

## Modern Technologies on the Primary Housing Market in Poznan in the Opinion of Potential Flat Buyers

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### ABSTRACT

Purpose – Proptech is a new trend related to the development of innovative technological products and business models on the real estate market. The result of these changes is a digital transformation in the sector, also affecting the residential real estate market. Modern technologies used both in the construction industry and in the customer service process result both from the technological revolution, but also from changes in the needs and requirements of buyers. Developers introduce new solutions that will distinguish them from others (investments) and allow them to gain new customers. The aim of the article is to try to indicate whether customers pay attention to modern technologies used on the residential real estate market, which of the possible solutions they are most interested in, and whether they are willing to pay a higher price for them.

Design/methodology/approach – The following discussion is based on a questionnaire survey conducted among students of the last year of first and second cycle studies and young people up to 35 years of age as potential flat buyers (sample n = 220).

Findings – On the basis of the conducted research, it can be concluded that the respondents have a positive attitude to modern technologies, they are interested in an offer containing innovations and are willing to pay a higher price for them. Women are more cautious in the context of introducing modern technologies, but the declarations of both women and men are at a relatively similar level.

Research limitations - an online survey in connection with the prevailing Covid-19 pandemic and related restrictions.

Research implications - research of interest to developers interested in introducing modern technologies to the residential real estate market.

**Keywords:** residential real estate market, developer, PropTech

**JEL codes:** O14, O18, O33, R31

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## INTRODUCTION

The issue of digital transformation in the real estate market, especially in the context of the residential real estate market, has so far been dealt with to a limited extent in Polish literature. However, economic changes, the development of IT systems and changes in the functioning business models that have taken place in recent years have had an impact on the real estate market. It seems that the digital transformation in the real estate sector is inevitable because the real estate market benefits from technological progress (e.g. thanks to data collection and analysis), and the globalisation process and the emerging Industry 4.0 make the development of innovative technologies intensify. The changes, particularly visible on the commercial real estate market, also include the residential real estate market and result primarily from the development of modern technologies that can be used by developers in many areas of activity - both in the initial stages of the project, during investment implementation, but also in terms of sales and customer service. The use of innovative solutions is related not only to the technological revolution, but also to the attempt to distinguish one's offer from the competition and the need to adapt to the requirements of buyers.

Taking into account the above arguments, the process of technological changes in the real estate market requires comprehensive and reliable research in the field of the residential real estate market - especially in the field of the primary market (taking into account the multi-stage investment process). Conducting research works, involving potential clients on the primary residential real estate market, is necessary to indicate which activities as part of introducing innovative solutions at the investment design stage should be paid attention to by developers, so that the investment is interesting and meets the buyers' requirements. The aim of the article is to try to indicate whether customers pay attention to modern technologies used on the residential real estate market, which of the possible solutions they are most interested in, and whether they are willing to pay a higher price for them. The following research hypothesis was established: customers want to know about innovative solutions in the real estate market and the possibilities of their application in the housing market.

The subject of the study was the perceptions of the technologies that can be used in housing construction and which of them would be the most important in the choice of housing by students in the last years of their first and second degree and people under 35 years of age as those who may become potential buyers of housing in the future (non-random sample selection, sample size n=220).

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The study seems to be a good starting point for a discussion on the use of modern technologies by developers in the residential real estate market.

### **LITERATURE REVIEW**

The digital transformation that is currently taking place on the real estate market is part of the so-called Fourth Industrial Revolution. So far, the literature has indicated three industrial revolutions:

- a) The First Industrial Revolution, which took place in 1784, and the breakthrough technology was the use of steam propulsion.
- b) The Second Industrial Revolution which took place in 1870 and the innovation was mass production through the use of a fixed assembly line.
- c) The Third Industrial Revolution, which took place in 1969, and the most important innovation was the computer.

The Fourth Industrial Revolution, the date of which has not been determined yet, is mainly related to cyber-physical systems, i.e. the digital revolution. It assumes widespread digitisation, the implementation of the so-called subversive innovations and such a development of machines that thanks to the use of artificial intelligence will allow them to obtain the ability to behave autonomously (Paprocki, 2016, pp. 20-21). In the presented vision of the world, the so-called Industry 4.0 concept, which is based on a combination of ICT, industry and the Internet of Things. The Industry 4.0 concept assumes increasing efficiency, reducing costs and improving products, achieved through production automation using artificial intelligence to exchange data in real time (Pieriegud, 2016). Transformation includes both technological changes as well as changes in business models and cultural changes. Starr, Saginor and Warzola (2021) say "Industry 4.0 recognizes a new set of emerging, disruptive and maturing digital technologies positioned to reshape and, in some cases, redefine business." It is a different view of running a business, as well as a change in the approach to the customer, taking into account their behaviour and preferences.

The ongoing changes in customer service and the proposed facilities in the field of modern technologies in various sectors of the economy mean that the real estate market will also have to adapt to the new reality, which Shawn (2020) emphasized by saying "Recent years have witnessed a surge in the development of digital real estate technologies". Also Starr, Saginor and Worzala (2021) emphasize that the real estate market is usually slow to

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change and late to implement technological innovations, but the COVID-19 situation somehow forces the need for faster changes. On the other hand, as emphasised by Cajias (2020), each cycle in the real estate market has a certain theme. After the financial crisis, the real estate market focused on sustainable development, green buildings and green certificates. Cajias points out that this was mainly due to the great interest from academia, which provided scientific evidence of the profitability of investing in green solutions. In Poland, this topic is still of great interest to investors, buyers and academia, but on a global scale we are entering a period of digitisation and artificial intelligence on the real estate market. This time, the interest in modern technologies is not only on the side of science, but mainly on the institutional side, which sees them increasing the effectiveness of their activities and increasing value thanks to the obtained data.

In the broadly understood digital transformation of the real estate market, the term Proptech can be encountered more and more often. Proptech is a combination of the English words Property and Technologies, which literally translate to real estate technologies, which means that Proptech is a combination of the real estate industry and modern technologies. The world literature indicates that the United States is the main leader of PropTech investments. (Singh, 2018) The next countries are Great Britain and China, while European countries that can play a significant role include Spain, France, Finland, the Netherlands, Germany and Poland. (Tagliaro, Bellintiani & Ciaramella, 2021).

The Polish real estate industry, which is usually criticised for a late reaction to events that occurred in the economy, as well as a certain shift in the implementation of innovations in this case reacts faster than usual, but nevertheless still much more conservative and preventive than others.

The development of Proptech in Poland is complicated due to the fact that there are companies on two different poles - on the one hand, there are large companies that operate on the real estate market and are willing to implement modern technologies, on the other hand, there are many small companies which both do not have sufficient resources to implement innovations and are not mentally prepared to introduce them. As a result, the former stand out from the competition, while the small ones lag behind and "lose" in the race to attract customers.

However, the fact that a new name for the industry in the field of modern technologies (Proptech) has been created, means that this trend is clearly defined and considered by many to be valuable, and thus even those "small" who want to stay on the market will have to adjust to these changes. In connection with the development of Proptech, in 2020

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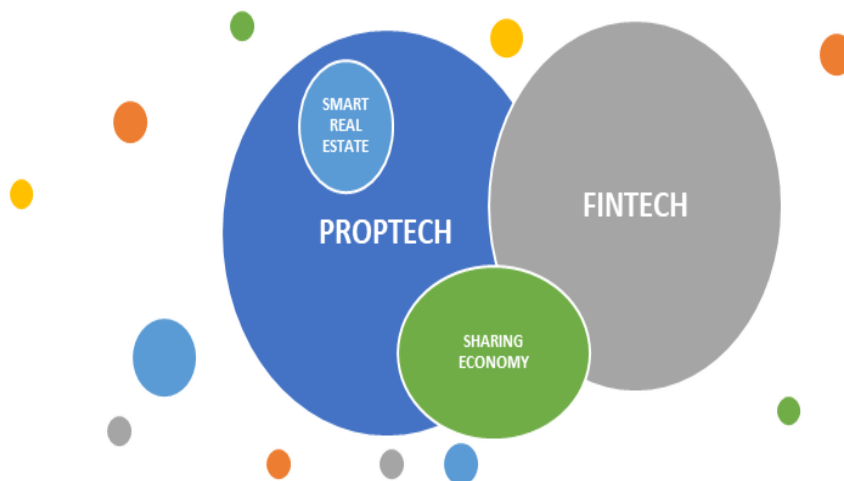
a foundation was established in Poland - the Proptech Foundation, whose aim is to bring together the greatest leaders in the real estate industry in order to analyse digital trends and effectively implement the most valuable products and services on the real estate market. The created platform is to be a place for the exchange of knowledge, skills and inspiration for all participants of the real estate market - both developers, technology suppliers, construction companies, management and operational staff in order to accelerate the implementation of digital innovations. ([www.proptechfoundation.pl](http://www.proptechfoundation.pl))

It should be emphasised that innovative technologies increasingly affect the development industry in Poland and around the world, both on the commercial and residential market. A special role in introducing technological innovations is played by start-ups that create innovative solutions, as well as people/companies creating new trends in the real estate market (e.g. coworking offices that did not function on the Polish real estate market a few years ago).

Proptech means the real estate industry supported by digital technologies, which includes FinTech, i.e. the financial industry supported by technologies; smart cities and buildings, where technologies related to information and communication systems are aimed at increasing efficiency and facilitating and improving the lives of their inhabitants; sharing economy as an economic model of sharing unused or not fully used resources. In the case of real estate, these are coworking or coliving solutions.

On this basis, proptech distinguishes the following industries, the relationships of which are illustrated in Figure 1:

- real estate market (property),
  - real estate financing (FinTech),
  - smart cities and buildings
  - sharing economy,
  - housing industry (ConTech).
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**Figure 1. PropTech Sector**

Source: (Baum, 2017).

Due to the wide scope of PropTech's impact on the real estate market, certain areas are indicated that may be the subject of scientific research:

- real estate construction technology (Baum, 2017; JLL, 2017),
- implementation of the investment and exploitation process and development activities (Maududy & Gamal, 2019).
- real estate trade and management (management, sales and real estate marketing process) (Baum, 2017; Maududy & Gamal, 2019),
- indirect/financial real estate investing (Shaw, 2018).

In the article, the author focuses primarily on modern technologies introduced at the design and implementation stage of a construction project, which could be of interest to potential buyers.

Bac (2014) emphasises that "meeting customer requirements by creating new solutions that bring benefits should be the basic determinant of the developing modern real estate market". Therefore, it is necessary that developers in their projects take into account the needs of customers also in the field of modern technologies. The research conducted by Ullah, Sepasgozar and Wang (2018) also shows that consumers, however, often regret their buying/renting decisions, and most of them are related to the lack of information provided by online channels, so this is another area where the use of modern technology is important.

Customers can report the demand for innovations on the residential real estate market in many areas, but most often they relate to modern technologies used in buildings, i.e. innovations that affect the use and maintenance costs of real estate. Technical and technological innovations

include solutions used in the construction sector. Both at the design stage, project implementation, final metering of the building and its operation. These innovations are related both to the construction materials used, the construction and finishing services provided, as well as solutions in the field of passivity and energy efficiency of the facility (Sitek, 2017). The young generation of customers, operating in a completely different reality, where the telephone is an integral part of their lives, expects that the technological solutions they have dealt with so far will also be introduced into their private space, and that modern technologies in the use of the building and flat will facilitate their daily duties and functioning in the living space. It can also be expected that, within a few years, developers will be forced to accept the fact that the technologies used are decisive when buying a flat.

### **RESEARCH METHODOLOGY**

At the Department of Investments and Real Estate at the University of Economics and Business in Poznań, as part of the project on the use of modern technologies on the residential real estate market, research was undertaken to evaluate the information contained on the developers' website and to determine the need to use selected modern technologies related to housing construction. For this purpose, a survey was conducted in 4 months - from May to August 2021. The subjects of the study were mainly students of the last years of first and second cycle university studies and people up to 35 years of age, as those who may become potential buyers of flats in the future. The subject of the study was their perception of technologies that can be used in housing construction and which of them would be the most important when choosing a flat. Due to the prevailing Covid-19 pandemic<sup>1</sup> a research tool in the form of an Internet questionnaire was chosen. The selection of the sample was non-random, but bearing the features of deliberate selection (because the respondents were people from the last year of university studies), with elements of non-purposeful selection (research conducted via the Internet is associated with the lack of full control over who the respondent is and therefore it is a random element). The methodological assumptions related to the study are presented in Table 1.

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<sup>1</sup> According to WHO COVID-19 (coronavirus disease 2019) - acute infectious disease of the respiratory system caused by infection with the SARS-CoV-2 virus. It was first recognised and described in November 2019, in central China (Wuhan city, Hubei province), during a series of cases that started the pandemic of this disease.

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**Table 1. Basic information on modern technologies on the residential real estate market in Poznań**

Research subject	Mainly students of the last years of first and second cycle university studies, who may become potential buyers of flats in the future, and people up to 35 years of age. Such a research entity was adopted due to greater openness to modern technologies
Subject of the study	Buyers' attitude towards modern technologies in residential real estate
Selection and size of the sample	Non-random, has the features of purposeful selection, with elements of non-random selection, n = 220
The spatial scope of the study	The local residential real estate market in Poznań
Time range	From May to August - 4 months of 2021
Research tool	Internet survey questionnaire

Source: own study.

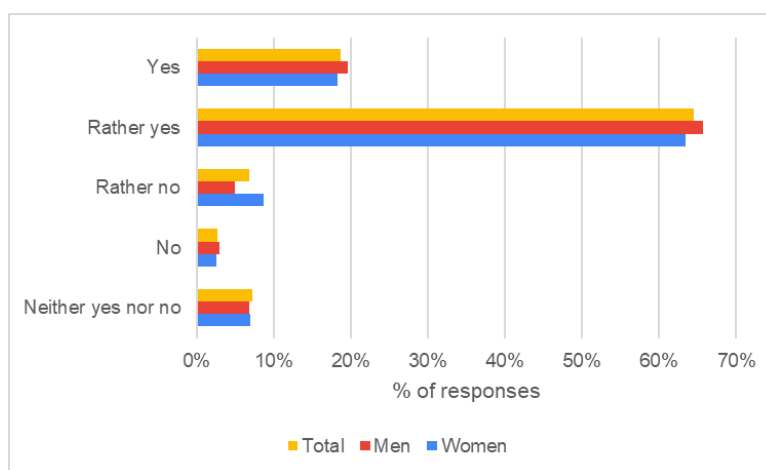
The research was conducted on the local residential real estate market in Poznań. The number of respondents was 220 people and is a contribution to conducting further research. The surveys were entered into an excel spreadsheet, where data summaries were then created according to the adopted criteria. Most of the respondents were women (53%), and the largest age group were people under 25 (64%). The remaining respondents were between 26-35 years old (24%), and the oldest respondent was 58 years old. The average age was 27. When it comes to plans for offspring, the largest group of respondents wants to have two children in the future - 47%, one child is planned by 17%, and three or more children - 15%. Every fifth respondent does not want to have children in the future. Almost half of the respondents (49%) think about buying a flat, and 42% plan to buy a detached house. Only every 9th respondent would choose a terraced or semi-detached house.

## **RESULTS & DISCUSSION**

Nowadays, the possibilities of using modern technologies in residential real estate are increasing. However, it involves additional costs both at the design and implementation stage. So, the question arises whether potential buyers are actually interested in using them and what are the feelings about their application.



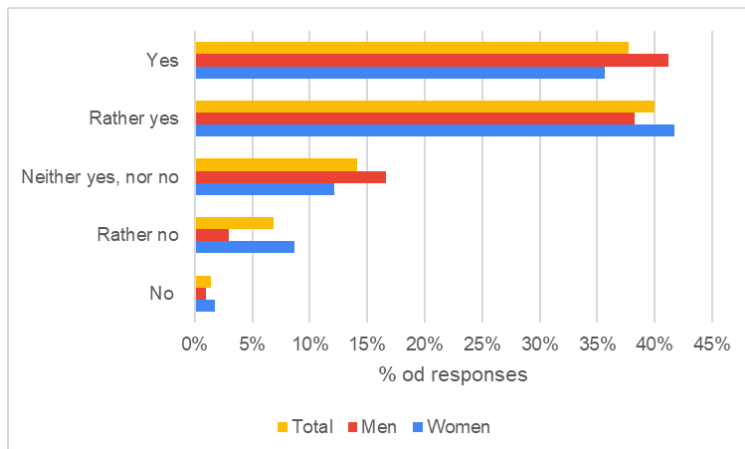
The respondents were presented with technologies that can be used in residential real estate, which include: technologies related to high thermal insulation of the building, alarm and monitoring systems, flat access control, air conditioning, heating, lighting and electronic equipment control, photovoltaic panels, the possibility of charging electric vehicles, underfloor heating, collecting rainwater for watering green areas, using solar energy for heating, a weather system or own sewage treatment plant. The author decided to analyse the division into women and men in order to find out whether there is a gender difference in terms of attitudes towards modern technologies.



**Figure 2. When buying a flat, would you be willing to pay more for the technologies you choose?**

Source: own study.

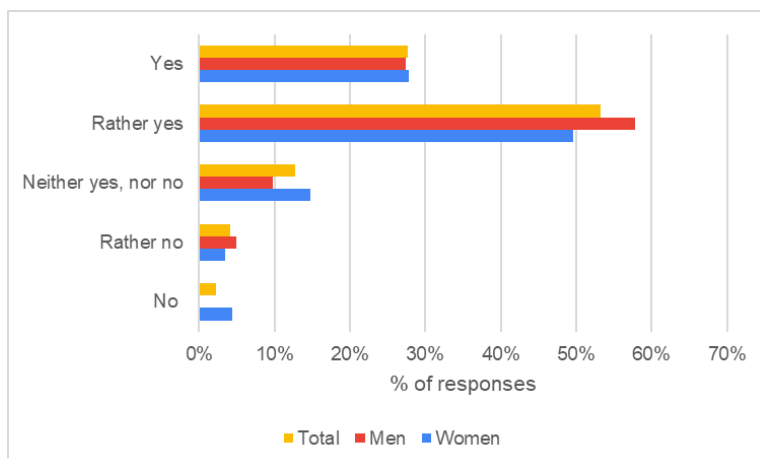
The first question concerned the willingness to pay a higher price depending on the technologies used, what is shown in the Figure 2. According to the survey, both women and men in over 80% (about 65% of the answers - rather yes, and almost 20% of the answers - yes) are willing to pay a higher fee for the technologies they choose. This may be an incentive for developers to invest in such solutions.



**Figure 3. Do you think that the indicated technologies reduce the cost of maintaining a flat?**

Source: own study.

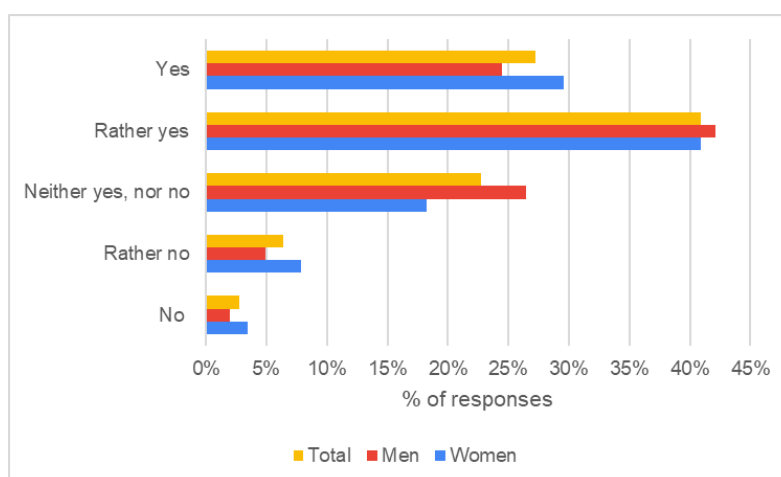
Another question, presented at Figure 3, concerned views related to modern technologies as a way to reduce the cost of housing. In the opinion of the majority of respondents, the use of the indicated technologies reduces costs, which men were more often convinced than women. At the same time, 17% of men and 12% of women were not able to determine whether the reduction in costs would actually occur or not, and almost 10% of women believed that modern technologies do not reduce the cost of living. Perhaps it would be worthwhile for developers using selected solutions to take steps to make potential customers aware of the benefits of their use.



**Figure 4. Does the presence of modern technologies in the investment make you more interested in a given housing offer?**

Source: own study.

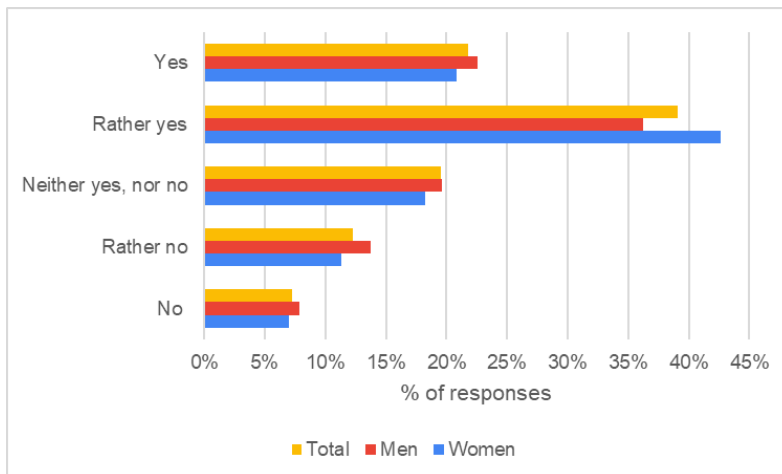
In response to the question regarding the interest in the offer, depending on the modern technologies used, both the majority of men and women declared a greater willingness to see the offer in which they were used (about 80% of respondents), with men being more inclined. The women were a bit more cautious in their declarations, what is shown in the Figure 4. Due to the great interest in real estate with innovation, it is an opportunity for developers to use them in their investments to be more competitive on the market and to stand out from other offers. A similar result of their study was obtained by Ullah, Sepasgozar and Wang, where the respondents mainly regretted that they did not have access to information regarding properties to buy or rent.



**Figure 5. Does the use of modern technologies make you feel safer in your flat?**

Source: own study.

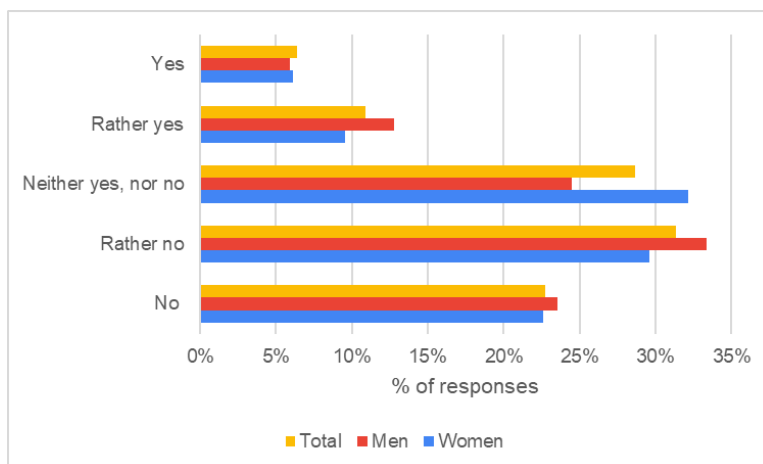
Next, the respondents were asked to determine whether the modern technologies used increase their sense of security in their home. According to the survey and results shown in the Figure 5, both the majority of women (70%) and men (67%) believe that it is a factor increasing safety, and women are more determined in this respect. At the same time, a large proportion of the respondents, because every 4th man and every 5th woman have no opinion in this area.



**Figure 6. Does the use of modern technologies in a flat create a sense of prestige and recognition from the environment?**

Source: own study.

Interestingly, in the question about the sense of prestige and recognition resulting from the use of modern technologies in the flat, such feelings more or less more often applied to women (63%) than to men (59%). At the same time, almost every fifth person believed that this was not a reason to feel superior to people living in "normal" flats what is shown in the Figure 6.



**Figure 7. Does the use of modern technologies make you feel controlled?**

Source: own study.

The last question concerned the feeling of being in control resulting from the modern technologies used. Opinions were slightly more divided in this respect as shown in the Figure 7. Although a large proportion of

women and men believe that they are not checked, they account for only about half of the respondents. Almost every third woman and every fourth man have no opinion on this topic, and about 20% of respondents believe that the use of innovative solutions may entail the risk of being monitored by outsiders.

### **CONCLUSION**

The results of the research indicate a positive attitude to modern technologies on the part of both women and men. The respondents are eager to learn about innovations on the market, the possibilities of their application in residential real estate and the resulting savings related to their use. The survey shows that despite similar answers on the part of women and men, ladies are more cautious in presenting their declarations. Developers' progressive actions help to increase the sense of security among buyers and the recognition from the environment. Modern technologies, which have just been introduced to the market, build a sense of prestige and satisfaction in them.

In the context of developers, it seems reasonable for them to apply new solutions in planned projects, and to present the benefits of their implementation after the start of the investment. Despite the fact that the respondents are largely aware and positive about the initiated projects, they may not always be aware of all their advantages. The application of modern technologies in the residential real estate market may contribute not only to the improvement of the residents' living comfort and safety, but also the way of property management and operation. Thanks to the applied solutions it will be possible to reduce the costs of electricity, heating, environmental pollution through the use of cars powered by electricity. The conducted research seems to be a good contribution to their continuation in this area, especially that the undertaken subject Proptech is only just taking its first steps on the Polish residential real estate market, and its development seems to be inevitable in the coming years.

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