# AI in the Digital Era: Smart Technologies Enabling Independence and Inclusive Futures

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**ABSTRACT**

Artificial Intelligence (AI) in the digital era is reshaping healthcare, accessibility, and elder care by enabling independence and fostering inclusive futures. This paper examines the role of smart technologies including health monitoring systems, voice enabled assistants, fall detection sensors, and social robotics in improving safety, healthcare outcomes, and social participation among seniors and individuals with disabilities. Drawing on literature review, case studies from India and worldwide, and comparative analysis, the study identifies best practices and proposes a roadmap for integrating AI into caregiving ecosystems. Findings highlight AI's dual role in addressing physical safety and psychosocial well-being, while underscoring the importance of ergonomic design, affordability, and ethical governance. Key challenges such as digital literacy, privacy, and infrastructural disparities are critically assessed, and future research directions are outlined to ensure equitable adoption. Ultimately, AI-powered smart assistance is positioned as a transformative socio-technical system that empowers vulnerable populations, bridges accessibility gaps, and promotes dignified living in an increasingly digital world.

**Keywords :** Artificial Intelligence (AI); Aging in place; Assistive technologies; Social robotics; Inclusive design; Accessibility; Smart healthcare systems

## 1. INTRODUCTION

Artificial Intelligence (AI) has become one of the most defining technologies of the reforming healthcare, education, logistics, and accessibility in profound ways [4]. Its rapid integration into everyday life demonstrates the potential of intelligent systems to transform how societies function and how individuals interact with technology. For aging populations and individuals with disabilities, AI offers unprecedented opportunities to enhance independence, dignity, and participation in society [1][2].

The demographic shift toward an aging global population, coupled with increasing prevalence of chronic conditions and mobility challenges, has created urgent demand for innovative solutions. Traditional caregiving models often struggle to meet these needs due to resource constraints, rising costs, and limited availability of skilled personnel [1].

AI-powered smart technologies—ranging from health monitoring systems to social robotics—present a promising alternative by enabling proactive healthcare, personalized assistance, and inclusive participation in digital ecosystems [2][3]. Wearable devices and predictive diagnostics allow early detection of health risks [1], while voice-enabled assistants and fall detection sensors provide safety and daily living support [4][6]. Social robots further extend the scope of AI by offering companionship, cognitive stimulation, and emotional well-being, thereby reducing isolation and improving quality of life [2][3]. At the same time, inclusive design principles ensure that these technologies remain accessible to seniors and individuals with limited digital literacy [5].

This paper explores the role of AI in enabling inclusive futures through literature review, case studies from India and worldwide [6][7], and analysis of implications, challenges, and future research directions [8][9]. Ultimately, AI is positioned as a transformative solution to empower vulnerable populations in the digital age.

## 2. PATH TOWARDS CARE FREE LIVING : AI –SMART ENABLING

### 2.1. Role in Aging and Accessibility

Artificial Intelligence (AI) has emerged as a transformative force in the digital era, reshaping how societies address aging and accessibility. The integration of smart technologies into elder care and inclusive living environments has created new opportunities for independence, safety, and social participation. Scholars emphasize that AI is not merely a technological advancement but a socio-technical system that influences health outcomes, autonomy, and dignity for vulnerable populations [3].

Artificial Intelligence (AI) plays a pivotal role in reshaping how societies address the challenges of aging and accessibility. By integrating smart technologies into healthcare, daily living, and social participation, AI empowers vulnerable populations to live independently, safely, and with dignity [1][2]. Its applications extend beyond medical diagnostics into communication, mobility, and psychosocial well-being, making it a socio-technical system that influences autonomy and inclusion [3][5].

#### 2.1.1 AI in Aging

AI technologies have become essential in supporting the growing elderly population worldwide. Health monitoring systems, including wearable devices and predictive diagnostics, enable continuous tracking of vital signs and early detection of chronic conditions [1]. This proactive approach reduces hospitalizations and supports the concept of "aging in place," allowing seniors to remain in familiar environments with minimal external intervention [1].

Beyond healthcare, AI enhances daily living through smart home systems, fall detection sensors, and voice-enabled assistants that simplify routine tasks [4]. Social robots provide companionship, cognitive stimulation, and emotional support, mitigating loneliness and fostering mental well-being [2]. Case studies such as India's Walkfit project, an AI-enabled walking stick attachment, demonstrate how affordable innovations can directly improve safety and mobility [6]. Globally, AI-driven frailty management programs highlight the potential of intelligent systems to transform elder care [1].

#### 2.1.2 AI in Accessibility

AI also plays a transformative role in improving accessibility for individuals with disabilities. Smart technologies extend into communication, mobility, and social participation [3]. Voice-enabled assistants, gesture recognition systems, and adaptive interfaces allow users to interact seamlessly with digital environments, bridging gaps in usability [5]. AI-powered tools such as sign language recognition systems and intelligent prosthetics expand opportunities for communication and mobility, while emotion-detection technologies support mental health interventions [2][3].

The socio-technical impact of these innovations is profound: AI is not merely a technical solution but a catalyst for inclusion and dignity [3]. By reducing barriers to participation, AI fosters independence and empowers individuals to engage more fully in education, employment, and community life [8][9].

Global initiatives such as the Equitable AI Alliance emphasize embedding accessibility features into mainstream consumer technologies, ensuring inclusivity at scale [9]. In India, projects like AI-powered smart wheelchairs highlight the potential of locally developed solutions to address diverse accessibility needs [7]. These examples demonstrate that AI-driven accessibility tools are reshaping how societies approach disability, creating pathways toward equitable participation in the digital era.

**2.1.3 Synthesis: Connecting Aging and Accessibility**

While aging and accessibility are often discussed as separate domains, they share significant overlaps in the challenges faced and the solutions offered by AI. Both seniors and individuals with disabilities encounter barriers related to mobility, communication, healthcare, and social participation [1][2][3]. AI technologies address these issues through common tools such as smart assistants, predictive diagnostics, and adaptive interfaces, which enhance autonomy and reduce dependence on caregivers [4][5].

For example, fall detection sensors benefit both elderly individuals prone to frailty and persons with mobility impairments [4][6]. Similarly, voice-enabled assistants simplify daily tasks for seniors while also serving as communication aids for those with speech or motor limitations [5]. Social robots, designed to provide companionship and cognitive stimulation, mitigate loneliness among older adults but also support individuals with disabilities who may experience social isolation [2][3].

The convergence of aging and accessibility needs highlights the importance of designing inclusive systems that serve diverse populations simultaneously [5][9]. Global initiatives like the Equitable AI Alliance emphasize embedding accessibility features into mainstream consumer technologies, ensuring that solutions are scalable and adaptable across contexts [9]. In India, projects such as AI-powered smart wheelchairs and affordable walking aids demonstrate how localized innovation can address both aging and disability challenges in resource-constrained settings [6][7].

Ultimately, the synthesis of aging and accessibility underscores AI's broader role as a socio-technical enabler. By bridging these domains, AI fosters independence, dignity, and participation, creating inclusive futures where vulnerable populations are empowered to thrive in the digital era [1][2][3][9].

**2.2. AI for Health and Independence**

McDaniel et al. [1] highlight how AI technologies enhance resilience and independence among older adults. Their study focuses on frailty management, predictive health monitoring, and AI-driven interventions that allow seniors to maintain autonomy while reducing reliance on institutional care. AI-powered wearables and monitoring systems can detect early signs of chronic conditions, enabling proactive healthcare and reducing emergency hospitalizations. This positions AI as a critical enabler of "aging in place," where seniors can remain in familiar environments with minimal external support [1].

Aging populations and individuals with disabilities face multiple risks in daily living, including chronic health deterioration, frailty, falls, and social isolation. Chronic conditions such as cardiovascular disease, diabetes, and neurodegenerative disorders often progress silently, increasing vulnerability to sudden medical emergencies [1]. Frailty and reduced mobility heighten risks of falls and accidents, while cognitive decline undermines independence. Beyond physical health, loneliness and lack of social participation pose significant psychosocial challenges, eroding quality of life [2].

Artificial Intelligence offers a suite of tools to mitigate these risks and empower individuals to live independently. AI-powered health monitoring systems—such as wearable sensors, smart watches, and predictive diagnostic platforms—enable continuous tracking of vital signs and early detection of anomalies [1]. Fall detection sensors integrated into smart homes or mobile devices provide immediate alerts, ensuring timely intervention [4]. Voice-enabled assistants simplify daily routines by managing medication schedules, controlling appliances, and offering reminders, thereby reducing reliance on external support [5]. Social robotics and conversational AI agents address psychosocial risks by providing companionship, cognitive stimulation, and emotional support [2]. Predictive analytics also identify patterns of decline, enabling personalized interventions tailored to individual health histories and biomarkers [3].

Case studies illustrate these applications in practice. In India, projects such as Walkfit, an AI-enabled walking stick attachment, demonstrate affordable solutions for fall prevention [6]. Globally, AI-driven frailty management programs and smart wearable-based fall detection systems highlight the potential of intelligent tools to transform elder care [1][4].

### 2.3. Assistive Technologies and Social Robotics

Oladele [2] explores AI-powered assistive technologies in elder care, including smart home systems, wearable devices, and fall detection sensors. These tools improve safety and daily functioning, while social robotics provide companionship, cognitive stimulation, and emotional support. The dual role of AI—addressing physical safety and psychosocial well-being—illustrates its potential to reduce isolation and enhance quality of life. Social robots, for example, are increasingly used to engage seniors in conversation, memory exercises, and entertainment, thereby mitigating loneliness and cognitive decline [2].

Assistive technologies powered by AI are reshaping elder care and accessibility by combining safety, convenience, and psychosocial support. Smart home systems equipped with fall detection sensors and voice-enabled assistants provide daily living support, ensuring that seniors and individuals with disabilities can manage routine tasks independently [2][4]. These systems improve safety while reducing caregiver burden, offering real-time alerts during emergencies and simplifying household management through voice commands [5].

Beyond functional assistance, social robotics represent another frontier in inclusive technology. Robots designed for companionship, cognitive stimulation, and emotional well-being mitigate loneliness and cognitive decline, which are common risks among aging populations [2]. Case studies demonstrate robots engaging seniors in conversation, memory exercises, and entertainment, thereby enhancing psychosocial health [3]. Research highlights the dual role of AI in addressing both physical safety and emotional resilience, positioning social robotics as critical tools in holistic elder care [2][5].

Global initiatives underscore the growing importance of these technologies. In Japan, humanoid robots such as Pepper have been deployed in nursing homes to provide interactive companionship and cognitive training [4]. In India, emerging projects focus on affordable AI-powered smart wheelchairs and sign language recognition systems, extending accessibility to diverse populations [7]. These examples illustrate how AI-driven assistive technologies are not only improving safety and healthcare outcomes but also fostering inclusion and dignity [2][3][5].

Ultimately, assistive technologies and social robotics demonstrate that AI is more than a technical innovation—it is a socio-technical system that enhances autonomy, reduces isolation, and creates pathways toward inclusive futures [9].

Comparative Table: AI Assistive Technologies and Social Robotics

**Table I: Comparative AI Assistive Technologies in India and Globally**

| Aspect | India Projects | Global Projects |
|---|---|---|
| **Examples** | Walkfit (AI-enabled walking stick), Smart | Pepper Robot (Japan), CareFall (AI fall |

| Aspect | India Projects | Global Projects |
|---|---|---|
| | Wheelchair, Sign Language Recognition | detection), AI-powered smart glasses, intelligent prosthetics |
| **Primary Focus** | Affordability, mobility support, communication aids | Advanced robotics, emotional companionship, cognitive stimulation, high-tech prosthetics |
| **Affordability** | Designed to be low-cost (₹3,000–₹5,000 for Walkfit) to reach wider demographics | Higher cost, often premium technologies; affordability varies by region |
| **Technology Level** | IoT-based devices, AI-enabled sensors, basic robotics | Humanoid robots, AI + IoT integration, advanced machine learning for personalization |
| **Scalability** | Localized solutions targeting rural and urban populations in India | Global scalability with mainstream consumer tech integration (Equitable AI Alliance) |
| **Accessibility Impact** | Focus on bridging digital literacy gaps and affordability barriers | Focus on embedding accessibility features into mainstream consumer technologies |
| **Psychosocial Role** | Emerging projects in social robotics, limited but growing | Established use of social robots for companionship, memory exercises, and emotional support |
| **Policy Support** | Government-led initiatives (National Conference on AI for Disabilities, NITI Aayog FrontierTech) | International collaborations, corporate-led alliances, and research-driven frameworks |

### 2.4 Ergonomic and Inclusive Design

Research published in Universal Access in the Information Society [5] emphasizes the importance of ergonomic, multi-modal digital support systems. By integrating AI and VR-based assistance, these systems aim to bridge the digital divide and improve technology acceptance among seniors. Age-friendly design principles, such as simplified interfaces and adaptive feedback, are critical to ensuring usability. The study highlights that without inclusive design, even advanced AI solutions risk excluding those with limited digital literacy or cognitive impairments [5].

Inclusive design is critical to ensuring that AI technologies are accessible to seniors and individuals with disabilities. Research emphasizes age-friendly principles such as simplified interfaces, adaptive feedback, and multimodal support systems that accommodate diverse cognitive and physical abilities [3][5]. Without ergonomic design, advanced AI risks excluding vulnerable populations, particularly those with limited digital literacy or cognitive impairments [5].

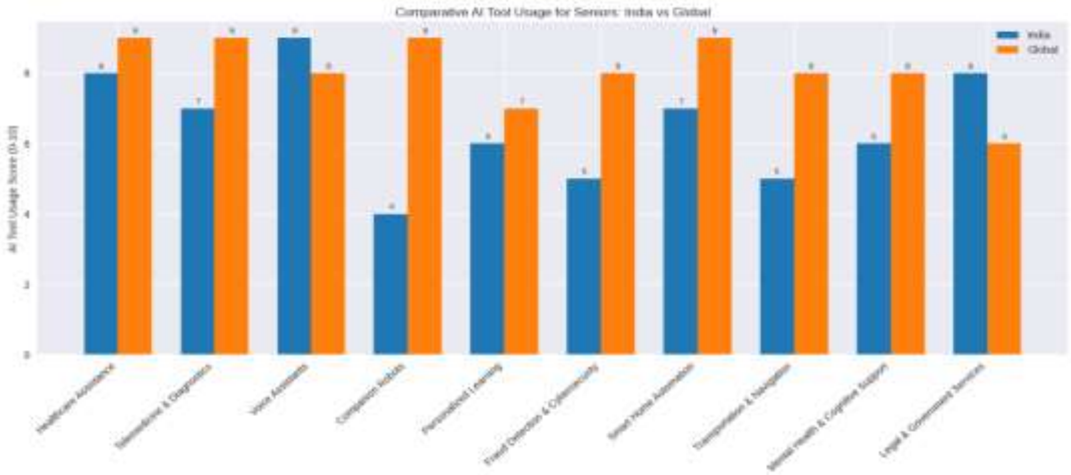
Adaptive feedback mechanisms allow systems to adjust complexity based on user proficiency. Simplified dashboards and voice-guided prompts reduce cognitive load for seniors, while gesture recognition and haptic feedback enhance accessibility for individuals with mobility challenges [3]. Multimodal support systems—combining text, audio, and visual cues—bridge the digital divide by offering multiple pathways for interaction [5].

Emerging research highlights the potential of combining AI with Virtual Reality (VR) to create immersive environments for accessibility and engagement [5]. VR platforms, enhanced by AI-driven personalization, can simulate real-world scenarios for training, rehabilitation, and social participation.Ultimately, ergonomic and inclusive design ensures that AI technologies are not only technically advanced but also socially equitable [3][5].

## 3. AI TOOLS FOR SENIORS AND INDIVIDUAL ASSISTANCE

Initiatives in India are exploring **wearables and apps** that monitor vital signs (heart rate, blood pressure, oxygen levels) and provide **virtual health assistants** for medication reminders. These tools aim to reduce hospital visits and combat loneliness for seniors

**Figure 1: Comparative AI Tool Usage for Seniors (India vs Global)**



1. **Healthcare Assistance**: AI-powered apps and wearable devices can monitor vital signs such as heart rate, blood pressure, and oxygen levels [1]. Virtual health assistants provide reminders for medication, reducing the risk of missed doses and hospital visits [1][5].
2. **Telemedicine and AI-Enabled Diagnostics** : AI-driven telemedicine platforms enable seniors to consult doctors from the comfort of their homes [4]. Predictive analytics assist in early disease detection, helping diagnose conditions such as diabetes and cardiovascular diseases in their early stages [1][9].
3. **Voice Assistants for Daily Tasks** : Smart AI assistants such as Alexa and Google Assistant simplify daily routines by setting reminders, answering questions, playing music, and controlling smart home devices, thereby supporting elderly users with limited mobility [5].
4. **Companion Robots to Combat Loneliness:** Social isolation is a growing concern among seniors. AI-powered companion robots provide conversation, games, and emotional support, reducing loneliness and promoting mental well-being [2][3].
5. **AI-Powered Personalised Learning:** AI-driven platforms offer customised courses in regional languages, enabling seniors to learn hobbies, new languages, or technology skills at their own pace [5].
6. **Fraud Detection and Cybersecurity:** Senior citizens are vulnerable to financial fraud and scams. AI-based security systems monitor unusual banking activities and alert seniors and family members to potential fraud attempts [9].

7. **Smart Home Automation for Safety and Comfort:** AI-powered smart home devices enhance safety by automating lighting, security cameras, and emergency alerts. These systems can detect falls, inactivity, or gas leaks, ensuring timely intervention [6].
8. **Transportation and Navigation Assistance:** AI-driven ride-hailing apps can be tailored for seniors with simplified interfaces and voice-command options. AI-powered navigation tools also assist visually impaired individuals in moving safely [4].
9. **Mental Health and Cognitive Support:** AI applications for mental wellness provide guided meditation, memory-enhancing games, and early detection of cognitive decline such as Alzheimer's and dementia, aiding in timely intervention [2][3].
10. **Access to Legal and Government Services** : AI chatbots and virtual assistants help seniors navigate complex government services, including pension applications, legal aid, and insurance claims, making these processes simpler and more accessible [7][9].

**AI Accessibility Tools for Seniors**

**Table II: AI Accessibility Tools for Seniors in India**

| **Tool/Initiative** | **Description** | **Impact for Seniors** |
|---|---|---|
| Sugamya Bharat App (2025 Revamp) | AI-powered mobile app by the Government of India to report accessibility barriers in public infrastructure and ICT systems | Empowers seniors to flag accessibility issues and access government schemes easily |
| AI-Powered Healthcare Wearables | Devices that monitor heart rate, BP, oxygen levels, and detect anomalies | Enables early detection of chronic conditions, reduces hospital visits |
| Telemedicine Platforms | AI-driven diagnostics and remote consultations (Apollo TeleHealth, Practo AI) | Provides healthcare access from home, especially for mobility-restricted seniors |
| Voice Assistants | Alexa, Google Assistant localized in Indian languages | Simplifies daily tasks, controls smart homes, supports seniors with limited mobility |
| Companion Robots | AI robots offering conversation, memory games, and emotional support | Reduces loneliness, improves mental well-being |
| Smart Home Automation | AI-enabled fall detection, lighting, and emergency alerts (Walkfit, IoT devices) | Enhances safety, detects inactivity or accidents |
| AI Chatbots for Government Services | Integrated into apps like Sugamya Bharat | Helps seniors navigate pensions, insurance, and legal aid |
| AI-Driven Learning Platforms | Personalized courses in regional languages | Supports lifelong learning and digital literacy |

## 4. CASE STUDIES

### 4.1. Case Studies In India

India has emerged as a hub for affordable and innovative AI solutions in aging and accessibility. One notable example is Walkfit (Mumbai), an AI-enabled walking stick attachment designed by engineering students to prevent falls among seniors. With pricing between ₹3,000–₹5,000, Walkfit demonstrates how affordability can be balanced with innovation, making assistive technology accessible to wider demographics [6].

Another milestone is the National Conference on AI for Empowering Persons with Disabilities (Bengaluru, 2025), a government-led initiative that showcased applications of deep learning, robotics, and computer vision for accessibility [2].

Emerging projects from Indian universities and startups include AI-powered smart wheelchairs and sign language recognition systems, focusing on mobility and communication [2]. Collectively, these efforts demonstrate India's growing commitment to leveraging AI for inclusive futures, balancing affordability with innovation.

**AI Missions for Disabilities (2025)**:

The Department of Empowerment of Persons with Disabilities (DEPwD) launched **four major AI-driven digital missions** in collaboration with the Artificial Limbs Manufacturing Corporation of India (ALIMCO).It focus areas by **education, healthcare, livelihood, and everyday services**.

### 4.2. Case Studies in Worldwide

Globally, AI initiatives in accessibility emphasize scalability and integration into mainstream consumer technologies. The Equitable AI Alliance represents a major step in embedding adaptive AI features into everyday devices, shifting from specialized assistive tools to flexible systems that serve diverse populations [4].

The Top 10 AI-based Assistive Technologies list includes innovations such as AI-powered smart glasses for the visually impaired, intelligent prosthetics, and emotion-detection systems for mental health [5].

Academic research further reinforces this trajectory. Springer Research (2025) documents AI-driven innovations in assistive technology that improve communication, mobility, and accessibility for persons with disabilities [3]. These global projects underscore the universal relevance of inclusive design, demonstrating how AI can simultaneously address physical, cognitive, and emotional needs across populations.

## 5. IMPLICATIONS

The implications of Artificial Intelligence (AI) in aging and accessibility extend across healthcare, social inclusion, economic development, and governance.

### 5.1Healthcare Transformation:

AI enables proactive care by shifting from reactive treatment to predictive monitoring. Wearable devices and diagnostic platforms continuously track vital signs, allowing early detection of chronic conditions and reducing hospitalizations [1][9]. This transformation alleviates strain on healthcare systems, particularly in countries with limited medical infrastructure. By supporting "aging in place," AI reduces dependence on institutional care and empowers seniors to remain in familiar environments [1].

### 5.2. Social Inclusion:

Beyond physical health, AI fosters dignity and participation through companionship tools such as social robots and conversational agents. These technologies mitigate loneliness, encourage cognitive stimulation, and enhance emotional well-being [2][3]. By bridging communication gaps for individuals with disabilities—through sign language recognition or adaptive interfaces—AI strengthens inclusion in education, employment, and community life [3][5].

**5.3. Opportunities:**

Affordable AI solutions create new markets in elder care and accessibility. Innovations such as India's Walkfit project demonstrate how low-cost assistive devices can reach wider demographics [6]. Globally, intelligent prosthetics and adaptive consumer technologies highlight the potential for scalable business models that balance affordability with innovation [5].

**5.4. Policy and Governance:**

Ethical frameworks are essential to ensure equitable access and protect privacy. Concerns around algorithmic bias, autonomy, and data security require robust governance structures. International initiatives, such as the Equitable AI Alliance, emphasize embedding accessibility features into mainstream consumer technologies, ensuring inclusivity at scale [9]. Governments must collaborate with industry and academia to establish policies that safeguard dignity while promoting innovation.

## 6. CHALLENGES AND LIMITATIONS

Despite the promise of Artificial Intelligence (AI) in aging and accessibility, several challenges remain:

**Affordability**: High costs limit adoption in low-income communities, where advanced robotics and smart devices remain financially inaccessible. While projects such as Walkfit demonstrate affordable innovation in India, global solutions often remain premium technologies [6].

**Digital Literacy:** Seniors frequently struggle with technology acceptance and usability. Without age-friendly interfaces and adaptive feedback, AI risks excluding those with limited digital literacy or cognitive impairments [5].

**Ethical Concerns:** Privacy, autonomy, and algorithmic bias remain unresolved. AI systems often rely on sensitive health data, raising concerns about misuse or breaches. Ethical frameworks are needed to safeguard dignity and ensure equitable access [9].

**Infrastructure Gaps:** Rural regions lack connectivity and digital infrastructure, limiting the deployment of AI-enabled devices. This digital divide exacerbates inequalities in access to healthcare and assistive technologies [2].

Scalability: Adapting solutions across diverse cultural contexts is complex. AI systems must account for linguistic diversity, socio-economic differences, and varying healthcare infrastructures to achieve global inclusivity [3].

## 7. FUTURE RESEARCH DIRECTIONS

Future research must address these limitations by advancing innovation and governance:

1. **Personalized AI caregiving**: Tailoring systems to individual health needs through predictive analytics and adaptive interfaces [1].
2. **Integration with robotics:** Combining AI with exoskeletons, smart prosthetics, and mobility aids to enhance independence [3].
3. **Policy frameworks**: Developing ethical and regulatory structures to ensure equitable access, privacy protection, and accountability [9].
4. **Cross-disciplinary collaboration**: Bridging AI, healthcare, and social sciences to design holistic solutions that address both technical and psychosocial needs [5].
5. **Global sharing of best practices:** Establishing international platforms for knowledge exchange to scale inclusive AI adoption across diverse contexts [2][9].

## 8. CONCLUSION

Artificial Intelligence (AI) in the digital era is a transformative force enabling independence and inclusive futures. Case studies from India and worldwide demonstrate the potential of smart assistive technologies to improve healthcare outcomes, enhance safety, and foster social inclusion [2][3][6]. From affordable innovations such as Walkfit in Mumbai to global initiatives like the Equitable AI Alliance, evidence shows that AI can bridge gaps in accessibility and empower vulnerable populations.However, challenges of affordability, digital literacy, ethical concerns, and infrastructural disparities remain significant barriers [9][5]. Without careful attention to usability and inclusivity, advanced AI risks excluding seniors and individuals with disabilities who lack digital proficiency or access to resources.

Ethical frameworks addressing privacy, autonomy, and algorithmic bias are essential to ensure equitable adoption.A roadmap integrating innovation, inclusive design, and policy support is therefore critical. Inclusive design principles—such as simplified interfaces, adaptive feedback, and multimodal support—must be embedded into system architecture to ensure accessibility across diverse populations [5]. Policy frameworks should safeguard dignity while promoting innovation, ensuring that AI serves as a socio-technical enabler rather than a source of inequality.Ultimately, AI's role in aging and accessibility extends beyond technology: it is a catalyst for dignity, independence, and participation in the digital age. By aligning innovation with affordability, inclusivity, and ethical governance, societies can ensure dignified living for seniors and individuals with disabilities, creating pathways toward equitable futures. AI, when aligned with affordability, inclusivity, and ethical governance, is not just a technology but a socio-technical enabler of dignity and independence in the digital era."

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