

SMART HOMES: TECHNOLOGIES, APPLICATIONS, BENEFITS, CHALLENGES, AND PERSPECTIVES

CASAS INTELIGENTES: TECNOLOGIAS, APLICAÇÕES, BENEFÍCIOS,
DESAFIOS E PERSPECTIVAS

Ciências Humanas, Engenharias, Ciências da Saúde • 27/05/2026

REGISTRO DOI: [10.70773/revistatopicos/779746219](https://doi.org/10.70773/revistatopicos/779746219)

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ABSTRACT

Smart homes represent a significant technological evolution in the context of residential automation, integrating resources such as the Internet of Things (IoT), artificial intelligence, smart sensors, and automated systems aimed at optimizing domestic activities. This study aimed to analyze the main technologies applied to smart homes, as well as their benefits, challenges, and perspectives. This is an integrative literature review, conducted through searches in the SciELO, Latindex, Springer, OJS, and university repositories, using studies published between 2022 and 2026 in Portuguese and English. The results demonstrated that smart homes contribute to increased comfort, security, energy efficiency, practicality, and accessibility, especially benefiting the elderly, people with functional limitations, and individuals with Amyotrophic Lateral Sclerosis (ALS). Challenges related to implementation costs, interoperability between devices, privacy, and digital security were also identified. Furthermore, it was observed that the advancement of artificial intelligence and connected technologies tends to make residential environments increasingly autonomous, sustainable, and personalized. It is concluded that smart homes have a high potential for transforming contemporary domestic environments.

Keywords: Residential automation; Smart homes; Artificial intelligence; Internet of Things; Assistive technology.

RESUMO

As casas inteligentes representam uma importante evolução tecnológica no contexto da automação residencial, integrando recursos como Internet das Coisas (IoT), inteligência artificial, sensores inteligentes e sistemas automatizados voltados à otimização das atividades domésticas. O presente estudo teve como objetivo analisar as principais tecnologias aplicadas às smart homes,

bem como seus benefícios, desafios e perspectivas. Trata-se de uma revisão integrativa da literatura, realizada por meio de buscas nas bases SciELO, Latindex, Springer, repositórios OJS e universitários, utilizando estudos publicados entre 2022 e 2026 nos idiomas português e inglês. Os resultados demonstraram que as casas inteligentes contribuem para ampliar o conforto, segurança, eficiência energética, praticidade e acessibilidade, beneficiando especialmente idosos, pessoas com limitações funcionais e indivíduos com Esclerose Lateral Amiotrófica (ELA). Também foram identificados desafios relacionados aos custos de implementação, interoperabilidade entre dispositivos, privacidade e segurança digital. Além disso, observou-se que o avanço da inteligência artificial e das tecnologias conectadas tende a tornar os ambientes residenciais cada vez mais autônomos, sustentáveis e personalizados. Conclui-se que as smart homes possuem elevado potencial de transformação dos ambientes domésticos contemporâneos.

Palavras-chave: Automação residencial; Casas inteligentes; Inteligência artificial; Internet das Coisas; Tecnologia assistiva.

1. INTRODUCTION

The increasing incorporation of digital technologies into the home environment has significantly transformed how people interact with their homes, driving the development of so-called smart homes. This concept refers to the integration of internet-connected devices, sensors, automated systems, and digital platforms capable of promoting greater control, comfort, energy efficiency, security, and convenience in daily life. The advancement of the Internet of Things (IoT), coupled with the growth of artificial intelligence and home automation, has enabled previously manual activities to be carried

out in an automated and intelligent way, promoting relevant changes in contemporary housing patterns (Costa, 2022).

Smart homes have become an important technological trend due to the increasing digitalization of society and the search for solutions that promote quality of life and optimization of domestic resources. Digital domesticity represents a new configuration of contemporary architecture, marked by connectivity between devices and users (Bordignon, 2024).

The development of home automation technologies is directly related to the evolution of wireless communication networks and connected devices. Technologies such as Wi-Fi and ZigBee play a fundamental role in communication between smart devices, promoting greater operational efficiency in automated systems (Maia, 2022). Furthermore, integrating platforms expand interoperability between different devices, allowing for greater flexibility and customization of smart environments (Rossi; Sirqueira, 2025).

Another relevant aspect refers to the use of artificial intelligence in smart home systems. The application of intelligent algorithms allows devices to learn user behavior patterns, making interactions more personalized and efficient (Carola, 2024). The integration between virtual assistants and home devices also enhances the user experience, making home management more intuitive and accessible (Almeida; Nascimento, 2024).

The benefits associated with smart homes encompass issues related to security, accessibility, and well-being. Home automation contributes to strengthening home security through remote

monitoring, presence sensors, and integrated surveillance systems (Alves; Costa, 2022). In addition, these technologies have important applicability in supporting the well-being of the elderly, promoting greater autonomy and security through continuous monitoring and automation of household functions (Alves, 2025). Smart technologies also help prevent accidents and assist in daily activities, enhancing the quality of life of users (Chagas; Dos Santos Rabello, 2024).

Despite technological advancements and the benefits provided, challenges still exist that limit the widespread adoption of smart homes. Among the main concerns are privacy, data security, and interoperability between devices. Connected residential environments are subject to cyber vulnerabilities capable of compromising users' personal information (Lima, 2023).

In this context, it is observed that smart homes represent an important technological evolution in the residential environment, promoting transformations in the relationship between technology, comfort, and quality of life. However, the challenges related to digital security, technological integration, and user acceptance demonstrate that there are still gaps to be investigated.

Thus, this study aims to analyze the main technologies used in smart homes, highlighting their benefits, challenges, and perspectives in the context of home automation and the digital transformation of domestic environments.

2. THEORETICAL FOUNDATION

The advancement of digital technologies, especially the Internet of Things (IoT), artificial intelligence, and home automation, has promoted significant changes in the way individuals interact with

domestic environments. Smart homes have come to integrate connected devices, sensors, digital platforms, and automated systems capable of performing functions autonomously, increasing comfort, security, practicality, and energy efficiency.

Gonçalves (2025) highlights that the growth of smart homes is directly related to the expansion of connected technologies and the growing need for more functional environments that are adaptable to contemporary human needs. In agreement, Souza and Marques (2024) state that home automation has been consolidating itself as a technological solution capable of optimizing daily activities, reducing waste, and expanding control over domestic environments.

The literature analyzed demonstrates consensus regarding the central role of IoT in the functioning of smart homes. Costa (2022) states that IoT-based architecture enables continuous communication between connected devices, allowing real-time monitoring and automated management of domestic functions. In line with this, Oliveira (2023) emphasizes that smart sensors associated with databases favor greater operational control of residential environments, enabling automation of lighting, air conditioning, security monitoring, and control of electronic equipment.

In addition, Maia (2022) highlights that communication technologies such as Wi-Fi and ZigBee are fundamental to ensuring efficiency in data transmission and stability of connectivity between automated devices. Venceslau (2021) complements this discussion by stating that IoT protocols play an essential role in the functional integration

of intelligent systems, favoring efficient communication between multiple devices connected simultaneously.

The studies also highlight the advancement of artificial intelligence as a fundamental element for the development of smart homes. Carola (2024) points out that intelligent systems based on predictive algorithms have the ability to identify behavioral patterns of users, automatically adapting domestic functions according to established preferences and routines. In agreement, Almeida and Nascimento (2024) state that the integration between virtual assistants and automated systems has significantly increased the practicality and accessibility in smart homes, allowing control through voice commands and personalization of domestic activities.

Home automation based on artificial intelligence favors the creation of intelligent environments capable of interpreting user behaviors and automatically adapting their functions, promoting greater comfort, efficiency, and personalization of domestic activities (Carola, 2024, p. 18).

Studies indicate that smart homes make an important contribution to residential security and the functional efficiency of domestic environments. Alves and Costa (2022) emphasize that smart sensors, automated cameras, and remote monitoring systems have significantly expanded property protection mechanisms.

In line with this, Rocha (2023) highlights that home automation systems favor greater control of residential functions, allowing

remote management of devices and optimization of daily activities.

Another aspect addressed in the literature refers to the application of smart homes as a resource for promoting well-being, accessibility, care, and assistance for the elderly and the autonomy of people with functional limitations and individuals with Amyotrophic Lateral Sclerosis (ALS). Alves (2025) states that automated systems promote greater autonomy and security for the elderly through continuous monitoring and automation of domestic functions. In agreement, Xavier Junior (2022) emphasizes that smart devices applied to care environments allow remote monitoring of health conditions and prevention of domestic accidents.


Rabelo et al (2025) emphasize that for people with Amyotrophic Lateral Sclerosis (ALS), smart homes have an even more significant impact, considering that the disease causes the progressive loss of motor skills and, in many cases, verbal communication. In this context, assistive technologies integrated into the home environment act primarily in two complementary dimensions.

The first refers to alternative environmental control, through devices activated by voice commands or eye-tracking systems, which allow the individual to interact autonomously with different resources in the home, such as opening curtains, activating electronic devices, and adjusting lighting and air conditioning. The second dimension is related to predictive and clinical monitoring, in which intelligent sensors and computer systems allow the identification of subtle changes in the user's health status, such as changes in behavioral patterns. This information contributes to faster medical interventions, favoring continuous clinical monitoring, treatment adaptation, and increased safety and well-being for patients.

Chagas and Dos Santos Rabello (2024) add that the integration between artificial intelligence and assistive robotics presents significant potential for supporting daily activities and monitoring the health of vulnerable populations. Thus, it is observed that smart technologies have a relevant social contribution by promoting accessibility, continuous care, and improved quality of life in different residential contexts.

Despite the benefits evidenced, the authors also point out important challenges related to the expansion of smart homes. Luna, Luna, and Fettermann (2024) highlight that the high implementation and maintenance costs still represent significant barriers to the widespread adoption of smart technologies. In agreement, Nascimento and Fettermann (2021) state that difficulties related to the use of technologies, resistance to digital dependence, and concerns about privacy directly interfere with the acceptance of smart homes by users.

Issues related to digital security and data protection appear as one of the main concerns present in the studies analyzed. Cogliatti (2023) emphasizes that connected devices continuously collect personal information, increasing risks related to user privacy. Similarly, Lima (2023) states that smart environments based on IoT present cyber vulnerabilities capable of compromising both automated devices and information stored in residential systems.



The growth of smart homes significantly increases the challenges related to digital security and the protection of personal data, requiring more efficient mechanisms for privacy, authentication, and protection of information shared by connected devices (Cogliatti, 2023, p. 22).

Furthermore, Caldas (2023) points out that the lack of standardization among manufacturers still limits interoperability between smart devices, hindering the full integration of automated systems. In line with this, Rossi and Sirqueira (2025) state that integrating platforms such as Home Assistant have sought to minimize these limitations by favoring the centralization of the management of connected devices.

Finally, Rodrigues (2024) and Bordignon (2024) highlight that the future prospects of smart homes point to progressively more autonomous, sustainable and adaptable environments to human needs, consolidating smart homes as an important part of the contemporary digital transformation.

3. METHODOLOGY

This study is characterized as an integrative literature review, with a qualitative approach, descriptive nature, and exploratory character, developed with the objective of gathering, analyzing, and synthesizing scientific productions related to technologies applied to smart homes, their benefits, challenges, and perspectives.

The integrative review allows for the gathering of results from previously published research, contributing to the expansion of scientific knowledge about the investigated theme and allowing for a more comprehensive understanding of the object of study. The research was guided by the following question: what are the main technologies used in smart homes and what benefits, challenges, and perspectives are associated with home automation?

Data collection was carried out between March, April, and May 2026, through electronic searches in the Scientific Electronic Library Online (SciELO), Latindex, Springer, Open Journal Systems (OJS) repositories, and national and international university repositories. These platforms were chosen due to their academic relevance, multidisciplinary scope, and the availability of scientific studies related to the themes of home automation, the Internet of Things (IoT), artificial intelligence, and smart homes.

For data searches, the following descriptors were used in Portuguese and English, combined using the Boolean operators AND and OR: “casas inteligentes”, “automação residencial”, “Internet das Coisas”, “inteligência artificial”, “smart homes”, “home automation”, “Internet of Things”, and “artificial intelligence”. The use of these descriptors allowed us to broaden the scope of the searches and identify studies compatible with the research objectives.

The inclusion criteria adopted included: scientific articles, undergraduate theses, dissertations, and complete studies published between 2022 and 2026; productions available in Portuguese and English; studies that addressed technologies applied to smart homes, home automation, IoT, artificial intelligence,

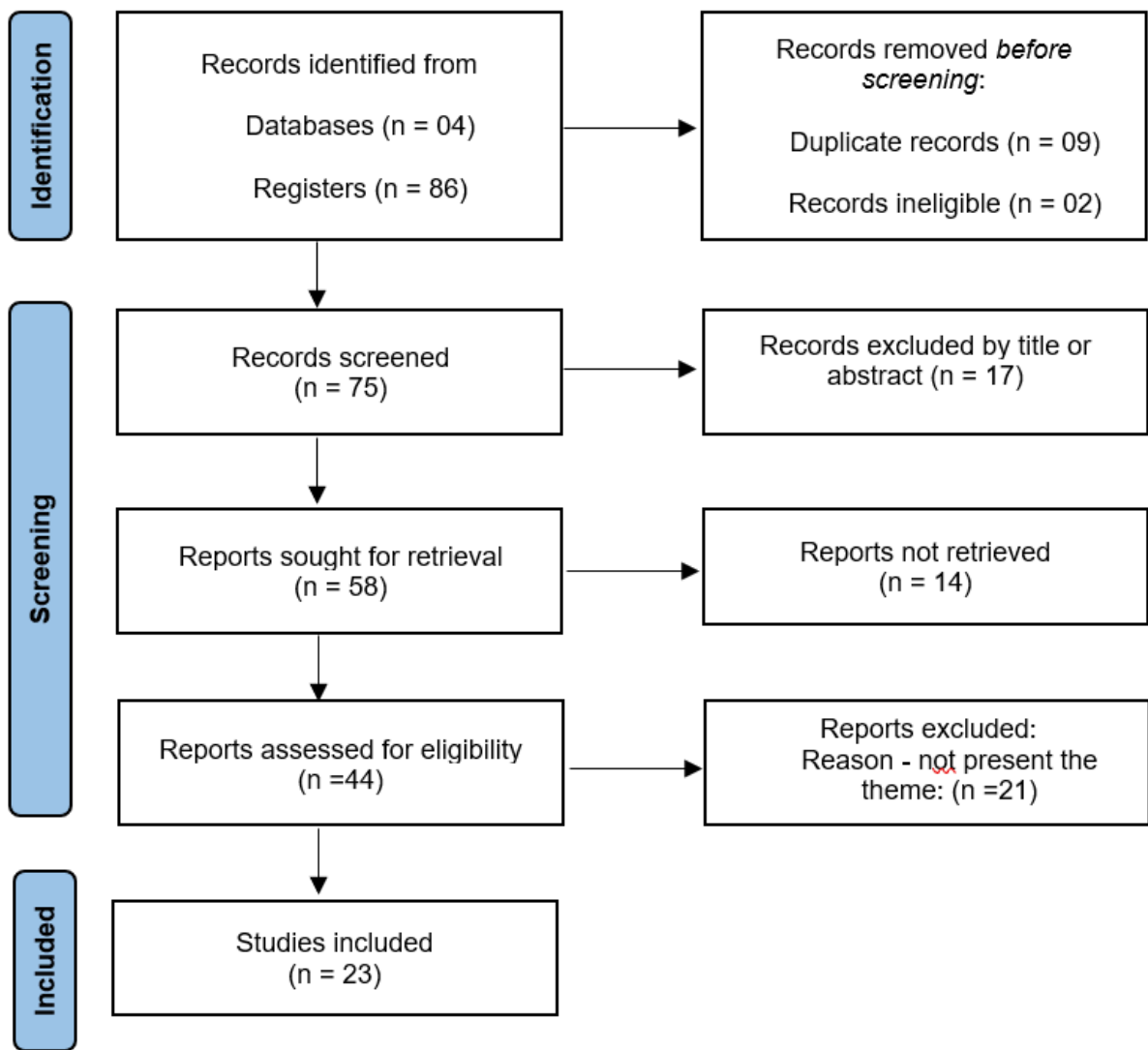
digital security, and quality of life related to smart homes; as well as publications freely available in full electronic format.

On the other hand, the following exclusion criteria were established: duplicate studies in the databases; simple abstracts, editorials, letters to the editor, and incomplete works; publications outside the delimited period; Studies in languages other than Portuguese and English were excluded, as well as research that did not have a direct relationship with the proposed theme. Articles that addressed industrial or business automation without association to the smart home context were also excluded.

The study selection process occurred in successive stages, beginning with reading the titles and abstracts to identify thematic relevance. Then, the pre-selected studies were submitted to full reading, allowing for careful analysis of their suitability to the research objectives and the previously established criteria.

After applying the inclusion and exclusion criteria, the eligible studies were organized and analyzed in a descriptive and thematic manner. Figure 1 presents the stages of the methodological process used for the identification, selection, and inclusion of the studies that comprised this integrative literature review.

Figure 1 – Flowchart of the steps for selecting studies for the integrative review.



Source: Author's own work (2026)

After the final selection of studies, the data were organized into thematic categories related to the technologies used in smart homes, benefits of home automation, challenges related to digital security, and perspectives of smart homes. Data analysis was conducted qualitatively, through two thematic axes that supported the research discussions: "Technologies and applications of smart home automation" and "Benefits, challenges, and perspectives of smart homes."

Because this is an integrative review based on secondary data available in the scientific literature, the present study did not require submission to the Research Ethics Committee, in accordance with the guidelines established by Resolution No. 510/2016 of the National

Health Council, which regulates research conducted with publicly available information and without the direct involvement of human beings.

4. RESULTS AND DISCUSSION OR DATA ANALYSIS

Based on the application of the previously established inclusion and exclusion criteria, 23 studies were selected to compose this integrative literature review.

The analyzed works addressed different perspectives related to smart homes, including home automation, the Internet of Things (IoT), artificial intelligence, interoperability between devices, digital security, accessibility, intelligent monitoring, and impacts on quality of life.

A predominance of studies published between 2022 and 2025 was observed, highlighting the growth of research focused on smart homes and the digital transformation of domestic environments. Table 1 presents the characterization of the studies included in the review, considering authorship, year, objective, and main findings related to the investigated topic.

Table 1 – Characterization of the studies selected for the integrative review

Autor/Ano	Study Objective	Main findings
Almeida; Nascimento (2024)	Analyze the feasibility of integrating virtual assistants into home automation	It was found that the integration of virtual assistants into intelligent systems expands the accessibility, practicality, and personalization of automated domestic routines.

Alves (2025)	Evaluate automation technologies applied to the well-being of the elderly	It was confirmed that home automation promotes greater autonomy, security, and continuous monitoring of the health and well-being of elderly people.
Alves; Costa (2022)	Investigate the evolution of home automation focused on security and Comfort	It was found that home automation significantly contributes to increased security, comfort, and convenience through sensors, smart alarms, and remote monitoring.
Bordignon (2024)	Discuss the relationship between smart homes and contemporary architecture	It was evidenced that smart homes represent a new configuration of digital domesticity, promoting greater interaction between technology, architecture, and housing experience.
Branco (2022)	Develop a digital platform for managing smart homes	It was demonstrated that integrating platforms favor the centralization of home management, providing greater control and operational efficiency of smart devices.
Caldas (2023)	Evaluate the interoperability of IoT devices for smart homes	It was highlighted that the lack of standardization between devices and manufacturers limits interoperability and compromises the efficiency of automated systems.
Carola (2024)	Investigate applications of artificial intelligence in smart systems	It was identified that artificial intelligence favors the development of predictive systems capable of adapting automated functions according to the habits and preferences of users.
Chagas; Dos Santos	Review applications of AI	It was observed that artificial intelligence and assistive robotics

Rabello (2024)	and assistive robotics in elderly care	contribute to health monitoring, accident prevention, and support for the daily activities of the elderly.
Cogliatti (2023)	Discuss consent in the context of IoT in smart homes	Concerns were raised regarding the continuous collection of personal data and the need for more secure mechanisms to protect user privacy.
Costa (2022)	Develop a home automation architecture based on IoT	It was found that IoT-based architecture expands connectivity between devices and enables greater efficiency in monitoring and automating home environments.
Gonçalves (2025)	Conduct a systematic review on smart home automation	Significant growth in research related to smart homes was recorded, highlighting technological advances and the expansion of residential connectivity.
Lima (2023)	Analyze security in residential IoT solutions	It was revealed that smart environments have cybersecurity vulnerabilities capable of compromising the security of devices and users' personal information.
Luna; Luna; Fettermann (2024)	Investigate benefits and barriers to the adoption of smart homes	It was highlighted that, although smart homes promote comfort and practicality, factors such as high costs and privacy concerns still limit their widespread adoption.
Maia (2022)	Compare Wi-Fi and ZigBee technologies in smart homes	It was identified that Wi-Fi and ZigBee technologies perform efficiently in communication between automated devices, highlighting differences related to

		energy consumption and connection stability.
Nascimento; Fettermann (2021)	Identify factors that interfere with the acceptance of smart homes	It became evident that factors such as high cost, difficulty of use, privacy concerns, and resistance to technological dependence directly influence the acceptance of smart homes by users.
Oliveira (2023)	Develop a monitoring system for smart environments	It was observed that IoT systems associated with databases allow for real-time monitoring, automated information storage, and greater efficiency in home management.
Rocha (2023)	Implement and analyze a home automation system	It was proven that the implementation of home automation systems promotes greater functional efficiency, automated control, and optimization of domestic activities.
Rock; Tajudeen; Chung (2024)	Evaluate the impacts of smart homes on quality of life	It was found that smart technologies positively impact quality of life, providing greater comfort, convenience, and efficiency in domestic activities.
Rodrigues (2024)	Analyze the future of smart homes until 2035	It was projected that advances in artificial intelligence and connected technologies will make homes more autonomous, sustainable, and adaptable to human needs.
Rossi; Sirqueira (2025)	Investigate the use of Home Assistant in home automation	It was emphasized that integrating platforms such as Home Assistant expand interoperability between devices and promote centralized management of smart homes.
Souza; Marques	Present the fundamentals of	It was highlighted that automated systems contribute to optimizing

(2024)	home automation	energy consumption, everyday practicality, and greater control over residential environments.
Venceslau (2021)	Develop a support system based on IoT protocols	It was observed that IoT protocols play an essential role in the integration, communication, and efficient monitoring of devices present in smart environments.
Xavier Junior (2022)	Develop a monitoring interface for seniors in nursing homes	It was emphasized that intelligent monitoring systems promote greater security, remote monitoring, and care support for the elderly in care environments.

Source: Author's own work (2026)

The analysis of the selected studies showed that the advancement of digital technologies has promoted significant transformations in the dynamics of residential environments, expanding the integration between smart devices, automated systems, and resources based on the Internet of Things (IoT).

The authors analyzed converge in highlighting that smart homes represent an important contemporary technological trend, marked by the search for greater efficiency, security, comfort, and quality of life. In this context, the discussion of the results was organized into the following subtopics: "Technologies and applications of smart home automation" and "Benefits, challenges, and perspectives of smart homes," allowing for a more in-depth understanding of the main advances, limitations, and impacts associated with the expansion of smart homes in the current scenario.

4.1. Technologies And Applications Of Smart Home Automation

The studies analyzed demonstrated consensus regarding the central role of the Internet of Things (IoT) in the development of smart homes, being considered the main technological basis responsible for the integration between devices, sensors, and automated systems. Costa (2022) highlights that the use of IoT-based architectures favors continuous communication between connected equipment, allowing real-time monitoring and greater functional efficiency in residential environments. In agreement, Oliveira (2023) states that intelligent systems associated with databases and automated sensors expand the capacity for remote management of residences, promoting greater operational control and optimization of domestic activities.

In addition to the connectivity provided by IoT, the authors analyzed the importance of wireless communication technologies for the efficient operation of smart homes. Maia (2022) observes that protocols such as Wi-Fi and ZigBee play an essential role in the stability of communication between smart devices, favoring speed in data transmission and reduction of energy consumption. Similarly, Venceslau (2021) argues that IoT communication protocols are fundamental to ensuring functional integration and interoperability between automated systems, especially in environments with multiple devices connected simultaneously.

Another aspect widely discussed by the authors refers to the integration between digital platforms and home management systems. Branco (2022) highlights that integrating platforms enable centralized control of smart devices, favoring greater practicality and efficiency in the administration of automated environments. In agreement, Rossi and Sirqueira (2025) emphasize that tools such as Home Assistant significantly expand interoperability between

devices from different manufacturers, reducing limitations related to technological compatibility and favoring more personalized experiences for users.

Studies also converge in highlighting the growing integration of artificial intelligence in smart home automation. Carola (2024) states that intelligent systems based on predictive algorithms are able to learn users' behavioral patterns, automatically adapting functions such as lighting, climate control, and security monitoring. This perspective is reinforced by Almeida and Nascimento (2024), who point out that the integration between virtual assistants and smart devices contributes to greater accessibility and practicality in the interaction between users and automated environments. According to the authors, voice commands and the personalization of household routines represent significant advances in the experience of residents of smart homes.

The literature analyzed also demonstrates agreement regarding the relevance of intelligent technologies for expanding residential security. Alves and Costa (2022) highlight that presence sensors, smart cameras, automated alarms, and remote monitoring systems have promoted significant evolution in home protection mechanisms. In this sense, the authors emphasize that home automation reduces vulnerabilities related to property security and expands the ability to supervise domestic environments in real time. Complementing this perspective, Lima (2023) argues that intelligent systems associated with IoT enable continuous monitoring of homes, favoring faster responses to risky situations or intrusions.

Another recurring point in the studies refers to the applications of home automation in supporting the care and well-being of the

elderly. Alves (2025) highlights that smart devices promote greater autonomy and safety for elderly people, especially through continuous monitoring, automated control of domestic functions, and accident prevention. In agreement, Xavier Junior (2022) states that intelligent systems applied to care environments allow remote monitoring of users' conditions, expanding assistance and reducing risks related to falls and domestic emergencies. Similarly, Chagas and Dos Santos Rabello (2024) emphasize that the integration between artificial intelligence and assistive robotics presents significant potential for health supervision and assistance in daily activities of vulnerable groups.

The authors also agree when addressing the technological challenges related to the interoperability of smart systems. Caldas (2023) highlights that the lack of standardization among manufacturers still represents a significant limitation for the development of smart homes, hindering the integration between different devices. This perspective is reinforced by Gonçalves (2025), who points to the need for advances in technological compatibility and digital infrastructure to ensure greater operational efficiency of automated systems.

In addition, Bordignon (2024) emphasizes that smart homes represent a transformation not only technological, but also architectural and social, promoting new forms of interaction between individuals and domestic environments. According to the author, digital domesticity redefines the relationship between living space and technology, making environments more dynamic, connected, and adaptable to human needs. In agreement, Souza and Marques (2024) state that home automation has contributed to

the modernization of contemporary residences, favoring greater comfort, practicality, and energy efficiency.

Thus, there is a consensus among authors regarding the impact of smart technologies on the transformation of residential environments. The integration between IoT, artificial intelligence, digital platforms, and automated devices highlights the potential of smart homes to promote innovation, connectivity, and functional improvement of residences, consolidating home automation as one of the main technological trends of our time.

4.2. Benefits, Challenges, And Future Prospects Of Smart Homes

The studies analyzed demonstrated broad agreement regarding the positive impacts of smart homes on the quality of life, security, and functionality of domestic environments. Rock, Tajudeen, and Chung (2024) state that Internet of Things-based technologies provide greater comfort, convenience, and efficiency in daily activities, favoring more personalized residential experiences.

In line with this, Gonçalves (2025) highlights that the growth of home automation is directly related to the search for practicality, time optimization, and technological integration in contemporary living spaces. Similarly, Souza and Marques (2024) emphasize that automated systems contribute to greater control of domestic functions, promoting operational efficiency and improving the user experience.

Home security appears as one of the most recurring benefits in the selected studies. Alves and Costa (2022) highlight that home automation has significantly expanded home protection mechanisms through the use of smart sensors, integrated alarms,

digital locks, and remote monitoring systems. In agreement, Oliveira (2023) states that intelligent systems associated with IoT favor continuous supervision of home environments and rapid identification of risk situations. Complementing this discussion, Rocha (2023) emphasizes that home automation systems provide greater remote control of residences, allowing for more efficient management of security functions and real-time monitoring.

The relevance of smart homes in promoting well-being and accessibility for the elderly, people with functional limitations, and individuals affected by ALS is also highlighted. Alves (2025) points out that home automation promotes greater autonomy and safety for elderly people through automated devices capable of assisting in the control of lighting, air conditioning, and monitoring of domestic emergencies. In agreement, Xavier Junior (2022) states that intelligent systems applied to the care of the elderly enable continuous remote monitoring, reducing risks related to falls and domestic accidents. Similarly, Chagas and Dos Santos Rabello (2024) observe that the integration between artificial intelligence and assistive robotics presents significant potential for supporting daily activities and monitoring health in smart environments.

Energy efficiency has also been identified as an important benefit associated with smart homes. Costa (2022) emphasizes that automated systems allow intelligent control of energy consumption through the automation of devices and monitoring of energy use in real time. In line with this, Maia (2022) states that technologies such as Wi-Fi and ZigBee contribute to optimizing the performance of smart systems, reducing energy consumption and promoting greater stability in communication between devices. In addition, Branco (2022) highlights that integrating platforms enable more

efficient management of residential resources, contributing to the rationalization of energy consumption and greater environmental sustainability.

Despite the benefits evidenced, studies also point to important challenges related to the implementation and expansion of smart homes. Luna, Luna and Fettermann (2024) highlight that economic factors still represent significant barriers to the widespread adoption of smart technologies, especially due to the high costs of acquisition, installation and maintenance of automated systems. In agreement, Nascimento and Fettermann (2021) state that the difficulty of use, resistance to technological dependence, and limitations in digital knowledge also directly interfere with the acceptance of smart homes by users.

Issues related to digital security and privacy appear among the main concerns discussed by the authors. Cogliatti (2023) emphasizes that the continuous data collection carried out by connected devices increases the risks related to the protection of users' personal information. In line with this, Lima (2023) states that IoT-based smart environments present cyber vulnerabilities capable of compromising both devices and residential privacy. According to the authors, the absence of more stringent regulations and advanced digital security mechanisms represents a significant challenge for the consolidation of smart homes on a large scale.

Another point of agreement among the studies refers to the difficulties related to interoperability between devices and digital platforms. Caldas (2023) highlights that the lack of technological standardization among manufacturers limits the full integration of intelligent systems, hindering efficient communication between

different devices. In agreement, Rossi and Sirqueira (2025) observe that integrating platforms, such as Home Assistant, have sought to minimize these limitations by centralizing the management of connected devices. However, the authors emphasize that compatibility between different protocols still represents a significant obstacle to the expansion of home automation.

Regarding future prospects, the authors demonstrate consensus regarding the growth potential of smart homes in the coming years. Rodrigues (2024) highlights that advances in artificial intelligence, cloud computing, and predictive technologies should make homes increasingly autonomous, intelligent, and sustainable. In agreement, Carola (2024) states that intelligent systems tend to have a greater capacity to adapt to users' habits and preferences, favoring more intuitive and personalized residential experiences. Furthermore, Almeida and Nascimento (2024) emphasize that the integration between virtual assistants and automated devices should significantly expand accessibility and practicality in home environments.

Finally, Bordignon (2024) highlights that smart homes represent a structural transformation in the relationship between technology, architecture, and contemporary domesticity. According to the author, the trend is for residential environments to become progressively more connected, interactive, and adaptable to human needs. Thus, it is observed that the authors converge in recognizing that, although there are challenges related to digital security, costs, and interoperability, smart homes have high potential to promote innovation, sustainability, and improved quality of life in the context of the digital transformation of contemporary society.

5. CONCLUSION AND FINAL CONSIDERATIONS

This study made it possible to understand that smart homes represent an important technological evolution in the context of home automation, integrating resources such as the Internet of Things, artificial intelligence, smart sensors, and automated systems capable of expanding the functionality of domestic environments. From the analysis of the literature, it was found that smart homes have promoted significant transformations in the way individuals interact with residential spaces, favoring greater connectivity, practicality, and operational efficiency.

In response to the guiding question of the research, it was found that the main technologies used in smart homes involve IoT-based systems, integrating platforms, virtual assistants, automated sensors, and artificial intelligence tools. In addition, it was observed that these technologies contribute directly to increased home security, optimization of energy consumption, automation of tasks, and improvement in the quality of life of users, consolidating smart homes as a contemporary technological trend.

The results analyzed also demonstrated that home automation has important applicability in supporting the well-being of the elderly and people with functional limitations and individuals affected by ALS. Studies have shown that intelligent systems promote greater autonomy, continuous monitoring, and prevention of domestic accidents, increasing safety and accessibility in residential environments.

Despite the identified benefits, the research highlighted significant challenges related to the expansion of smart homes. Among the

main obstacles were the high implementation costs, difficulties in interoperability between devices, vulnerabilities related to digital security, and concerns about user privacy.

The perspectives presented by the analyzed studies indicate that smart homes tend to become progressively more autonomous, sustainable, and adaptable to human needs. Advances in artificial intelligence, cloud computing, and predictive technologies should expand the capacity for personalization and automation of home environments, strengthening the integration between users and connected devices.

Finally, it is suggested that future research investigate the social, ethical, and economic impacts related to the use of smart homes, especially regarding digital privacy, technological inclusion, and accessibility of automated technologies for different population groups. In addition, it is recommended that studies focused on creating safer, more interoperable, and sustainable systems be developed, contributing to the responsible and efficient expansion of smart home automation.

REFERENCES

ALMEIDA, E. C.; NASCIMENTO, R. S. 2024. 90p. **Estudo técnico teórico e prático da viabilidade de integração de assistentes virtuais com diversos tipos de tecnologias na automação residencial.** Trabalho de conclusão de curso (Técnico em Eletrotécnica) - Instituto Federal da Bahia, Salvador, 2024. Available at: <https://repositorio.ifba.edu.br/jspui/handle/123456789/812>.

Accessed on: May 12, 2026.

ALVES, A. F.; COSTA, A. H. M. Automação residencial: evolução da segurança e conforto na sua moradia. **RCMOS**, 2022. DOI: [10.51473/rcmos.v2i2.344](https://doi.org/10.51473/rcmos.v2i2.344). Available at: <https://submissoesrevistarcmos.com.br/rcmos/article/view/310>.

Accessed on: May 13, 2026.

ALVES, G. S. **Integração de tecnologias de automação em residências para suporte ao bem-estar do idoso**. 2025. Available at: <https://repositorio.ifpb.edu.br/handle/177683/4510>. Accessed on: May 12, 2026.

BORDIGNON, G. B. Casas inteligentes, domesticidade digital e arquitetura contemporânea. **Aurora: Revista de Arte**, 2024. DOI: [10.23925/1982-6672.2023v16i47p54-75](https://doi.org/10.23925/1982-6672.2023v16i47p54-75). Available at: <https://revistas.pucsp.br/index.php/aurora/article/view/62496>.

Accessed on: May 12, 2026.

BRANCO, Gabriela. **Domo: plataforma digital para gestão de casas inteligentes**. 2022. 111 f. Trabalho de Conclusão de Curso (Graduação em Comunicação Visual - Design) - Escola de Belas Artes, Universidade Federal do Rio de Janeiro, Rio de Janeiro, 2022. Available at: <https://pantheon.ufrj.br/handle/11422/19436>. Accessed on: May 13, 2026.

CALDAS, Eduardo Alves Lima. **Checklist para avaliação da interoperabilidade em dispositivos iot com foco em casas inteligentes**. 2023. 82 f. Trabalho de Conclusão de Curso (Graduação em Engenharia de Software) - Universidade Federal do Ceará, Campus de Quixadá, Quixadá, 2023. Available at: <https://repositorio.ufc.br/handle/riufc/73943>. Accessed on: May 12, 2026.

CAROLA, G. A. **Aplicações de inteligência artificial em sistemas de controle inteligente.** 2024. Available at: <https://repositorio.pucgoias.edu.br/jspui/handle/123456789/8367>. Accessed on: May 13, 2026.

CHAGAS, A. D. A.; DOS SANTOS RABELLO, R. A aplicação de inteligência artificial e robótica assistiva no cuidado de idosos: uma revisão sistemática. **Revista Foco**, v. 17, n. 10, p. e6069, 2024. DOI: <https://doi.org/10.54751/revistafoco.v17n10-046>. Available at: <https://ojs.focopublicacoes.com.br/foco/article/view/6069>. Accessed on: May 12, 2026.

COGLIATTI, Rafaella Silva. **Internet das coisas: uma discussão sobre a aplicabilidade do consentimento no ambiente de casas inteligentes.** 2023. 84 f. Trabalho de Conclusão de Curso (Bacharelado em Direito) - Faculdade Nacional de Direito, Universidade Federal do Rio de Janeiro, Rio de Janeiro, 2023. Available at: <https://pantheon.ufrj.br/handle/11422/24635>. Accessed on: May 13, 2026.

COSTA, J. S. **Arquitetura de um sistema para automação residencial baseado em IoT.** 2022. Available at: <https://repositorio.ufrn.br/server/api/core/bitstreams/630eeca6-d6e2-49f6-90fd-7ddf70317ecf/content>. Accessed on: May 12, 2026.

GONÇALVES, A. D. S. **Revisão sistemática de automação residencial inteligente.** 2025. Available at: <https://repositorio.ifpb.edu.br/handle/177683/4758>. Accessed on: May 13, 2026.

LIMA, G. V. N. **Uma visão geral sobre segurança em soluções IoT para ambientes residenciais.** 2023. Available at:

<https://repositorio.ifpb.edu.br/jspui/handle/177683/3151>. Accessed on: May 13, 2026.

LUNA, M. B.; LUNA, P. T. M.; FETTERMANN, D. Benefícios e barreiras à adoção de tecnologias da casa inteligente: uma análise da literatura. **Revista Gestão Industrial**, 2024. DOI: [10.5212/Admpg.v.01.2503.010](https://doi.org/10.5212/Admpg.v.01.2503.010). Available at: <https://revistas.uepg.br/index.php/admpg/article/view/23969>. Accessed on: May 12, 2026.

MAIA, G. F. **Análise comparativa entre a aplicação das tecnologias Wi-Fi e ZigBee em estudo de caso: casa inteligente**. 2022. Available at: https://www.oasisbr.ibict.br/vufind/Record/UFRN_0522e7788e127f8115df413e935b161a?print=1&lng=en. Accessed on: May 13, 2026.

NASCIMENTO, D. R.; FETTERMANN, D. Quais os fatores que interferem na aceitação das tecnologias da casa inteligente pelo usuário: uma revisão. **Produto & Produção**, 2021. DOI: <https://doi.org/10.22456/1983-8026.119183>. Available at: <https://seer.ufrgs.br/ProdutoProducao/article/view/119183>. Accessed on: May 12, 2026.

DE OLIVEIRA, P. S. F., and JAD AMADO. **Sistema de monitoramento para ambientes inteligentes com IOT e banco de dados**. *DE CIÊNCIA DA COMPUTAÇÃO*. Universidade Estadual do Sudoeste da Bahia/Edições UESB eISSN: 2596-2701, 2023. Available at: https://www.researchgate.net/publication/387530919_Sistema_de_monitoramento_para_ambientes_inteligentes_com_IOT_e_banco_de_dados. Accessed on: May 13, 2026.

RABELO, H. et al. Casas inteligentes para pessoas com esclerose lateral amiotrófica (ELA): uma revisão sistemática da literatura. **INTERFERENCE: A JOURNAL OF AUDIO CULTURE**, v. 11, n. 2, p. 47-64, 2025. Available at: <https://doi.org/10.36557/2009-3578.2022v11n2p47-64>. Accessed on: April 13, 2026.

ROCHA, J. F. S. **Implementação de um sistema de domótica: análise exploratória dos dados recolhidos**. 2023. Tese de Doutorado. Available at: <http://hdl.handle.net/10400.19/8154>. Accessed on: May 12, 2026.

ROCK, L. Y.; TAJUDEEN, F. P.; CHUNG, Y. W. Usage and impact of the internet-of-things-based smart home technology: a quality-of-life perspective. **Universal access in the information society**, v. 23, n. 1, p. 345-364, 2024. Available at: <https://pmc.ncbi.nlm.nih.gov/articles/PMC9667851/>. Accessed on: May 13, 2026.

RODRIGUES, E. F. **O futuro das smart homes em Portugal no horizonte 2035**. 2024. Available at: <http://hdl.handle.net/10400.5/98927>. Accessed on: May 12, 2026.

ROSSI, A. C. R.; SIRQUEIRA, T. F. M. Home Assistant: Uma ferramenta para integrar IOT com Automação Residencial. **Caderno de Estudos em Engenharia de Software**, v. 6, n. 2, 2025.

SOUZA, V.; MARQUES, L. **Automação residencial**. 2024. Available at: <https://repositorio.faculdefama.edu.br/xmlui/handle/123456789/277>. Accessed on: May 13, 2026.

VENCESLAU, F. A. M. **Sistema para suporte à implantação e monitoramento de aplicações de campus inteligente baseado em**

protocolos de IoT. 2021. Available at: <https://repositorio.ufpb.br/jspui/handle/123456789/22566>. Accessed on: May 12, 2026.

XAVIER JUNIOR, L. S. **Vovô Care: protótipo de interface de monitoramento com aplicação do conceito da internet das coisas e automação residencial em casas de repouso para idosos.** 2022. Available at: <https://repositorio.ufersa.edu.br/handle/prefix/8874>. Accessed on: May 13, 2026.

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