, a clear recognition of a problem and its relevance to the purpose for its review is very essential. It is only a clearly defined review problem and purpose that will accelerate the rest of the review stages (Whittemore & Knafl 2005.) Also, it

is important to note that a clearly defined literature search strategies are key to performing a standard literature review (Whittemore 2005; Conn et al. 2003). Next to successful collection of relevant literatures, is the data evaluation stage, where the primary studies are scrutinized. As a result of disparities in the study designs, the process of evaluation in integrative literature review is complicated. In a situation where the review data are a combination of both theoretical and empirical sources, two kinds of quality criteria tools could be applied as inclusion and exclusion criteria (Whittemore & Knafl 2005). Whittemore (2005) averred that the reliability of a review evaluation is improved when there are two different reviewers. The essence of this stage is to arrange, summarize and harmonize a conclusion about the research problem.

The type of research review determines the variation between the data analysis methodology and procedures, as all reviews other than meta-analysis use narrative or qualitative analysis. In other words, the researcher will have to match up the coded data from independent studies with every other study for similarities or differences on every side of variables of interest. Finally, the researcher will write a synthesis of the findings. Synthesis is the dominant level of abstraction that introduces a new model or framework for problems (Whittemore 2005; Whittemore & Knafl 2005).

Last stage in the review is the presentation stage, at this instant in the report, a clear documentation of the literature search process in the final report, the entire review process however must be duly described to enable the reader to evaluate the trustworthiness of the work easily. The report encompasses such elements like the search terms, the list of databases used, the search strategies, and what constitutes the inclusion and exclusion criteria in determining relevant literatures. (Whittemore 2005.) In principle, the outcome of the study will generate new ideas regarding the reviewed topic, and its effect to the implementation should be emphasized, as well as consequences for research and policy approaches. (Whittemore 2005; Whittemore & Knafl 2005).

In this paper also, EUPATI was used as a structure, with the amalgamation of knowledge from SHAPES, Studies hits(articles), and EUPATI values, the author used a deductive structure to arrive at the code of conduct. Deductive reasoning is a “top-down” procedure of reasoning whether a hypothesis is true, established on logic and demonstration. Deductions starts with a generic assumption, then narrow in scope until a precise determination. Features of deductive reasoning are top-to-bottom reasoning, valuable for reaching certain conclusions, and of course, not a “fool proof” method (Hackmann 2021). In line with EUPATI’s values, for example, relevance, fairness, equity, legitimacy, and capacity building, including its rational principles of mutual respect, trust, reliability, responsibility, transparency, accountability, public disclosure, and sustainability (EUPATI 2020) constitutes an integral part of the code of conduct, which is the outcome of this thesis process. SHAPES codes of ethics and principles



anchored on dignity, autonomy, participation, justice, solidarity, and freedom formed the nucleus of the knowledge base in the trinity amalgamation that gave life to this paper's intervention, i.e., Constructing ethical Code of Conduct, to support the third sector and citizens in co-creating value sustainably (Figure 3).

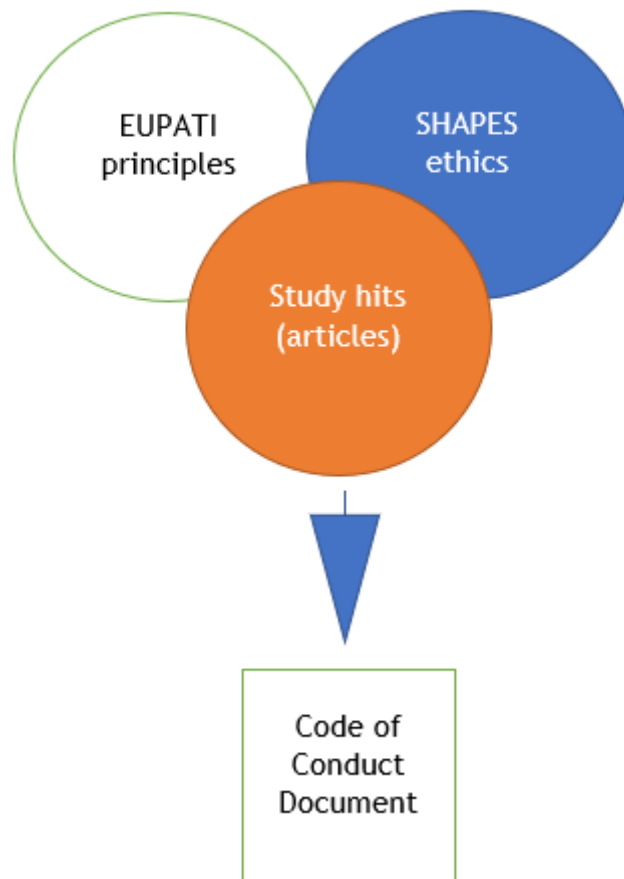


Figure 3: EUPATI structure and three elements amalgamation to produce the code of conduct documents.

#### 4.2 Inclusion and exclusion criteria

Inclusion Criteria: Prior to the data search, the author properly defined the inclusion and exclusion criterions. Inclusion criteria were elucidated in a more comprehensive manner to be able to get suitable articles for the study. Title, abstracts, and the full texts were considered, publications between 2010 and 2021 were selected, and only medical, epidemiological, and nursing journals on age-friendly neighbourhoods, ethics, digital infrastructure, and ethics published in English were carefully selected, qualitative and quantitative peer reviewed original and suitable peer reviewed original journals, journal

articles on age-friendly and multigenerational neighbourhoods, journals articles on digital infrastructure, sustainable ethics. The author included interventions that are on par with constructing ethical code of conduct, to support the third sector and citizens in co-creating values for a sustainable, age-friendly, multigenerational neighbourhoods, in the digital era.

Exclusion Criteria: Research articles older than 11 years, any language that is not English, all articles' duplicates, case reports, students' thesis. Table 4 below shows the inclusion and exclusion criteria.

According to Burke and Hutchins (2007), any article that should be considered for inclusion must allow for explanation how the construct is transferred, either explicitly, or provide a considerable information throughout the abstract, introduction, method, results, and possibly the discussion sections to clarify that the transmission was the criterion variables of interest.

Inclusion Criteria	Exclusion Criteria
<ul style="list-style-type: none"> <li>• Publication language: English</li> <li>• Type of research design: (qualitative, quantitative, mixed methods, systematic literature review, integrative literature review, data synthesis)</li> <li>• Peer reviewed original articles</li> <li>• Publications below 11 years</li> <li>• Journals on age-friendly, multigenerational neighbourhoods, ethics, digital/physical infrastructures</li> </ul>	<ul style="list-style-type: none"> <li>• Other languages other than English</li> <li>• Research articles older than 10 years</li> <li>• Students' thesis</li> <li>• Case reports</li> <li>• All article duplicates</li> </ul>

Table 4: Inclusion and exclusion criteria.

#### 4.3 Data search and review

The study data search commenced in October 2021. Subsequently, there was a painstaking deliberations and guidance from a LAUREA's information specialist, where 4 databases were chosen for the data search i.e., ProQuest Central, ScienceDirect (Elsevier), Sage Premier, and

Google Scholar databases. (Figure 4). For the reliability assurance of the data search, the author consulted with the supervisor in every stage of the data search.

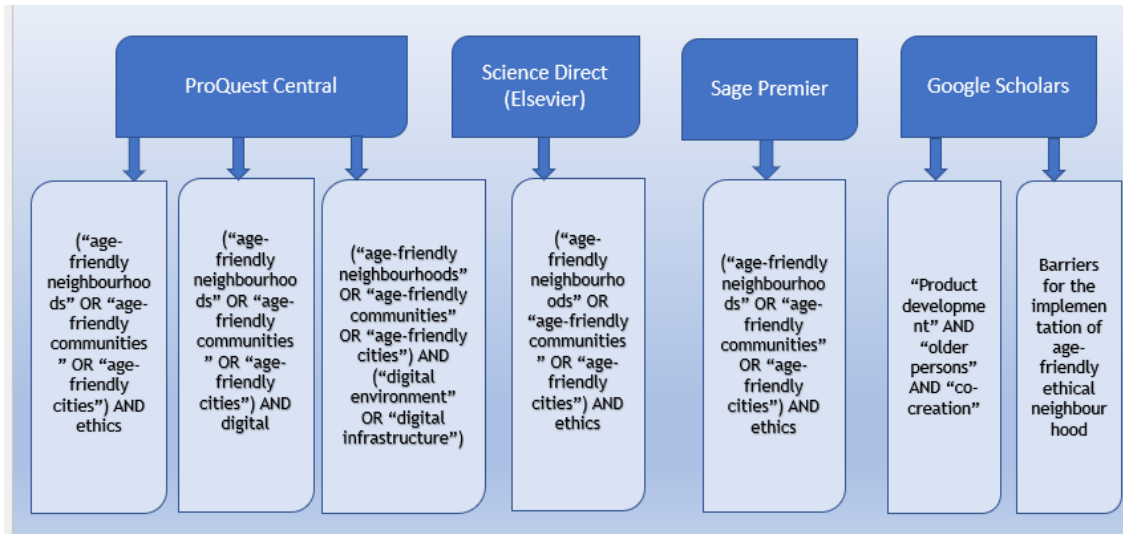


Figure 4: Data search from databases.

Relevant materials were obtained from these databases using the following search terms: ProQuest Central: ("age-friendly neighbourhoods" OR "age-friendly communities" OR "age-friendly cities") AND ethics, ScienceDirect (Elsevier): ("age-friendly neighbourhoods" OR "age-friendly communities" OR "age-friendly cities") AND ethics, Sage Premier: ("age-friendly neighbourhoods" OR "age-friendly communities" OR "age-friendly cities") AND ethics, Google Scholar: "Product development" AND "older persons" AND "co-creation". On the 14 October 2021, another search queries were conducted in ProQuest Central: ("age-friendly neighbourhoods" OR "age-friendly communities" OR "age-friendly cities") AND digital, ("age-friendly neighbourhoods" OR "age-friendly communities" OR "age-friendly cities") AND ("digital environment" OR "digital infrastructure"), Google Scholar: Barriers for the implementation of age-friendly ethical neighbourhood. Google Scholar was accessed in other to obtain scientific papers that meet specified criteria which the previous data bases could not achieve in the hits.

The entire references obtained from hits were saved in the RefWorks software for careful evaluation. In the initial stage, all the identified duplicates were deleted. In the second stage, topics, abstracts including the study language were adequately screened, and relevant references were considered for full-text review November 2021. At the third stage however, the full text of the literatures was screened. Then finally in the last stage, all selected literatures' full texts were analysed for inclusion criteria and quality, using relevant

assessment tools, and subsequently the final references were incorporated by the same November 2021.

#### 4.4 Quality assessment

A crucial element of a literature review according to Higgins and Greene (2011) is the evaluation for validity. There exist several diverse criteria assessment tools for distinct study designs (Higgins & Greene 2011; ICMJE 2015). Assessment criteria tools are very important because they assist the researcher in reporting the vital elements of the study methods, study contexts, findings, to examine and transparently interpret the findings (ICMJE 2015; The Joanna Briggs Institute 2014; Tong, Sainsbury & Craig 2007). According to Whitemore and Knafl (2005), an average integrative review consists of diverse study designs that makes evaluation exercise burdensome. Systematic and diligent reviews possess the capabilities to offer a far-reaching appreciation of problems pertinent to healthcare and practices. There is the inclusion of various data sources in integrative reviews, which amplifies a comprehensive impression of the topic of concern.

That said, it remains challenging to integrate varied data sources. However, a modernized integrative review methodology encompasses appreciable systematic and meticulous approach to the method, especially to data analysis. Utilising mixed method approaches or qualitative research to this procedure has the prospect to curtail bias or error. Integrative reviews could also contribute to evidence-based practice approach by depicting the intricacies innate in healthcare related issues. (Whitemore & Knafl 2005.) Going forward, the author in this paper thoroughly assessed the quality of the studies included. In this study, Critical Appraisal Skills Programme (CASP) checklist for qualitative studies was used as an assessment tool for qualitative studies (CASP 2017) Appendix 3. The CASP tool assesses both internal and external validity. However, the essence of utilizing appraisal tools for review is to scrutinize its validity, to review the result and to evaluate its applicability and the extent to which the study outcome could be applied in practice.

CASP has diverse checklists for distinct study designs and these checklists were specifically developed to be employed as an educational pedagogic tool, therefore it does not propose a scoring approach (CASP 2017). Notwithstanding, this study utilized a modified CASP checklist (B) for qualitative studies by including scores to enable it to be in the same position with the rest assessment tools. Moreover, the author prefers the use of Critical Appraisal Skills Programme (CASP) in most of the studies that have elements of different methodologies due to its suitability in appraising the quality of diverse types of research (Johnston et al. 2020, 378-381). Hence it is safe to say that CASP can be used to appraise both quantitative and qualitative research (Appendix 3). Steps used in case study methodology is not different from

that of other research types, it follows first by defining a unique case or pointing out a cluster of related cases that can subsequently be integrated into various case studies. An exploration to ascertain what is the outcome of investigations about the case(s) is generally conducted. In case studies, data are usually, but not solely qualitative in nature. (Heale & Twycross 2018.)

In the other hand, PRISMA is a checklist for evidenced based used for documenting systematic reviews and meta-analyses. It is the objective of PRISMA to enhance the documenting of systematic reviews, as well as being used for critical appraisal of published systematic reviews, though it is not an authentic quality assessment tool for certifying the quality of a systematic review (PRISMA 2015). Nevertheless, the utilization of PRISMA is likely to strengthen the systematic reviews' methodology (Moher, Shamseer, Clarke, Gherzi, Liberati, Petticrew, Shekelle, Stewart & PRISMA-P Group 2015). Checklist (C), Appendix 4.

The quality of systematic reviews in this study was high (87%-100%; mean 89), The quality of the qualitative studies, and mixed method studies using CASP tools were also generally very high (90%-100%; mean 96%, 100%-100%; mean 96%, 90%-100%; mean 96%, 95%-100%; mean 96% and 95%-100%; mean 96%) respectively. According to Lewin et al. (2015), the methods for assessing qualitative evidence synthesis findings are inadequately developed.

#### 4.5 Data analysis

Data analysis in an integrative review according to Whitemore & Knafl (2005) demands that the variety of data derived from main origin should be arranged, categorized, coded, and encapsulated into a combined and cohesive deduction concerning the research problem. The coded data is however further juxtaposed in the evaluation and synthesis process. In view of the foregoing, the objective of the data analysis stage is the in-dept and objective interpretation of the primary sources, together with an ingenious synthesis of the proof. Acknowledging the difficulties inherent in data analysis process with integrative reviews, Whitemore and Knafl (2005) suggested an analysis technique for integrative reviews geared towards improving the strength of integrating diverse data methodologies. In the integrative review method, the modus operandi for data analysis is in tune with the utilization of diverse data from mixed methodologies. And the approach incorporates data reduction, data display, data comparison, and drawing of conclusion and validation (Whitemore & Knafl 2005). In this study however, the process of data analysis commenced after the inclusion and assessment of the final studies.

From the output of the entire data search, a total of 753 references were found. After removing duplicate articles, 747 prospective references remained for careful screening. Also, the titles and abstracts were properly screened for applicability, which resulted in the

reduction of the number of references to 150, eliminating 597. Further, out of the 150 references, full text articles were evaluated for eligibility, and 130 eliminated for obvious reasons, at this stage the references were further narrowed to 20, the reason for the elimination was because the studies were not relevant to the main subject. However, at the final stage, the references were further evaluated for inclusion and exclusion criteria, in addition to their quality, 14 references were further removed. The reason for the exclusion was because though the population and interventions in the studies satisfies eligibility criteria, the study design does not. At the end of the review processes however, a total of 6 references were included in this study (Appendix 2). The included articles are as follows: Buffel et al. 2010, Cindery et al. 2018, Hatton et al. 2020, Pedell et al. 2021, Scott 2017, and Torku et al. 2021. Note that the rationalisation for excluding most of the literatures were for reasons ranging from being duplicates of literatures located in other databases, keywords were only disclosed in the titles or abstracts but failed to explicitly focus on issues relating to the topic of this review, and absence of appropriate studies included (Figure 5).

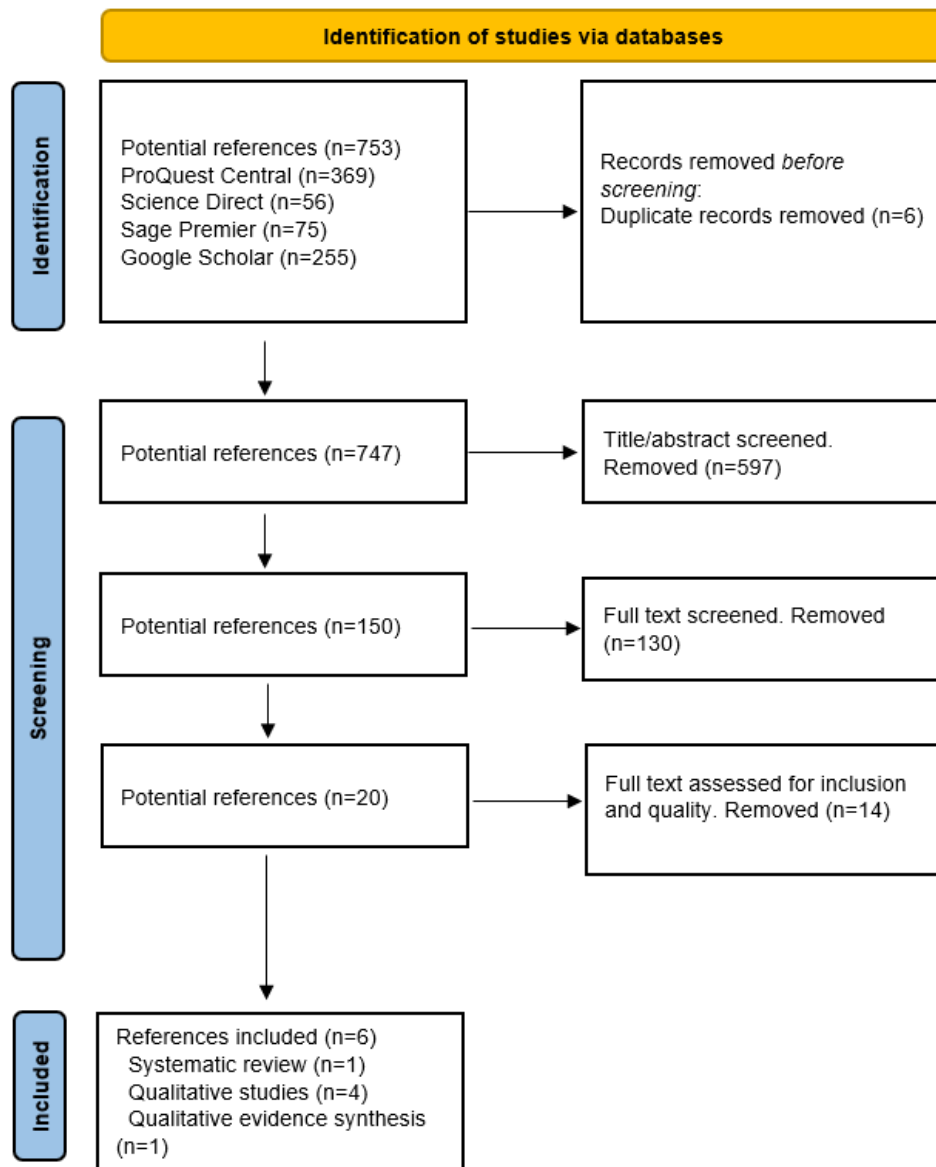


Figure 5: PRISMA Data review process (from Page, McKenzie, Bossuyt, Boutron, Hoffmann, Mulrow et al. (2021), modified by the Author).

## 5 Results

An age-friendly neighbourhood that is sustainable and ethical is such that stimulates active ageing through the improvement of possibilities for health, engagement, and security to boost the quality of life of the older adults. In the light of the foregoing, the study results from the organisational and citizen-oriented code of conduct, for a sustainable, age-friendly, and multigenerational neighbourhoods that emerged from 6 articles; Buffel et al. 2010, Cindery et al. 2018, Hatton et al. 2020, Pedell et al. 2021, Scott 2017, and Torku et al. 2021, revealed

the rapid occurrence of three trends, i.e., urbanisation, ageing population, and digitalisation. They identified the need to put into consideration all the domains of age-friendly cities, i.e., digital, physical, and social aspects. It highlighted the need for education and training among the older adults, their carers, and the third sector operators. The results emphasised the need to concentrate on the features that makes a city attractive and enabling, environmentally, socially, and emotionally, as well as reachable to the older adults. They highlighted the role emotion plays in the older adults' adaption of various domains of age-friendly neighbourhoods. Four interrelated challenges to the implementation of ethical age-friendly neighbourhoods were further identified in the results i.e., economic austerity, bureaucratic structures and interagency collaboration, sustainability and measuring impact. They revealed contemporary divergence amongst organisations in working together for common good, and the need for investors to focus on alleviating older adults' problems. Finally, they identified five major barriers to the implementation of age-friendly neighbourhoods, which includes: physical and environmental barriers, technological, financial, and social barriers.

### 5.1 Description of the included studies

Among the six studies included, all written in English were four mixed method studies, one systematic review, and one qualitative evidence synthesis. The whole studies were conducted between 2010 and 2021. The studies settings were predominantly in the Western countries (83%). Details of the study publications are as follows: United Kingdom (n=4), Australia (n=1), and Hong Kong (n=1) Appendix 2.

The following are the description of the selected articles in this paper:

#### (1) Buffel et al. 2020

This study was carried out by Buffel, T., Remillard-Boilard, S., & Walsh, K. using a case study approach in 2020. The study environment was in Brussels, Dublin, and Manchester which are three members of the Global Network of Age-friendly Cities and Communities (AFCC). The cities were selected based on three criteria:(a) Because they had adopted the WHO framework to build their work around age-friendliness;(b) they are amongst the first to become members of the GNAFCC, which mirrors their pioneering functions in developing age-friendly schemes;(c) they were situated in different countries. The participants comprise of stakeholders in each city drawn as follows: City of Brussels (n=23), duration of interview = 50-92 min, averaging 69 min, City of Dublin (n=27), duration of interview = 36-105 min, averaging



78 min, and City of Manchester (n= 25), duration of interview = 43-89 min, averaging 62 min. The background of the participants are as follows: Local authority (n=5); Voluntary organisations (n=4); Statutory services (n=5); Policy specialists (n=3); Academia (n=2); Community stakeholders (n=4). Local authority (n=8); Voluntary organisations (n=4); Statutory services (n=6); Policy specialists (n=4); Private services (n=1); Community stakeholders (n=4). Local authority (n=7); Voluntary organisations (n=5); Statutory services (n=3); Policy specialists (n=2); Academia (n=3); Community stakeholders (n=5) respectively.

The paper at the end suggests that there are mutual benefits in connecting age-friendly and social exclusion agenda for creating new ways of tackling unequal encounters of ageing cities. The strength of this study lies on the fact that the reported age-friendly initiatives were drawn upon different organisations that have previously been engaged on issues that affects older adults, for example, voluntary groups acting on behalf of older people, pensioners action group, and carers' organisations. (Table 5). The role the researchers played as active participants in this study is to drive several age-friendly initiatives that concentrated or minimising a single or multiple areas of exclusion around the cities, first among them are projects directed at promoting the involvement of older people in sports and "active ageing" undertakings in one hand, including decision making through the older people's council. Their second initiative was directed at preventing social isolation by way of creating community spaces, and social framework that serves as a meeting point for older people to socialise and volunteer. The third initiative was focused on reduction of neighbourhood exclusion, by involving older people in improving and designing aspects of built environments that caters for their populations' needs. The study conforms to this papers' inclusion criteria (Table 4).

Reference	Country	Purpose and aim of the study	Design and study sample	Data and Methods	Results and Conclusion
Buffel et al. 2020. Age-Friendly Approaches and old-age Exclusion: A Cross-City Analysis	United Kingdom, Ireland, Belgium	To address the research gap on rising inequalities among urban elders by comparing how Brussels, Dublin, and Manchester, as three members of the Global Network of AFCC, have responded to social exclusion in later life.  The study represents the first attempt to explore the challenges and opportunities of the AFCC model to reduce social exclusion in later life across three city contexts	This study used a case-study approach. Participants from Manchester, Dublin, and Brussels. City of Brussels, City of Dublin, City of Manchester. Background of participants •Local authority (n=5) •Voluntary organisations (n=4) •Statutory services (n=5) •Policy specialists (n=3) •Academia (n=2) •Community stakeholders (n=4) •Local authority (n=8) •Voluntary organisations (n=4) •Statutory services (n=6) •Policy specialists (n=4) •Private services (n=1) •Community stakeholders (n=4) •Local authority (n=7) •Voluntary organisations (n=5) •Statutory services (n=3) •Policy specialists (n=2) •Academia (n=3) •Community stakeholders (n=5)	The article combines data from document analysis and stakeholder interviews to examine: first, the background against which age-friendly programmes have emerged in the respective cities; second, the extent to which the goal of reducing social exclusion is integrated in the age-friendly strategies; and third, barriers to the implementation of age-friendly programmes	This article has identified various benefits linked to connecting the age-friendly approach to the goal of reducing social exclusion: First, it offers a lens for incorporating the views of seldom heard or hidden population; second, it provides a forum for developing interdisciplinary and cross-sectorial partnerships to challenge discriminatory practice and marginalisation; and third, it provides a viable orientation and focal point for measuring the impact of age-friendly initiatives

Table 5: Buffel et al. 2020. Age-Friendly Approaches and old-age Exclusion: A Cross-City Analysis.

## (2) Cinderby et al. 2018

This study was carried out by the following authors: Cinderby, S., Cambridge, H., Attuyer, K., Bevan, M., Croucher, K., Gilroy, R., & Swallow, D. in 2018 using a mixed method approach. The study environment was United Kingdom, and reported on a co-design study with 117 participants, to investigate the interconnection of urban spaces and support on mobility and well-being of older residents from age 55years and above. The authors evaluated co-designed solutions with a view to connecting general acceptability or the benefits otherwise on a broader sample of urban residents (n=233) utilising both face-face and online surveys per municipality. The study's co-design activities were carried out in three different case study locations. These includes Hexham, a small rural community with a population of n=13,000; York, a medium sized city of n=205,000; and Leeds, a reasonably large metropolis with a population of n=787,000.

Reference	Country	Purpose and aim of the study	Design and study sample	Data and Methods	Results and Conclusion
Cinderby et al. 2018. Co-designing Urban Living Solutions to Improve Older People's Mobility and Well-being. Journal of Urban Health	United Kingdom	To address the need identified by the European Innovation Partnership on Active and Healthy Ageing for tools to characterise the triggers promoting active healthy ageing or conversely lead to increasing inactivity alongside calls to "qualify" conventional official GIS-mapping outputs to promote better decision-making	This paper reports on a co-design study with 117 participants investigating the interaction of existing urban spaces and infrastructure on mobility and well-being for older residents (aged 55+ Years) in three cities	Participants were recruited using a mixture of methods ranging from leafletting, adverts, talks at older people's groups and social media to encourage a cross-section of participation from across the case study sites	The study analysis identified three critical intersecting and interacting thematic problems for urban mobility amongst older people: The quality of physical infrastructure; issues around the delivery, governance and quality of urban systems and services; and the attitudes and behaviours of individuals that older people encounter. This identified complexity reinforces the need for policy responses that may not necessarily involve design or retrofit measures, but instead might challenge perceptions and behaviours of use and access to urban space. The co-design results further highlight that those solutions need to move beyond the generic and placeless, instead embedding specific locally relevant solutions in inherently geographical spaces, populations, and processes to ensure they relate to the intricacies of place

Table 6: Cinderby et al. 2018. Co-designing Urban Living Solutions to improve Older People's Mobility and Well-being.

The choice of these locations according to UK Office of National Statistics suggests that they cut across demographic profiles with 12% of Leeds population being non-whites; York = 89%, and Hexham having 95% white British population. In York and Leeds, the percentage of their 65 years and older adults are 16.8% and 15.6% respectively, while Hexham has a bigger segment with 25.4% in this age cohort. The site of the study included a heterogeneity of developed environments of which the design, topography, and infrastructure displays an array of mobility problems and possibilities. Participants were recruited utilising a mixture of methods comprising of leaflets, adverts, talks at older people's groups, and social media aimed at motivating a wide range of participants across the study sites (Table 6). The study meets the standards of this authors inclusion criteria (Table 4).

### (3) Hatton et al. 2020

This study was executed by the following researchers: Hatton, A.L., Haslam, C., Bell, S., Langley, J., Woolrych, R., Cory, C., Brownjohn, J.M.W. & Goodwin, V.A. in 2020, applying a co-design interdisciplinary approach which involves participants across multiple disciplines like the older adults, carers, physiotherapists, geriatricians, engineers, human movement professionals, geographers, and psychologists in two different countries i.e., United Kingdom and Australia. The participants were engaged in a day workshop that involves different types

of presentations from international speakers regarding urban design, social connectedness, hazards and injury prevention, and the physical environment. A global association known as “Retrofit living for ageing well through understanding and Redesign of Built environments: ReFURB” incorporated in 2018, including its ten core members facilitated a small group discussion followed by expositions to assess the opportunities, challenges and barriers experienced with ageing. This incorporates the use of creative engagement schemes i.e., LEGO Serious Play, mind maps, and poster gallery walk, with a view to helping the participants share individual stories and give a thought on the issues advanced. Their core mandate was to: explore cutting-edge solutions to safe living for ageing populations; and to develop innovative approaches to daily physical environments that ensures health benefits (Table 7). The study meets all the standards of this paper’s inclusion criteria (Table 4).

Reference	Country	Purpose and aim of the study	Design and study sample	Data and Methods	Results and Conclusion
Hatton et al. 2020. Innovative Solutions to enhance safe and green environment for ageing well using co-design through patient and public involvement	United Kingdom And Australia	The aim of the study was to identify the needs of older people in relation to ageing well in the environment by bringing together knowledge from different perspectives using Patient and public Involvement	The study used a co-design interdisciplinary framework involving older adults, carers, physiotherapists, geriatricians, engineers, human movement experts, geographers and psychologists from the UK and Australia. This engaged people in a 1-day workshop that comprised a series of presentations from international speakers on urban design, social connectedness, hazards and injury prevention, and the physical environment	An international consortium (Retrofit living for ageing well through Understanding and Redesign of Built environment consortium: ReFURB) was established in April 2018, including ten core members, to (i) explore cutting edge solutions to safe living for ageing population and (ii) develop innovative approaches to everyday physical environments, which bring about health benefits	Five themes were identified across the workshops: access and transport; involvement of the whole community; restoration rather than redesign; assistive and digital technology; and intergenerational approaches. These dimensions related to the physical, social, and nature-based qualities of everyday environments, as they pertain to ageing well

Table 7: Hatton et al. 2020. Innovative Solutions to enhance safe and green environment for ageing well using co-design through patient and public involvement.

#### (4) Peddel et al. 2021

The case study was undertaken by the following authors: Pedell, S., Borda, A., Keirnan, A. & Aimers, N. in 2021 in Australia, as part of a larger project building an evidence based that focuses on independently living older adults, who were using or have used consumer wearables devices to self-manage, or self-monitor their health. Among the initial cohort of survey respondents, those opting to be interviewed were followed up, and formed part of this subsequent study. Participants consists of a total of eight older adults aged 65 years or older,

that are actively utilising a wearable device(s). Amongst the group are two male and six female participants whose age ranges from 65-69 at the time the interview was conducted, and one in the range of 80 years (Table 8).

Reference	Country	Purpose and aim of the study	Design and study sample	Data and Methods	Results and Conclusion
Pedell et al. 2021. Combining the Digital, social and Physical Layer to Create Age-Friendly Cities and Communities. International Journal of environmental research and public health, 18(1)	Australia	To investigate and make suggestion about creating Age-friendly cities for older adults focusing on three domains of the World Health Organisation (WHO) age friendly city framework, namely, "Communication and Information", "Outdoor Spaces and Buildings", and "Social Participation"	This case study was part of a larger project building an evidence based, focusing on independently living older adults who are using or have used consumer wearable device(s) to self-manage or self-monitor their health. From among the initial cohort of survey respondents, those opting to be interviewed were followed up and comprise of this subsequent study. The present study involved a total of eight older adults aged 65 years or older, actively using a wearable device(s). The group comprised two male and six female participants, seven of whom fell within the age range 65 - 69 at the time of the interview, and one in the range of over 80	These case studies apply a co-designed and citizen-based approach, focusing within these larger frameworks on emotions, values, and motivational goals of older adults	Results suggests how the convergence of the often-siloed age-friendly city components based on older adult's goals and input can lead to better social participation and longer-term health outcomes. The authors propose that the digital, physical, and social aspects need to be considered in all domains of age-friendly cities to achieve benefits for older adults

Table 8: Pedell et al. 2021. Combining the Digital, Social, and Physical Layer to Create Age-Friendly Cities and Communities.

##### (5) Scott 2017

The study was carried out by Scott, I. employing co-designed and other research methods in the United Kingdom by the year 2017. The setting of this study was the Mobility, Mood, and Place (MMP) studio, a pedagogic studio project that also forms a part of funded research that engages in live techniques of public participation. Though there was no mention of exact number of participants in the study, however, the participants include students of architecture and landscape design on post-graduate academic programmes, and older adults (including stroke-survivors and those with dementia) on a mission to produce co-design research on age-friendly environment, with a view to offer some methodological insights. This work with students and older people includes well-lit spaces, legible environments, access to services, access to nature, social opportunities, optimising mobility, a mixture of uses, safety and security, enhancing cultural memories, and designing for the senses and for goal setting (Table 9).

Reference	Country	Purpose and aim of the study	Design and study sample	Data and Methods	Results and Conclusion
Scott, I. 2017. <i>Mobility, Mood, and Place- Co-Designing Age-Friendly Cities: A Report on Collaboration between Older People and Students of Architecture.</i> Arts (Basel), 6(4)	United Kingdom	<i>Mobility, Mood, and Place</i> explores how places can be designed collaboratively to make pedestrian mobility easy, enjoyable, and meaningful for older people	Participatory co-design approaches and other methods were used	The mobility, mood, and place (MWP) research project took a whole-systems approach through four interrelated work packages: WP1- "Co-Created Environment", is the work package this paper is principally concerned with, whilst WP2- "Environment and Affects" employed mobile electrooculography (EEG) assistive technologies to record real time emotional responses to place. WP3- "Life-course and Places" examined how built and social environments evolved over time and considered whether these processes were implicated in explaining inequalities in health-related mobility in older age	They offered contributions to architects in designing places that consider the needs of older people

Table 9: Scott 2017. *Mobility, Mood, and Place-Co-Designing Age-Friendly Cities: A report on Collaboration between Older People and Students of Architecture.*

(6) Torku et al. 2021

The study was conducted in Hong Kong by Torku, A., Chan, A.P.C. & Yung, E.H.K. by 2021, using a systematic literature review, which was conducted to identify the barriers to implementing age-friendly initiatives in smart cities. The review of the literature was conducted using Scopus search engine. Relevant keywords were applied to discover 81 articles in academic journals. The titles, abstracts, keywords, and full texts of the articles were examined to select 39 literatures that were relevant for identifying the barriers that hinder the implementation of age-friendly initiatives in smart cities. The contents of the 39 relevant articles were further analysed to ascertain the key barriers. A system thinking approach was adopted to appreciate the interaction among the barriers.

The study identified five major groups of barriers - namely physical barriers and environmental characteristics, technological barriers, social barriers, financial barriers, and political barriers that smart city encountered or are likely to encounter in implementing age-friendly initiatives. Furthermore, practical examples of good age-friendly implementation practices were emphasised. An identified limitation of this study is in the number of literatures reviewed. Notwithstanding the comprehensive review, the number of literatures reviewed may not be all-embracing. This is justified by the inapplicability of considering all possible keywords in one review study (Table 10).

Reference	Country	Purpose and aim of the study	Design and study sample	Data and Methods	Results and Conclusion
Torku et al. 2021. Implementation of Age-friendly Initiatives in Smart Cities: Probing the barriers through a systematic review, Built Environment <i>Project</i> and Asset Management, 11(3)	Hong Kong	The purpose of this study is to identify the barriers that hinder the implementation of age-friendly initiatives in smart cities	A systematic review of the literature	Content analysis was conducted to systematically identify and categorise the barriers to AFC initiative implementations. A system thinking approach was adopted to understand the interaction among the barriers	The study identified five key groups of barriers- namely physical barriers and environmental characteristics, technological barriers, social barriers, financial barriers, and political barriers- that smart city encountered or likely to encounter in implementing age-friendly initiatives. Moreover, practical examples of good age-friendly implementation practices were highlighted

Table 10: Torku et al. 2021. Implementation of age-friendly initiatives in Smart Cities: probing the barriers through a systematic review.

These six articles were selected because they conformed to the standards of this authors inclusion criteria (Table 4) in terms of their quality, and for the fact that they are peer-reviewed publications, moreover, this author believe that the profile of these databases to some extent is trustworthy and adheres to the concepts of stability, accuracy, and reproducibility which forms the bedrock all quality literature review domains.

## 5.2 What kind of neighbourhood is age-friendly, sustainable, and ethical

Curiously, as societies are rapidly growing into urban neighbourhoods universally, there is a report from the United Nations (UN) which indicated that at present the preponderance of people now lives in urban environment, this according to a forecast will increase to 66 percent by 2050, the implication however is an additional estimated 2.5 billion people to the urban population by mid of the century (Cinderby et al. 2018.) In conjunction to this rapid urbanisation is a demographic paradigm with a reasonable ageing of the population, a trend that affects the entire globe.

Digitalization has a lot of ethical implications with regards to its development and adaptation in other to conform to the WHO's standard of age-friendliness. Going forward, the implication of these demographic changes is that the urban lay out need transformation, in a such way as to adjust to the demands of the older adults, to make the neighbourhood age friendly (Cinderby et al. 2018). To be sure, an age-friendly neighbourhood is such a space that stimulates general well-being and ensure that citizens participates actively as they get older.

In their qualitative studies investigation, which focused on the three domains of the World Health Organization (WHO), age-friendly city framework, like “Communication and information”, “Outdoor Space and Buildings” and “Social participation”. Pedell, Borda, Keirnan and Aimers (2021) presented a two case studies, one dealing with older adults utilising routine wearables for self-health management in the neighbourhood, and the other focusing on older adults that are engaged in social recommended activities in the community, while reflecting on the relationships of the WHO domains and future opportunities for age-friendly neighbourhoods. The study applied a combination of a co-design and citizen-based approach, that concentrated on such wider substructures like emotions, values, and motivational goals of the older adults. The study result indicates how the convergence of the often-isolated age-friendly components based on older adults’ goals and input could lead to greater social participation and enduring health outcomes.

The authors proposed that in order to achieve the requisite benefits for older adults, there is a need to put into consideration all the domains of age-friendly cities like the digital, physical, and social aspects (Pedell et al. 2021). What it means in essence is that older people should be made to understand the intended benefits to their wellbeing’s of certain digital solutions and be part of the creation through their lived experience before adaptation, because through their social participation and flawless communication, trust is built understanding gained. Social participation is all about inclusivity, especially the vulnerable groups like the older adults.

### 5.3 Process to gain an age-friendly, sustainable, and ethical neighbourhood

The importance of initiating a sustainable cutting-edge solution that can improve age-friendly, ethical neighbourhood, safe and green visible environment that has the capacity to boost health care, welfare, and active involvement of the older adults on issues that pertains to well-being in a digital era can never be overemphasized. Hatton et al. (2020) in their studies aimed at identifying the needs of older people with respect to ageing well in the environment, utilised a co-design and interdisciplinary method that involved older adults, carers, physiotherapists, geriatricians, engineers, human movement experts, geographers and psychologists from the UK and Australia, where they identified five subject matters that are associated to physical, social and nature-based qualities of daily environments as it concerns healthy ageing. These includes access and transport; involvement of the whole community; restoration rather than redesign; assistive and digital technology; and intergenerational approaches.



In their study, Hatton et al. (2020) further acknowledged some challenges in the identified themes, especially on the interrelated issues of "Access and Transport" which takes account of the movement of people within the environment, and "Assistive and digital technology" which highlights the necessity of devices that provides hazard consciousness, for example the safety of the pedestrians, but suggested that until what constitutes older pedestrians accidents are identified, it will be impossible to develop the requisite solutions.

Mobility is a crucial characteristic of active ageing that enables participation and freedom as people age. And being active in old age has enormous physical and social benefits that guarantees quality well-being (Cinderby et al. 2018). It was found that out of 36 participants involved in the study, only seven older adults were involved. While a mixed method research by (Cinderby et al. 2018) confirmed the importance of mobility in determining the quality or otherwise of older adults' wellbeing, it is of the view that active ageing mobility-centred method that stimulates wellbeing must have two goals, i.e. making the cities or neighbourhoods age-friendly, in other to foster the welfare and social involvement of older citizens, which invariably will enable the neighbourhood to thrive, and beyond that, measures to enable mobility should complement the independence of the mass component of the society.

Cinderby et al. (2018) however differ on approach, while highlighting on the recognised fundamental issues in locations and support, which includes "quality of physical infrastructure; issues around the delivery, governance and quality of urban systems and services; and the attitudes and behaviours of individuals that older people encounter", and suggested policy retroaction that confront viewpoints and behaviours about useability and accessibility of urban spaces (Cinderby et al. 2018). Their co-design study with 117 participants aged 55+ years, used a mixed method approach to determine locations favourable to personal well-being and participative solutions to the challenges associated with urban mobility. The authors used mixed method and tools because of its capacity to enable participants that have diverse cognitive strengths to offer contributions, with the objective to evaluate the prevailing interplay between urban spaces and support on mobility and well-being of older adults, the effectiveness of co-design was evaluated for suitability amidst a broad spectrum of urban residents ( $n = 233$ ) by employing web based and face-to-face surveys in each municipality. (Cinderby et al. 2018.)

#### 5.4 The structures required to get an age-friendly, sustainable, and ethical neighbourhood

To be able to achieve the much-desired age-friendly neighbourhood sustainably in the era of digitalization, some essential structures need to be in place. These were adequately reflected

in two studies about age-friendly domains (Scott 2017; Pedell et al. 2021). Scott (2017) in his study about mobility, mood, and place as they relate to health and well-being of older adults, suggests that researchers need to concentrate on those features that makes a place attractive and enabling, environmentally, socially, and emotionally, as well as reachable to the citizens at various life-course stages. The author acknowledged the importance of mobility in a built neighbourhood and the older adult's health and well-being and argues that removing barriers to mobility is not enough to increase mobility. He however highlighted those interventions in the built neighbourhoods aimed at improving the mobility and independence of older adults which often centered on security, accessibility, and functional performance. (Scott 2017.)

Be it as it may, there is no doubt that removing all barriers have the capacity to increase mobility, because it will give the older adults a sense of security and social inclusion, convinced that their safety while moving around the neighbourhood is assured. Pedell et al. (2021) in their qualitative investigative study focused on three domains of the World Health Organisation (WHO) age-friendly framework, namely "Communication and Information", "Outdoor spaces and buildings" and "Social participation". In one of their case studies, that concentrated on social prescribing activities that are engaged by the older adults in the neighbourhood, the authors utilized a co-creational and citizen-centered approach, zeroing in on far-reaching structures on emotions, which has to do with intense feelings emanating from the older adults' circumstances, their values, and motivational objectives. However, one common attribute in both studies under review (Scott 2017; Pedell et al. 2021) is the older adults' emotions in adapting to various domains of age-friendly neighbourhoods, in other words the older adults feeling and suspicion towards the adaptation or utilization of services and digital ecosystems kills their motivation to accessing them, these in no doubt contributes to a larger extent to certain ethical decisions they make.

The need to convince the older adults that taking safety precautions is prevalent and inclusiveness can never be over-emphasised, this in no doubt is central to changing people's apathetic reclusive emotions. Incidentally, emotional, quality, and functional goals cannot be achieved when there is an obvious psychological barrier, hence a far-reaching attitudinal change is needed in the part of the older adults. This can only be achieved through proper education and sensitization aimed at trust building, and to a large extent a critical policy change. Which instructively should be tailored towards how older adults can engage in activities to find solution on how to benefit their mood, that would mitigate the assumed minimal motivation and interest (Pedell et al. 2021).

### 5.5 Barriers for the implementation of age-friendly neighbourhood

Two studies that surveyed the barriers for the implementation of an age-friendly digital neighbourhoods were found (Torku et al. 2021; Buffel, Remillard-Boilard & Walsh 2020).

According to Buffel et al. (2020), there is increasing inequality among the urban older adult population, which no doubt contributes to social exclusion, and constitutes a great barrier to the implementation of the all-important global model of age-friendliness. They however identified four interrelated challenges that hinders the implementation of an age-friendly neighbourhood i.e., economic austerity, bureaucratic structures and interagency collaboration, sustainability and measuring impact (Buffel et al. 2020).

The impact of economic austerity towards the implementation of an enduring age-friendly neighbourhoods can never be overemphasised, especially when there is no synergy among the multi-stakeholders and the government in pulling resources together for the overall good of their local digital communities, which though was caused by the contemporary global recession. Moreover, since it is obvious that the government cannot do it alone, and the vulnerable population like the older people lacks the resources to provide those essentials for themselves. To tackle this, this author suggests for SHAPES the provision of digital ecosystem subsidies, and cost-effective housing by various stakeholders. Key investors moreover need to focus more on alleviating the older people's problems than the general concentration on profit making. More so, bureaucratic structures and interagency collaboration need to be strengthened. Undoubtedly, there is a gulf between organisations in working together for a common good, differences in languages and lack of communication. (Buffel et al. 2020.)

Citizen centred policies has the capacity to engender confidence and create an enabling environment that can make older adults feel accepted, respected, and their situations understood. Though political intervention and multistakeholder partnership is important (Buffel et al. 2020), but without the older adults' honest contributions through their lived experience, no tangible progress will be made. This informed the need for a defined all-inclusive code of conduct to guide their participation. Unlike Torku et al. (2021), Buffel et al. (2020) was silent on the barriers caused by the adaptation of technologies amongst the older adults in a rapid digitalising society, and their research however lacks the global colouration, because it was conducted in few small European cities of Brussel, Dublin, and Manchester. Torku et al. (2021) identified five major barriers, i.e., physical barriers and environmental characteristics, the fact is that potential changes in the features of neighbourhood have physical and emotional impacts on the older adults, hence they gravitate to local habitat and facilities to recompense the new reality.

They are often over attached to their immediate surroundings that majority will prefer maintaining the status quo. Another identified barrier according to Torku et al. (2021) is technological barrier, similar to the older adults hesitancy in accepting a change in the original features of their neighbourhood, technologies despite its huge benefits remains a very difficult new reality to be accepted by this segment of the society, their perception about the possible encroachment of the new technologies on their dignity, security and

autonomy determines the level of acceptance or otherwise, hence the need for proper assurance through education and assessment of these technologies.

Remarkably, the study views financial barriers from the prism of integrating age-friendly efforts into existing smart cities, but this author argues that the prominent financial barrier is non adoption of cost-effective structures, and provision of economic incentives to the older adults who does not have the financial capability to invest in the needed age-friendly initiatives. Buffel et al. 2020; Torku et al. 2021, were unanimous on the debilitating impacts of economic incapacity of the older adults as major challenge but did not offer a workable solution towards mitigating it. As stated above however, this author further maintain that it is the duty of the government, and other stakeholders to ensure that cost of housing is to the reach of the generality of the population. This study by Buffel et al. (2020) has recognised different gains linked to joining the age-friendly method to the objective of minimising social exclusion, amongst which is the opening of the window to integrate the views of the often neglected or marginalised population, it also presents an avenue for evolving interdisciplinary and cross-sectorial collaboration to tackle unfair dealings and marginalisation. Finally, it imparts a workable guidance and a point of convergence for appraising the impact of the age-friendly stratagem.

There is a need for the government to encourage social participation, and inclusion by creating an enabling environment for government-stakeholder-citizens interactions through the formulation of people-centred policies that could dismantle the political barriers. They should however strengthen their democratic institutions that discourages decent. To encourage the citizens and other stakeholders to pull resources together for investment purposes, the policy makers need to consider some forms of incentives and tax holidays for both the private sector and the third sectors who may wish to invest in age-friendly neighbourhood developments. This will not only curtail the cost of the infrastructure but will ensure sustainability of the framework. This is imperative because only a formidable financial guarantee and responsible political leadership can effectively drive an enduring age-friendly initiatives.

SUMMARY OF THE RESULTS OF THE STUDIES
Evidence indicates a rapid occurrence of three trends: urbanisation, ageing population, and digitalisation (Cinderby et al. 2018)
Evidence identified the need to put into consideration all the domains of age-friendly cities; the digital, physical, and the social aspects (Pedell et al. 2021)
Results highlights five subject matters that are associated to physical, social, and nature-based qualities of daily environments that guarantees healthy ageing i.e., access and transport; involvement of the whole community; restoration rather than redesign; assistive and digital technology; and intergenerational approach (Hatton et al. 2020)
Evidence recognised fundamental issues in locations and support, which includes “quality of physical infrastructure; issues around delivery, governance and quality of urban systems and services; and the attitudes and behaviours of individuals that older adults encounter” (Cinderby et al. 2018)
Evidence proves the need to concentrate on those features that makes a city attractive and enabling, environmentally, socially, and emotionally, as well as reachable to the citizens at various life-course stages (Scott 2017)
Evidence also reveals the role emotions play in the older adults’ adaption of various domains of the age-friendly neighbourhoods. (Scott 2017; Pedell et al. 2021)
Evidence identified four interrelated challenges to the implementation of ethical age-friendly neighbourhoods, i.e., economic austerity, bureaucratic structures and interagency collaboration, sustainability and measuring impact (Buffel et al. 2020).
Evidence shows contemporary divergence amongst organisations in working together for a common good, which is compounded by differences in languages, and lack of communication (Buffel et al. 2020)
Evidence indicates the need for political intervention and multistakeholder partnership (Buffel et al. 2020)
Evidence identified five major barriers for the implementation of age-friendly neighbourhoods i.e., physical, and environmental barriers, financial barriers, social and technological barriers (Torku et al. 2021)
Evidence recognised different gains linked to joining the age-friendly method to the objective of minimising social exclusion, which includes opening of the window to integrate the views of the often-marginalised population and presenting the avenue for evolving interdisciplinary and cross-sectorial collaboration, and guidance on appraising the impact of the age-friendly stratagem (Buffel et al. 2020)

Table 11: Summary of the study results.



## Code of Conducts for: Smart and Healthy Ageing through People Engaging in Supportive Systems.

### RELEVANCE:

SHAPES shall acknowledge the knowledge of the older adults, their unique perspectives and experiences that imparts to ethical consideration.

### FAIRNESS:

SHAPES shall recognize older adults equal rights with the stakeholders to advance co-creation, given their knowledge and lived experiences that empowers them to engage productively.

### EQUITY:

SHAPES shall seek to understand the various needs of the older adults with peculiar health related problems, with a view to ensuring ethical deployment of their digital solutions.

### INTEGRITY:

SHAPES shall not give out or receive any sensitive information from the older adults without a written consent letter from the older adults' family member, or carer.

- SHAPES shall always ensure that their decisions and collaborations are for the over all best interest of the older adults and citizens.

- SHAPES shall endeavour to avoid any possibility of their interests conflicting with the interest of the older adults during and after their co-creational collaborations.

### SUSTAINABILITY

SHAPES shall ensure that there is availability of a well organised, extensive, scientifically reliable, and user-friendly educational materials, for the purpose of educating the older adults on the procedures of co-creational developments.

- SHAPES shall ensure that older adults, carers, and advocates are adequately empowered with the requisite information for deeper understanding, to be able to work with other relevant authorities, and the third-sector players, in dealing with government policies and bureaucratic bottlenecks }n such a way that it will benefit both the older adults and the citizens.

- SHAPES shall establish a reliable support network that will involve the digital ecosystem producers, the third sector players, family/carers, and citizens in a Multistakeholder and Multidisciplinary Decision Making (MMDM) framework.

- SHAPES shall institute an Older Adults Digital-technology Adoption and Advocacy Forum (OADAAF), whose duty is to guide and protect the interests of the older adults when dealing with issues relating to co-creational activities, ethics, and impact analysis of the age-friendliness of the digital ecosystem.

- SHAPES shall make provisions for digital ecosystem subsidies for the older adults and ensure that cost-effective ecosystems for the older adults and citizens are realised.

Figure 6: Code of Conduct Document for SHAPES Organisation as produced by the Author.

## 6 Discussion

While reviewing the issue of age-friendly and sustainable multigenerational neighbourhoods in the digital era, which is the pivot of this paper, evidence indicates a rapid occurrence of two trends: urbanisation, and ageing population. The result also proves that a third global trend that cut across urbanisation and aging communities is digitalisation (Loos et al. 2020). The implication of these demographic changes therefore is that the urban layouts need transformation, in such a way as to adjust to the demands of the older adults, to make the neighbourhood age friendly (Cinderby et al. 2018). Though the settings of the studies were mainly in the West, but the basis of the study was in tune with the WHO domains of the sustainable development goals, as it relates to age-friendly environments and wellbeing of the older adults. Themes like digitalization emerged from the studies, which has a lot of ethical implications with regards to its development and adaptation that could move it towards conforming to the WHO's standard of age-friendliness. It is important to at this juncture to clarify that this paper comprises of studies that dealt on both physical and digital environments. Whereas digital environment means "the operational or information technology systems, networks, any internet-enabled applications, devices and/ data contained within such systems and networks and any other related digital systems". (Lawinsider 2022.) The physical environment on its part is the physical world people that people experience through their senses, such as air, sounds, climate, structures around individuals, built environments and so on. (Kenton 2014).

Nevertheless, it is imperative to point out that digital technologies are meant to supplement human core values, and significant human knowledge, hence as human beings that are engaged in co-creational activities, the older adults can only use their judgement to navigate the digital ecosystem in their direction, in other words, in developing the technology, the actors or key stakeholders must be conscious of the fact that those digital technologies are solely for humans, and universal advantage. According to Nancy White (2021) in her article "IIoT: Digital connects physical", there are basic characteristics of digital technologies on the physical, i.e., digital senses physical, digital translates physical, digital monitors physical, digital predicts physical, and digital optimises physical. It will be safe to say that digital environment impacts us as human beings in the physical environment, as it is obvious that embodied association, and physical existence or presence makes a difference in every human endeavour and remains an essential attribute in human connection. Suffice it to say that an age-friendly neighbourhood must be accessible, more inclusive, secure, and safe, while supporting facilitators of health and impede the commencement of diseases and reduction in functionality (PARADIGM 2020). These requires a comprehensive code of conduct to actualize, which obviously is at the core of this paper.

The kind of neighbourhood that is age-friendly, sustainable, and ethical according to the evidence must put into consideration all the domains of age-friendly cities, like the digital, physical, and social aspects (Pedell et al. 2021) in order for the older adults to accrue the dividends. These domains according to the WHO age-friendly framework are “Communication and Information”, “Outdoor spaces and buildings”, and “Social participation”, which the authors reflected on the interconnection between these domains and the ensuing opportunities. To be sure, the domains like “Communication and information”, “Outdoor and spaces and buildings” have a convergence that leads to a stronger “Social participation”, which as it is currently going through a substantial digital evolution, especially since the advent of the COVID-19 global pandemic. As a result, the unavoidable challenge of this social reality provides a distinctive opportunity for organisations like SHAPES to understand the prospects of some of their wearable technologies that could be incorporated into the digitally equipped age-friendly neighbourhood or cities, to cater to the pressing social necessities of the older adults. In the context of communication and information, making internet and digitally equipped technologies accessible to the older adults is a prerequisite, especially when these technologies such as wearables are medically and socially recommended. The availability of these technologies can prompt the older adults to take a firm embrace of smart cities, including its digital technologies and internet of Things (IoT) authorised infrastructures to create a deeper awareness that could in turn assist in the improvement of their health and wellness.

Suffice it to say that SHAPES’ ability to fuse spaces with the people, especially the older adults is very imperative in the construction of outdoor spaces and buildings that can ensure the age-friendliness of such neighbourhoods. The key in no doubt is to develop programmes that could integrate both the digital and the physical accessibility, for example, digital apps and wearables that supports older adults in their socialisation within the local neighbourhood, either for enhanced physical exercise, ancillary mental health issues, like minimal anxiety, including social isolation, by means of chat application and smart walking guides. Further, physical infrastructure in this context can go a long way in complementing digital infrastructure in achieving an equitable age-friendly neighbourhood, that can assist with active and healthy ageing. For instance, an app or a wearable device could be deployed to a city’s digital layer to identify the locations of certain facilities, like shaded rest stops, and water fountains on the community’s exercise routes, public toilets, etc. In the light of the foregoing, since the use of wearables amongst the older adults are assuming a new normal, it is therefore pertinent to expedite action in connecting it to the environment, by putting social-technological and users into consideration, so as to engender an all-encompassing structure that enhances the older adult’s quality of life, which is essentially by way of assisting them to sustain relationships and networks, and more so offering reliable access to relevant services and needed facilities. (Pedell et al. 2021.)



In the spirit of co-creation, the older adults must be part of the creation by bringing to bear their lived experiences, this will go a long way in convincing them to adapt these new digital solutions. This is because through their social participation and flawless communication, trust is built, and understanding gained, suffice it to say that social participation is all about inclusivity, especially when the issue has to do with a vulnerable population like the older adults. To effectively adopt these new technologies, the older adults need to have the requisite skills, social support, and experiences, in other to build the requisite capacity in line with EUPATI's principles. Social supports are imperative since old age is associated with some physical, cognitive, and financial constraints which might pose as barriers to their implementations.

On the process to gain an age-friendly neighbourhood, there is also evidence that highlights five subject matters that are associated to physical, social, and nature-based qualities of daily environments that guarantees healthy ageing i.e., access and transport; involvement of the whole community; restoration rather than redesign; assistive and digital technology; and intergenerational approach (Hatton et al. 2020). Further evidence recognized fundamental issues in locations and support, which includes "quality of physical and infrastructure; issues around the delivery, governance and quality of urban systems and services; and especially the attitudes and behaviours of individuals that older adults encounter" (Cinderby et al. 2018). Mobility remains a crucial feature of active ageing, which facilitates participation and autonomy into later life, there is no doubt that there are enormous physical and social benefits that guarantees high-level well-being in remaining active. Hence solutions, especially digital need a paradigm shift from generic and incongruous, to a more distinct neighbourhood effective solutions in a natural geographical space, population, and procedures.

For effective mobility to be guaranteed, digital solutions should also be incorporated to the physical to ensure legitimacy. For instance, employing different apps to map out specific user route options that could ensure that these vulnerable population can seamlessly access all relevant mobility related services and facilities, which includes recreational and social participation. Across these studies is a visible negligence, on the suggestion as to how and whose duty it is to ensure governance and quality of urban systems and services. It is the position of this paper that involving the third sector as advocates between the citizens and policy makers can only guarantee trust and all-encompassing solution towards achieving an age-friendly, sustainable, multigenerational, and ethical neighbourhood. It is the opinion of this author that the all-important aspect of older people's well-being can only be achieved when older adults with various physical immobility issues are directly involved in the design and implementation of the co-creation collaboration, since it is only the physically challenged that can safely proffer a workable solution to his or her predicament.

From the foregoing, there is the urgent need for education and training among the older adults, their carers, and the third sectors, which will enable them to be in tune with the principles of digitalisations. This makes it imperative that third sector organization like EUPATI, digital ecosystem providers like SHAPES and policy makers has the responsibility to provide this needed education and support through neighbourhood workshops on Health Technology Assessment and Adoption (HTAA), taking cognizance of culture, local languages of the people, and economic variables of the older adults in the neighbourhood, to be able to reap the dividends of co-creation, that is aimed at the healthy ageing of these vulnerable population. To initiate a sustainable cutting-edge solution that can improve age-friendly, ethical neighbourhood, safe and green visible environment that will boost health care, welfare, and active involvement of the older adults on issues that pertains to well-being in a digital era will go a long way to ensure inclusion and give the older adults the sense of dignity and relevance. Moreover, it is imperative that involving the third sector as advocates between the citizens and policy makers can guarantee trust and all-encompassing solution towards achieving an age-friendly, sustainable, multigenerational, and ethical neighbourhood. Older adults with various physical immobility issues need to be directly involved in the design and implementation of the co-creation collaboration, because it is only the physically challenged that can proffer a workable solution to their predicament.

Another evidence on the structures required to gain an age-friendly neighbourhood reveals the role emotion play in the older adults' adaption of various domains of age-friendly neighbourhoods (Scott 2017), this is proved by the fact that the older adults feeling and suspicion towards the adaptation or utilization of new services and digital ecosystems kills their motivation towards accessing them, which incidentally contributes to certain ethical decisions they make. Older adults need an encouraging and empowering residential setting that can recompence for their physical and social changes interconnected with ageing (WHO 2007). These structures or eight domains of urban living according to (WHO 2007) are: outdoor spaces and buildings; transportation; housing; social participation; respect and social inclusion; civic participation and employment; communication and information; and community support and health services. Result of the study prove the need to concentrate on those features that makes a place attractive and enabling, environmentally, socially, and emotionally, as well as reachable to the citizens at various life-course stages. (Scott 2017.)

It is a truism therefore that the non-inclusion of the third sector and patients advocates in the whole process, puts the older adults and other vulnerable participants in a very uncomfortable position, that eludes the rational principles of mutual respect, trust, reliability, responsibility, transparency, accountability, public disclosure, and sustainability (EUPATI 2020). These principles duly constitute a veritable tool for empowering the older adults to create values for their well-being. In an age-friendly cities, policies, services, settings, and structures support can enable people to age actively, when we recognize the

broad-spectrum of the older adults' capacities and assets, envisaging and easily acknowledging their preferences and needs, and fostering their inclusion and contributions in all aspects of community life (WHO 2007).

Findings further reveals the existence of strong barriers for the implementation of age-friendly neighbourhoods. These factors in no doubt can hinder the successful implementation of ethical age-friendly neighbourhood in a digital era. The four identified interrelated challenges are economic austerity, bureaucratic structures and interagency collaboration, sustainability and measuring impact (Buffel et al. 2020). These factors in no doubt if not identified and mitigated would pose a grievous danger of exclusion against the older adults and other vulnerable segments of the communities. The evidence suggests that the impact of economic austerity towards the implementation of an enduring age-friendly neighbourhoods is enormous, especially when there is no synergy among the multi-stakeholders and the government in pulling resources together for the overall good of their local communities. The solution to this is for SHAPES to make provisions for digital ecosystem subsidies and ensure the realization of a cost-effective housing by various stakeholders.

It is evident that there is currently a divergence amongst organisations in working together for a common good, which is compounded by differences in languages and lack of communication (Buffel et al. 2020). SHAPES should endeavour to stamp out all destructive policy bottlenecks, lack of trust, unhealthy competition, and absence of a defined roadmap towards achieving the desired age friendly and ethical digital neighbourhoods. Sustainability can only be achieved when there is a defined goal, unity of purpose, synergy and an obvious steady flow of investment capital. It is crucial however for political actors to take the lead through a citizen-centred policy regimes, to make impact assessment seamless (Ateetanan, P., & Shirahada, K. (2016), to know whether the intervention on the creation of an age-friendly communities is achieving the desired results of improving the general wellbeing of this vulnerable population, or whether there is a segment of the population that is suffering exclusion.

Relevant additional evidence found crucial barriers like technological barriers (Torku et al. 2021), which is in form of older adults' hesitancy towards accepting a new reality in the digital ecosystem, despite the huge benefits of technology to their wellbeing's. The existing evidence indicates that this may not be unconnected to their perceptions about possible encroachment of these technologies on their dignity, security, and autonomy, all these determines their level of acceptance or otherwise, hence the pertinence for proper assurance through education and assessment of these technologies. Additional evidence suggests that financial barrier (Torku et al. 2021) is a threat towards integrating age-friendly efforts into existing smart cities. But this author made a counter argument that the prominent financial barrier is non adoption of cost-effective structures, and provision of economic incentives to

the older adults who does not have the financial capability to invest in the needed age-friendly initiatives.

The government in collaboration with other multi stakeholders should ensure that cost of housing is to the reach of the generality of the population, especially the older adults. And one way to counter financial barriers is by initiating a durable collaborative mechanism between the government and the multi-stakeholders with a view to ensuring a political and financial commitment that will drive a long-term age-friendly plans (WHO 2007). The government also should encourage social participation, and inclusion by creating an enabling environment for government-stakeholder-citizens interactions through the formulation of people-centred policies that could dismantle the political barriers. They should however strengthen their democratic institutions that discourages decent. To encourage the citizens and other stakeholders to pull resources together for investment purposes, the policy makers need to consider some forms of incentives and tax holidays for both the private sector and the third sectors who may wish to invest in age-friendly neighbourhood developments. This will not only curtail the cost of the infrastructure but will ensure sustainability of the framework. This is imperative because only a formidable financial guarantee and responsible political leadership can effectively drive a long-lasting age-friendly initiatives.

Additional evidence recognised different gains linked to joining the age-friendly methods to the objective of minimising social exclusion, which includes opening of the window for the integration of the views of the often-marginalised population and presenting a veritable opportunity for evolving interdisciplinary and cross-sectional collaboration, and a clear guidance on the impact of the age-friendly stratagem (Buffel et al. 2020). However, to ensure inclusion and prevent exclusion of older persons in a digitalized society there is need to gain an understanding on how the demography phenomenon of a global surge in longevity can be successfully reconciled with the digitalization of society (Houssein 2017). The surge in longevity unlocked a fresh perspective to explore the role new technologies plays in human lives, as it is obvious that as people live longer, they stand the chance to experience the continual emergence of new innovations in technologies. (Taipale & Hänninen 2018.) As there are increasing amounts of both traditional and new digital solutions like alarm pendants, blood pressure instruments, sugar predictive apps, senior phones, smart homes, and other telecare systems available today aimed at facilitating healthy ageing and autonomous living whether in care institutions, at home or special home-like neighbourhoods. (Taipale & Hänninen 2018.) To effectively adopt these new technologies, the older adults need to have the requisite skills, social support and experiences, social supports is imperative since old age is associated with some physical, cognitive, financial constraints which might pose as barriers.

To be sure, the advent of digital technologies and its ethical impacts and effects on the well-being of older adults in a rapid changing multigenerational world, makes it critically

imperative for SHAPES to adopt a set of comprehensive Code of Conducts that can assist both the third sectors and the citizens in co-creating a sustainable values for an age-friendly neighbourhoods, since to a greater extent, the design, development, and deployment of these digital solutions affects the lives of overwhelming majority of population especially the older adults from age 65 and above (Cath et al. 2018). This should be done by putting into consideration all the domains of age-friendly cities, which includes the digital, physical, and social aspects. There is also a compelling need to include older adults in the smart city's framework as an important resource for human capital development, to be able to utilize their full potentiality (van Hoof, Kazak, Perek-Białas, & Peek 2018). Hence, they should be engaged as leaders in recognizing and prioritising their needs and ensuring their implementation (Torku et al. 2021).

There is also the need for the older adults to be engaged in education and training, including their carers and the third sector players, this will go a long way to ensure sustainability, hence this paper suggests the institution of Older Adults Digital-technology Adoption and Advocacy Forum (OADAAF) which will be saddled with the responsibility of guiding and protecting the interests of the older adults, when issues relating to Co-creational activities, ethics, and impact analysis of the age-friendliness of the digital ecosystem, are at the front burner. This framework is consistent with EUPAT's principles, and in no doubt would ensure ethical sustainability, through continuous education and sensitization, constant training and retraining to increase awareness, which encourages helpful responses, and alerting older adults on available support options that would ensure their inclusiveness and overall wellbeing. SHAPES should also produce their own training materials, as a veritable tool to educate and empower older adults towards partaking in visible advocacy roles on issues concerning them.

However, the need to concentrate and focus more on those features that make cities attractive and enabling, environmentally, socially, and emotionally, as well as reachable to the older adults and citizens can never be overemphasized. Therefore, it is the opinion of the author that there should be in place robust and comprehensive support network that will involve the digital ecosystem producers, third sector operators, family/carers, and citizens, in a Multistakeholder and Multidisciplinary Decision Making (MMDM) framework. This is important because some older people with complex health issues will need the presence and protection of their carer or loved ones, in order to have the confidence that will enable them to interact freely when engaging with other stakeholders on issues concerning their wellbeing. This will also go a long way in building trust, as well as guaranteeing them the right to self-determination, autonomy, respect, safety, and dignity. The involvement of the third sector will also act as a cushion, since they will always act as intermediaries between the producers, governments, and the end-users, especially in influencing policies, dismantling all bureaucratic structures that could hinder the successful implementation an ethical age-

friendly neighbourhood, and obtaining the legal permission and safe space for collaborative discussions on co-creation and inter-agency working. Patients Active in Research and Dialogue for an Improved Generation of Medicines (PARADIGM 2021) is clear in its guiding principles, where the protection of the patients/older adults takes a paramount position. It proposes a guidance on legal agreements between the patient and older adults' advocates and collaborating firms. The guiding principles of legal agreements serves as a baseline for the development of contracts for older adult's advocates engagements with the research and development firms (PARADIGM 2021).

It is the author's humble opinion that this study has contributed to knowledge by identifying select code of conducts that can assist the older adults and the third sectors to create a sustainable value in the rapidly emerging digital ecosystem (Appendix 5). The significance of these findings emanates from the fact that they provide explicit global perspective, to the ethical demands that can impact positively in establishing essential policies and strategies, that have the potentials to foster the implementation of age-friendly schemes. Though there exist codes of conducts for SHAPES and other third sector organisations, it is the opinion of this paper that for it to be sustainable in an ever-growing multigenerational environment, special consideration should be given to the most vulnerable segment of the population like the older adults with their unique and divers health needs. Finally, all digital ecosystems should be designed in a such a way as to address physical and environmental barriers, and other barriers like technological, financial, and social barriers, to achieve the desired goal of achieving the sustainable development goals. Social barriers are a big factor because certain construction aimed at city transformation have the possibility of alienating the older adults from the wider society, because the older adults generally place premium on social interaction and freedom there is the tendency that they will resist any thing that could diminish their freedom (Chui, Tang, et al. 2019). And one way to counter financial barriers is by initiating a durable collaborative mechanism between the government and the multi-stakeholders with a view to ensuring a political and financial commitment that will drive a long-term age-friendly plans (WHO 2007).

World Health Organization (WHO) recommends that for a community to be age-friendly, it must conform its structures and services in such a way as to be within reach to and inclusive of older adults that has diverse needs and functionalities, and the community's sustainability depends on the ability to provide structures and services that sustains the well-being and productivity of the residents. It is a truism that older adults especially need an encouraging and empowering residential setting that can recompense for their physical and social changes interconnected with ageing (WHO 2007). These structures or eight domains of urban living according to (WHO 2007) comprises of: outdoor spaces and buildings; transportation; housing;

social participation; respect and social inclusion; civic participation and employment; communication and information; and community support and health services. And these encompasses the EUPATI's principles that forms the analysis framework of this study.

### 6.1 Strengths and limitations of this study

This study's strengths lie on the considerable number of literatures reviewed. The articles used are peer reviewed and evidence-based, which bestowed significant reliability to the studies. Moreover, for the fact that the whole studies were conducted between 2010 and 2021, the evidence no doubt will be considered up to date. However, a major limitation which is synonymous to literature reviews is the absence defined method to ensures that every literature on a topic was not reckoned with, this ultimately has the potentials of leading to review bias. There is an obvious possibility that the author did not find all the requisite literatures on this subject, due to variations in search terms or key words. Also, only articles from 2011 to 2021 in English were considered for inclusion, which possibly may not figure similar initiatives in other countries and languages of the world. There is also a problem of generalizability because majority of the research are done in Europe and non from Africa and America. Future studies on this topic should endeavour to address the above limitations.

### 6.2 Ethical Consideration

Because this study was a theoretical study, there was no need for ethical approval characteristic for empirical studies. Nevertheless, in the conduct of ethical literature review, the responsible author/s have manifest obligations, in other words the review must be conducted and reported transparently. In the light of the foregoing, all possibilities of conflict of interest and sources of funding was disclosed in this report, the process of obtaining the data was precise, unnecessary publications associated with study was carefully avoided as much as possible, and more importantly the materials for the review were free from plagiarism (Wager & Wiffen 2011).

In view of this however, it is to be noted that in this study, the author has no conflicts of interest. There is a significant transparency in the study material referencing, to give due recognition to the authors whose work was used and ensuring that no plagiarized literatures were utilized.

### 6.3 Implications for practice and future research

The key findings will be useful for both SHAPES and governments policy and decision makers, for a complete understanding of the needs of the older adults and the third sector players, in co-creating values ethically and sustainably in the rapid digitalized and multigenerational ecosystem, in line with the United Nations Sustainable Development framework. These findings also can facilitate the code of conduct creation process as many factors which should be put into consideration during the process were vividly highlighted. Agreed that prior to this study, there is an existing code of conduct for SHAPES and relevant organisations, but they are not as all-encompassing as the outcome of this study suggests. However, the study's findings indicates that there are needs for future research.

Further work that focuses involvement of the third sector and Older Adults Digital-technology Adoption and Advocacy Forum (OADAAF), as it concerns the future shaping of an ethical age-friendly neighbourhoods and cities, and identifying its merits and demerits is required. This body will be involved in all stages of co-creation to achieve age-friendliness.

## 7 Conclusion

The organisational and citizen-oriented code of conduct for a sustainable, age-friendly, and multigenerational neighbourhoods in a digital era, through an integrative literature review, with the sole aim at enhancing the participation of the older adults and the third-sector players into the co-creation of ethically sustainable digital service systems, has contributed to the construction of a comprehensive code of conduct document for SHAPES organisation and other stakeholders. Code of conducts are pertinent for reputable organisations like SHAPES and stakeholders to act responsibly and encourage ethical design and deployment of the various digital solutions, conscious of the prevailing challenges their wrong use and possible proliferation portends, especially they are not designed according to the needs of the older adults, hence the imperativeness of co-creation. This integrative literature review contributed to the unveiling of several evidence that formed part of the code of conduct. The kind of neighbourhood that is age-friendly must have all the domains of age-friendly cities, like the digital, physical, and the social aspects. The process requires putting serious considerations on issues of locations and support, hence the quality of physical infrastructure, governance and quality of urban systems and services should be given due attention. The structures also should be built in such a way as to make the city attractive, and enabling, environmentally, socially, and emotionally.



However, such barriers like economic austerity, bureaucratic structures and interagency collaboration, sustainability, and ability to measure impact should be tackled head-on to achieve the much-desired age-friendly, sustainable, ethical, and multigenerational neighbourhoods. Critical organisational frameworks like Health Technology Assessment and Adoption (HTAA), Older Adults Digital-technology Adoption and Advocacy Forum (OADAAF), and a Multistakeholder and Multidisciplinary Decision Making (MMDM) framework should be put in place for an effective implementation of robust co-creational engagements of guiding and protecting the interests of the older adults.

## References

- AAA ISO report taster SHAPES 10 2021. AGEING SOCIETIES ISO/ TC 314 AgileAgeingAliance TM Cultivating Age-Friendly Neighbourhoods Report Made Possible by Working as One to Add Life to Years.
- ALLEA. 2021. All European Academies. Truth, Trust, and Expertise. Accessed 5 October 2021. <https://www.allea.org/truth-trust-and-expertise/>
- Ahlin, K., & Snyder, K. 2021. Person-centered Health Care Resting on Digitization and Systematic Processes: A position paper. GLOBAL HEALTH 2021. The Tenth International Conference on Global Health Challenges, Barcelona, October 3-7, 2021. Retrieved from <http://urn.kb.se/resolve?urn=urn:nbn:se:miun:diva-43461>
- Ateetanan, P., & Shirahada, K. 2016. A seamless value co-creation service roadmap of Assistive Technologies for the elderly. In 2016 Portland International Conference on Management of Engineering and Technology (PICMET) (2751-2761). IEEE. <https://pdfs.semanticscholar.org/fb90/f9440261bffd84bc1360afd00c10acd49c81.pdf>
- Buffel, T., Remillard-Boilard, S., Walsh, K. 2020. Age-friendly approaches and old age exclusion: A cross-city analysis.
- Burke, LA & Hutchins, HA. 2007. Training Transfer: An Integrative Literature Review. Human Resource Development Review, 6(3),263-296. Accessed 18 September 2021.
- CASP. 2017. 10 questions to help you make sense of qualitative research. Accessed 7 November 2021. [http://docs.wixstatic.com/ugd/dded87\\_25658615020e427da194a325e7773d42.pdf](http://docs.wixstatic.com/ugd/dded87_25658615020e427da194a325e7773d42.pdf)
- Cath, C., Wachter, S., Mittelstadt, B., Taddao, M., & Floridi, L. 2018. Artificial intelligence and the “good society”; the US, EU, and UK approach. Science and Engineering Ethics, 24(2), 505-528. Accessed 18 September 2021.
- Chui, C.H.K., Tang, J.Y.M., Kwan, C.M., Fung Chan, O., Tse, M., Chiu, R.L.H. and Lum, T.Y.S. 2019. “Older adults’ perceptions of age-friendliness in Hong Kong”, The Gerontologist, 59 (3), 549-558.
- Conn, V., Isaramalai, S., Rath, S., Jantarakupt, P., Wadhawan, R. & Dash, Y. 2003. Beyond MEDLINE for Literature Searches. Journal of Nursing Scholarship, 35 (2), 177-182.

Cinderby, S., Cambridge, H., Attuyer, K., Bevan, M., Croucher, K., Gilroy, R., & Swallow, D. 2018. Co-designing Urban Living Solutions to Improve Older People's Mobility and Well Being. *Journal of Urban Health*, 95(3), 409-422. <http://dx.doi.org/10.1007/s11524-018-0232-z>

Deloitte. 2019. Owning digital Responsibility and ethics. Future of risk in the digital era. Transformative change, Disruptive risk, (22). Accessed 2 October 2021.  
[www2.deloitte.com/content/dam/Deloitte/us/Documents/finance/us-rfa-future-of-risk-in-the-digital-era-report.pdf](http://www2.deloitte.com/content/dam/Deloitte/us/Documents/finance/us-rfa-future-of-risk-in-the-digital-era-report.pdf)

EMA. 2021. Revised framework for interaction between the European Medicines Agency and patients and consumers and their organizations/637573/2014.

EU CFR. 2016. Charter of Fundamental Rights of the European Union. (Consolidated version-2016/C202/02) OJ C202,7.6.2016, (389-405).  
<https://eur-lex.europa.eu/collection/eu-law/treaties/treaties-force.html#new-2-54>

EUFHR. 2007. Charter of Fundamental Rights of the European Union (2007/C303/01).  
[https://fra.europa.eu/sites/default/files/charter-of-fundamental-rights-of-the-european-union-2007-c\\_303-01\\_en.pdf](https://fra.europa.eu/sites/default/files/charter-of-fundamental-rights-of-the-european-union-2007-c_303-01_en.pdf)

Eurostat. 2021. Eurostat Statistics Explained. Accessed 13 October 2021.  
[https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Population\\_structure\\_and\\_ageing&oldid=423053](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Population_structure_and_ageing&oldid=423053)

EUPATI. 2021. European Patients' Academy on Therapeutic Innovation. Accessed 10 October 2021. <https://eupati.eu/about-us/>

Eurostat. 2017. Key figures on Europe. Luxembourg: Publication's office of the EU.

Haerry, D., Landgraf, C., Warner, K., Hunter, A., Klingmann, I., May, M. & See, W. (2018). EUPATI and Patients in Medicines Research and Development: Guidance for Patient Involvement in Regulatory Processes, (230).  
<https://www.frontiersin.org/articles/10.3389/fmed.2018.00230/full>

Hackmann, C. 2021. What is deductive Reasoning? Definition and Examples.

Hatton, A.L., Haslam, C., Bell, S., Langley, J., Woolrych, R., Cory, C., Brownjohn, J.M.W. & Goodwin, V.A. 2020. Innovative solutions to enhance safe and green environments for ageing well using co-design through patient and public involvement.

Heale, R., & Twycross, A. 2018. What is a case study? *Evidence-Based Nursing*. 2018; 21:7  
<https://ebn.bmj.com/content/21/1/7>

Higgins, J. & Greene, S. 2011. *Cochrane Handbook for Systematic Reviews of Interventions*. Cochrane Book Series. The Cochrane Collaboration and John Wiley & Sons Ltd. England, 1-633.

Holopainen, A., Hakulinen-Viitanen, T. & Tossavainen, K. 2008. Systematic review - a method for nursing research. *Nurse Researcher*, 16 (1), 72-83.

Houssein, C. 2017. Seniors and technologies: Issues of inclusion and exclusion. *Canadian Journal of Communication*, 42(2), 189. doi:10.22230/cjc2017v42n2e3277.

Hunter, A., Facey, K., Thomas, V., Haerry, D., Warner, K., Klingmann, I., May, M. & See, W. 2018. EUPATI Guidance for Patient Involvement in Medicines Research and Development: Health Technology Assessment *Frontiers Media S.*

ICMJE. 2015. Preparing for Submission. International Committee of Medical Journal Editors. Accessed 2.11.2021. <http://www.icmje.org/recommendations/browse/manuscript-preparation/preparing-for-submission.html>

Ijaz, S., Shah, M.A., Khan, A. and Ahmed, M., 2016. Smart cities: A survey on security concerns. *International Journal of Advanced Computer Science and Applications*, 7(2), 612-625.

Johnston, J., Barrett, A., & Stenfors, T. 2020. How to...synthesise qualitative data. *The Clinical Teacher*, (4), 378-381. <https://doi.org/10.1111/tct.13169>.

Joiner, K.A., & Lusch, R.F. 2016. *Evolving to a new service-dominant logic for health care: Dove Press Journal: Innovation and Entrepreneurship in Health.*

Kenton, B., ed. 2014. "Physical environment". Retrieved 9 March 2022. <https://sociologydictionary.org/physical-environment/>

Klingmann, I., Heckenberg, A., Warner, K., Haerry, D., Hunter, A., May, M., & See, W. 2018. EUPATI and Patients in Medicine research Development: Guidance for patience involvement in ethical review of clinical trials. *Frontiers in medicine*, 5, 251.

Lawinsider. 2022. Definition of digital environment. <https://www.lawinsider.com/dictionary/digital-environment>

Lewin, S., Glenton, C., Munthe-Kaas, H., Colvin, C.J., Gulmezoglu, M., Noyes, J., Booth, A., Garside, R. & Rashidian, A. 2015. Using Qualitative Evidence in Decision Making for Health and Social Interventions: An Approach to Assess Confidence in Finding from Qualitative Evidence Syntheses (GRADE-CERQual). *PLOS Medicine* 13 (6).

Mandolfo, M., Chen, S. & Noci, G. 2020. Co-creation in new product development: Which drivers of consumer participation?

<https://doi.org/10.1177/1847979020913764>. Sage Journals.

Moher, D., Shamseer, L., Clarke, M., Ghersi, D., Liberati, A., Petticrew, M., Shekelle, P, Stewart, L. & PRISMA-P Group. 2015. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Systematic Reviews Journals*, 4 (1), 1-8.

Nussbaum, M. 2011. *Creating Capabilities. The human development approaches.* The Belknap Press of Harvard University Press, Cambridge Massachusetts.

Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 2021;372: n71. doi: 10.1136/bmj. n71

PARADIGM. 2021 Patients Engagement. Guiding Principles.

[www.imi-paradigm.eu/petoolbox/contract-templates/the-guiding-principles/](http://www.imi-paradigm.eu/petoolbox/contract-templates/the-guiding-principles/)

Pedell, S., Borda, A., Keirnan, A. & Aimers, N. 2021. Combining the Digital, Social and Physical Layer to Create Age-Friendly Cities and Communities. *International journal of environmental research and public health*, 18 (1), 325.

POPESCU, AI. 2016. In brief: Pros and Cons of Corporate Codes of Conduct. *Journal of Public Administration, Finance and Law*. Issue 9/2016.

PRISMA. 2015. Welcome to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Website. Accessed 2 November 2021.

<http://www.prisma-statement.org>

Richard, J. 2005. Writing Integrative Literature Reviews: Guidelines and Examples. *Journal of human resource development review*, 4 (3) 356-367.

Scott, I. 2017. Mobility, Mood and Place-Co-Designing Age-Friendly Cities: A Report on Collaboration between Older People and Students of Architecture. *Arts (Basel)*, 6 (4), 12.

SHAPES. 2020. The Smart & Healthy Ageing through People Engaging in Supportive Systems. <https://shapes2020.eu/about-shapes/>

Slide Team. 2022. Picture modified from 5 Phases of the New Product process Power Point show. Accessed 7 February 2022.

<https://slidemodel.com/>

Spann, A. & Stewart, E. 2018. Barriers and facilitators of older people's mHealth usage: A qualitative review of older people's views. *Human Technology*, 264-296.  
doi:10.17011/ht/urn.201811224834.

Spinder, P., & Lima, B.S. 2018. Editorial: The European Patients Academy on Therapeutical Innovation (EUPATI) Guidelines on Patient Involvement in Research and Development.  
<https://www.frontiersin.org/articles/10.3389/fmed.2018.00310/full>

Stolt, M., Axelin, A. & Suhonen, R. 2015. Kirjallisuuskatsaus hoitotieteessä. University of Turku.

Taipale, S. & Hänninen, R. 2018. More Years, More Technologies: Aging in the Digital Era. *Human Technology*, 14(3), 258-263.

TEU. 2012. Consolidated version of the Treaty on European Union. Official Journal of the European Union. (2012/C326/13).

The Joanna Briggs Institute. 2014. Joanna Briggs Institute Reviewers' Manual: 2014 edition. Australia. 1-195. Tong, A., Sainsbury, P. & Craig, J. 2007. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality Health Care*, 19 (6), 349-357.

Tong, A., Sainsbury, P. & Craig, J. 2007. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality Health Care*, 19 (6), 349-357.

Torku, A., Chan, A.P.C. & Yung, E.H.K. 2021. Implementation of age-friendly initiatives in smart cities: probing the barriers through a systematic review. *Built Environment Project and Asset Management*, 11 (3), 412-426.

United Nations. New York, NY: United Nations; 2008. Convention on the Rights of Persons with Disabilities.

United Nations, Department of Economic and Social Affairs, Population Division (2019). World Population Ageing 2019: Highlights (ST/ESA/SER-A/430).

UN-WPA. 2020. World population ageing 2020 Highlights. Accessed 13 October 2021.  
[https://www.un.org/development/desa/pd/sites/www.un.org.development.desa.pd/files/un\\_desa\\_pd-2020\\_world\\_population\\_ageing\\_highlights.pdf](https://www.un.org/development/desa/pd/sites/www.un.org.development.desa.pd/files/un_desa_pd-2020_world_population_ageing_highlights.pdf)

van Hoof, J., Kazak, J.K., Perek-Białas, J.M. and Peek, S.T.M. 2018. "The challenges of urban ageing: making cities age-friendly in Europe", *International Journal of Environmental Research and Public Health*, 15(11), 2473.

Wager, E. & Wiffen, P. 2011. Ethical issues preparing and publishing systematic reviews. *Journal of Evidence-Based Medicine*, 4, 130-134.

Warner, K., See, W., Haerry, H., Klingmann, I., Hunter, A. & May, M. 2018. EAUPATI Guidance for Patient Involvement in Medicine Research and Development (R&D); Guidance for Pharmaceutical Industry-led Medicines R&D. Accessed 15 September 2021.

White, N. 2021. IIoT: Digital Connects Physical. A New Era: Digital Transforms Physical. <https://www.ptc.com/en/blogs/corporate/digital-transforms-physical>

Whittemore, R. 2005. Combining Evidence in Nursing Research. Methods and Implications. *Nursing Research*, 54 (1), 56-62. 46. Accessed 19 September 2021.

Whittemore, R. & Knafl, K. 2005. The integrative review: updated methodology. *Journal of Advanced Nursing*, 52 (5), 546-553. Accessed 19 September 2021. <https://casp-uk.net/casp-tools-checklists/>

WHO 2007. *Global Age-Friendly Cities: A Guide*, WHO Press, Geneva. [https://www.who.int/ageing/publications/Global\\_age\\_friendly\\_cities\\_Guide\\_English.pdf](https://www.who.int/ageing/publications/Global_age_friendly_cities_Guide_English.pdf)

WHO 2020. Ageing: Healthy ageing and functional ability. Accessed 19 October 2021. <https://www.who.int/westernpacific/news/q-a-detail/ageing-healthy-ageing-and-functional-ability>

EUFHR. 2007. *Charter of Fundamental Rights of the European Union (2007/C303/01)*. [https://fra.europa.eu/sites/default/files/charter-of-fundamental-rights-of-the-european-union-2007-c\\_303-01\\_en.pdf](https://fra.europa.eu/sites/default/files/charter-of-fundamental-rights-of-the-european-union-2007-c_303-01_en.pdf)

## Figures

Figure 1. 5 Phases of the new products process ..... **Error! Bookmark not defined.**

Figure 2. 5 Stages of an integrative literature review ..... **Error! Bookmark not defined.**

Figure 3. EUPATI structure and three elements amalgamation.....

Figure 4. Data search from databases.....

Figure 5. PRISMA Data review process.....

Figure 6. Code of Conduct document for SHAPES.....

## Tables

Table 1. EUPATI values by Haerry et al. 2018 ..... **Error! Bookmark not defined.**

Table 2. Comparison between SHAPES ethics and EUPATI toolbox.....

Table 3. PICO Model.....

Table 4. Inclusion and exclusion criteria.....

Table 5: Buffel et al. 2020.....

Table 6: Cinderby et al. 2018 .....

Table 7: Hatton et al. 2020.....

Table 8: Peddel et al. 2021.....

Table 9: Scott 2017.....

Table 10: Torku et al. 2021 .....

Table 11: Summary of the study results.....



## Appendices

### Appendix 1: Timetable

STAGES	TIMETABLE
<b>Planning Stage:</b> <ul style="list-style-type: none"> <li>Choosing the subject and method and presenting the topic to my teacher</li> <li>Thesis Plan</li> </ul>	July - August 2021
	August - October 2021
<b>Implementation Stage:</b> <ul style="list-style-type: none"> <li>Literature search and collection of data</li> <li>Data evaluation</li> <li>Data analysis and writing of thesis</li> </ul>	October - November 2021
	November 2021
	November - December 2021
<b>Final Stage:</b> <ul style="list-style-type: none"> <li>Presenting the result</li> <li>Publication</li> </ul>	April 2022
	April 2022

### Appendix 2: Characteristics of included studies.....16

Reference	Country	Purpose and aim of the study	Design and study Sample.	Data and methods	Results	Ethical issues, Validity and Reliability Other important remarks if needed
Buffel, T., et al 2020. Age-Friendly Approaches and Old-Age Exclusion: A Cross-City Analysis, International Journal of Ageing and later life: IJAL, 14(2), 1-29	United Kingdom, Ireland, and Belgium	To address the research gap by comparing how Brussels, Dublin, and Manchester, as three members of the Global Network of AFCC (Age-friendly Cities and Communities) have responded to social exclusion in later life	The study used a case-study approach, allowing for an in-depth investigation. A combination of data from document analysis and stakeholder interviews. It employed a purposeful and convenience sampling strategy to select three cities: Brussels, Dublin, and Manchester	Mixed method approach. Data were derived through a combination of policy documents and secondary qualitative data from interviews with stakeholders in each city. Internal reports and official policy documents were analysed to provide background to the study and explore the extent to which social exclusion was integrated as part of the age-friendly strategies and policy documents in the respective cities. Based on the selected materials, a preliminary document analysis was carried out by the lead researcher in the respective city, using qualitative content and thematic analysis. To enhance comparability between the cities' programs, a common framework was agreed, using six key codes to analyse the concepts, actions, and implicit links to social exclusion. In addition to the documentary analysis, the authors combined relevant data sets from their previous work in order to form a new secondary data sample for the study	The article identified various benefits linked to connecting the age-friendly approach to the goal of reducing social exclusion: first, it offers a lens for incorporating the views of seldom heard or hidden populations; second, it provides a forum for developing interdisciplinary and cross-sectorial partnerships to challenge discriminatory practice and marginalization; third, it provides a viable orientation and focal point for measuring the impact of age-friendly initiatives. It however provides the basis of a program of action in which age-friendly activities can be an important part of policies improving the communities in which people live	Proper references were made and original authors both from 2002 to 2018 acknowledged. The research funding was also disclosed, which was a support by the Economic and Social Research Council (ESRC) under the Future Research Leaders scheme (Grant No: ES/ N002180/1); the Social Sciences and Humanities Research Council of Canada (SSHRC) through a Doctoral Fellowship at the University of Manchester; Manchester City Council and The Atlantic Philanthropies (grant no. 22072) and the European Cooperation in Science and Technology (COST Action 15122) through ROSE net, Reducing Old-Age Social Exclusion: Collaboration in Research and Policy  Quality Assessment: 18/20 90%

Reference	Country	Purpose and aim of the study	Design and study Sample.	Data and methods	Results	Ethical issues, Validity and Reliability Other important remarks if needed
Cinderby, S., et al 2018. Co-designing Urban Living Solutions to Improve Older People's Mobility and Well-being. Journal of Urban Health, 95(3), 409-422	United Kingdom	This paper reports on a co-design study with 117 participants investigating the interaction of existing urban spaces and infrastructure on mobility and well-being for older residents (aged 55+ years) in three cities	<b>Co-design activities were undertaken in three case study locations, representing a cross section of typical conurbations ranging from Hexham, a small rural town with population of 13,000; York, a medium sized city with a population of 205,000; and Leeds, a large metropolis with a population of 787,000.</b> UK Office of National Statistics indicate these locations have a transect in terms of their demographic's profiles with 12% of Leeds population being non-whites; York having an 89% and Hexham 95% white British population. York and Leeds have similar percentages of their population 65 years and older at 16.8 and 15.6%, whereas Hexham has a higher proportion with 25.4% falling in this age bracket. The sites included a diversity of built environments whose design, topography, and infrastructure presented a range of mobility challenges and opportunities. Our participant population sample chosen are from 55 years onwards. This age range was chosen to capture mobility issues related to transitions in social circumstance, health, income, and mobility incentives. Participants were recruited using a mixture of methods ranging from leafletting, adverts, talks at older people's groups and social media to encourage a cross-section of participant from across the case study sites	A mixed method approach was trialled to identify locations beneficial to subjective well-being and participant-led solutions to urban mobility challenges. Spatial analysis was used to identify key underlying factors in locations and infrastructure that promote or compromise mobility and well-being for participants. Co-design solutions were assessed for acceptability or co-benefits amongst a wider cross-section of urban residents (n=233) using online and face-to-face surveys in each conurbation. The study's co-design approach utilized mixed methods, incorporating participatory mapping, photo diary elicitation and individual interviews. Different participants were included in the three activities	The study analysis identified three critical intersecting and interacting thematic problems for urban mobility amongst older people: The quality of physical infrastructure; issues around the delivery, governance and quality of urban systems and services; and the attitudes and behaviours of individuals that older people encounter. This identified complexity reinforces the need for policy responses that may not necessarily involve design or retrofit measures, but instead might challenge perceptions and behaviours of use and access to urban space. The co-design results further highlight those solutions need to move beyond the generic and placeless, instead embedding specific locally relevant solutions in inherently geographical spaces, populations, and processes to ensure they relate to the intricacies of place	Ethical approval for the project was obtained via the social Work Ethics Committee, University of York, and all participants gave their informed consent to take part in the research  Quality Assessment: 20/20 100%

Reference	Country	Purpose and aim of the study	Design and study sample.	Data and methods	Results	Ethical issues, validity, and Reliability. Other important remarks if needed
Hatton, A.L., et al 2020. Innovative Solutions to enhance safe and green environment for ageing well using co-design through patient and public involvement	United Kingdom and Australia	The aim of the study was to identify the needs of older people in relation to ageing well in the environment by bringing together knowledge from different perspectives using Patient and Public Involvement	An international consortium (Retrofit living for ageing well through Understanding and Redesign of Built environments consortium: ReFURB) was established in April 2018, including ten core members, to (i) explore cutting-edge solutions to safe living for ageing populations and (ii) develop innovative approaches to everyday physical environments, which bring about health benefits	The study used a co-design, interdisciplinary framework involving older adults, carers, physiotherapists, geriatricians, engineers, human movement experts, geographers and psychologists from the UK and Australia. This engaged people in a 1-day workshop that comprised a series of presentations from international speakers on urban design, social connectedness, hazards and injury prevention, and the physical environment	Five themes were identified across the workshops: access and transport; involvement of the whole community; restoration rather than redesign; assistive and digital technology; and intergenerational approaches. These dimensions related to the physical, social, and nature-based qualities of everyday environments, as they pertain to ageing well	Workshop talks and small group discussions were not audio or video recorded, to ensure participant anonymity and confidentiality, and protection of intellectual property. Whilst the facilitators did take notes during all sessions, and workshop participants were encouraged to document their thoughts and ideas on paper during the LEGO®, mind map and poster gallery walk activities, it is possible that some important voices, may have been lost in the absence of recordings. Generally, there was proper data collation and protection. And no competing interest. Funding reported  Quality assessment: 18/20 90%

Reference	Country	Purpose and aim of the study	Design and study sample.	Data and methods	Results	Ethical issues, validity, and Reliability. Other important remarks if needed
Pedell, S., et al 2021. Combining the Digital, Social and Physical Layer to Create Age-Friendly Cities and Communities. International journal of environmental research and public health, 18(1), 325	Australia	This qualitative investigation makes suggestions about creating age-friendly cities for older adults focusing on three domains of the World Health Organization (WHO) age-friendly city framework namely "Communication and Information", "Outdoor Spaces and Buildings" and "Social Participation"	This case study was part of a larger project building an evidence base focusing on independently living older adults who are using or have used consumer wearables device(s) to self-manage or self-monitor their health. From among the initial cohort of survey respondents, those opting to be interviewed were followed up and comprise this subsequent study. The present study involved a total of eight older adults aged 65 years or older actively using a wearable device(s). The group comprised two male and six female participants, seven of whom fell within the age range 65 - 69 at the time of the interview, and one in the range of over 80	These case studies apply a co-designed and citizen-based approach focusing within these larger frameworks on emotions, values, and motivational goals of older adults	Results suggests how the convergence of the often-siloed age-friendly city components based on older adult's goals and input can lead to better social participation and longer-term health outcomes. The authors propose that the digital, physical, and social aspects need to be considered in all domains of age-friendly cities to achieve benefits for older adults	No specific or personal identifying medical information were sought, and personal interview data or wearers' experiences were anonymized. The research reported on this case study has received ethics approval by the University of Melbourne Human Research Ethics Committee (Ethics ID: 1646991.2). Informed consent was obtained from all subjects involved in the study, and there was no conflict of interest by the authors  Quality Assessment: 19/20 95%

Reference	Country	Purpose and aim of the study	Design and study sample.	Data and methods	Results	Ethical issues, validity, and Reliability. Other important remarks if needed
Scott, I. 2017. Mobility, Mood, and Place - Co-Designing Age-Friendly Cities: A Report on Collaboration between Older People and Students of Architecture. Arts (Basel), 6(4), 12	United Kingdom	Mobility, Mood, and Place explores how places can be designed collaboratively to make pedestrian mobility easy, enjoyable, and meaningful for older people	The mobility, mood, and place (MWP) research project took a whole-systems approach through four interrelated work packages: WP1- "Co-Created Environment", is the work package this paper is principally concerned with, whilst WP2- "Environment & Affects" employed mobile electrooculography (EEG) assistive technologies to record real time emotional responses to place. WP3- "Life-course of Places" examined how built and social environments evolved over time and considered whether these processes were implicated in explaining inequalities in health-related mobility in older age	Participatory co-design approaches were used	They offered contributions to architects in designing places that consider the needs of older people	Where anonymization is possible, the data associated with this work will be considered for deposit in the data repository operated by the authors' institution at the end of this research programme. All work outlined in this paper was subject to ethics approval from the Edinburgh College of Art Research Ethics Committee. The research carried out during year 1 of the project was also subject to NHS ethics approval. R&D Reference: NHS Lothian 2013/0090. And the work was supported Research Councils UK under the Lifelong Health and Wellbeing Cross-Council Programme (grant reference number EP/K037404/1)  Quality Assessment: 19/20 95%

Reference	Country	Purpose and aim of the study	Design and study sample.	Data and methods	Results	Ethical issues, validity, and Reliability. Other important remarks if needed
Torku, A., et al 2021. Implementation of age-friendly initiatives in Smart Cities: probing the barriers through a systematic review. Built Environment Project and Asset Management, 11(3), 412-426	Hong Kong	The purpose of this study is to identify the barriers that hinder the implementation of age-friendly initiatives in smart cities	Content analysis was conducted to systematically identify and categorize the barriers to AFC initiative implementations	A systematic review of the literature	The study identified five key groups of barriers- namely physical barriers and environmental characteristics, technological barriers, and political barriers - that smart city encountered or are likely to encounter in implementing age-friendly initiatives. Moreover, practical examples of good age-friendly implementation practices were highlighted	This work was supported by the Research Grant Council of Hong Kong through the Ph.D. Fellowship Scheme (reference number PF17-02405), and the Department of Real Estate, The Hong Kong Polytechnic University  Quality Assessment: 40/46 87%

Appendix 3: Quality assessment of mixed methods studies applied from (CASP 2017) (B).

Reference	1	2	3	4	5	6	7	8	9	10	
Buffel, T., et al. 2020	●●	●●	●●	●	●●	●	●●	●●	●●	●●	18/20 90%
Cinderby, S., et al. 2018	●●	●●	●●	●●	●●	●●	●●	●●	●●	●●	20/20 100%
Hatton, A., et al. 2020	●●	●●	●●	●	●	●●	●●	●●	●●	●●	18/20 90%
Pedell, S., et al. 2021	●●	●●	●●	●●	●●	●	●●	●●	●●	●●	19/20 95%
●Scott, I. 2017	●●	●●	●●	●●	●●	●●	●●	●	●●	●●	19/20 95%

1. Aims of the research are clearly stated.
2. Qualitative methodology is appropriate.
3. The research design is appropriately addressed to the aims of the research.
4. Recruitment strategy is appropriate to the aims of the research.
5. The data is collected in a way that it addresses the research issue.
6. The relation between researcher and participants are adequately considered.
7. Ethical issues have been taken into consideration.
8. The data analysis is sufficiently rigorous.
9. The findings are clearly stated.
10. The value of the research is discussed.

●● Satisfies assessment criterion
● Partly satisfies assessment criterion
○ Hardly or not at all satisfies a assessment criterion
x Assessmentr criterionbdo not apply

## Appendix 4. Quality assessment of Systematic reviews applied from PRISMA 2009 checklist (C)

Reference	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
Torku, A., et al 2021	●●	●●	●●	●●	●●	●●	●●	●●	●	○	●	●●	●●	x	●●	●●	●	●●	●	●●	●●	●●	●●	●●	●●	40/46 87%

1. Study title and abstract is defined.
2. Background of the study is explained.
3. Objectives are stated.
4. Selection criteria is presented.
5. Information sources are presented.
6. Full electronic search strategy for at least one database is explained.
7. Process for selecting studies is explained.
8. Method of data extraction from reports are described.
9. All variables for which data were sought are listed and defined.
10. Methods used for assessing bias of individual studies are described.
11. Principal summary measures are stated.
12. The methods of handling data and combining result studies are described.
13. Any assessment of risk of bias that may affect the cumulative evidence is specified.
14. Additional analysis of methods is described.
15. Study selection is explained.
16. Characteristics of each study is presented.
17. Risk of bias of each study is presented.
18. Results of individual studies are presented.
19. Synthesis of results is presented.
20. Risk of bias across studies is presented.
21. Summary of main findings are included.
22. Limitations at study and outcome level are discussed.
23. A general interpretation of the results in the context of other evidence is provided.

24. Finding is reported.

<input checked="" type="radio"/> Satisfies assessment criterion
<input checked="" type="radio"/> Partly satisfies assessment criterion
<input type="radio"/> Hardly or not at all satisfies a assessment criterion
<input type="radio"/> Assessmenttr criterionbdo not apply