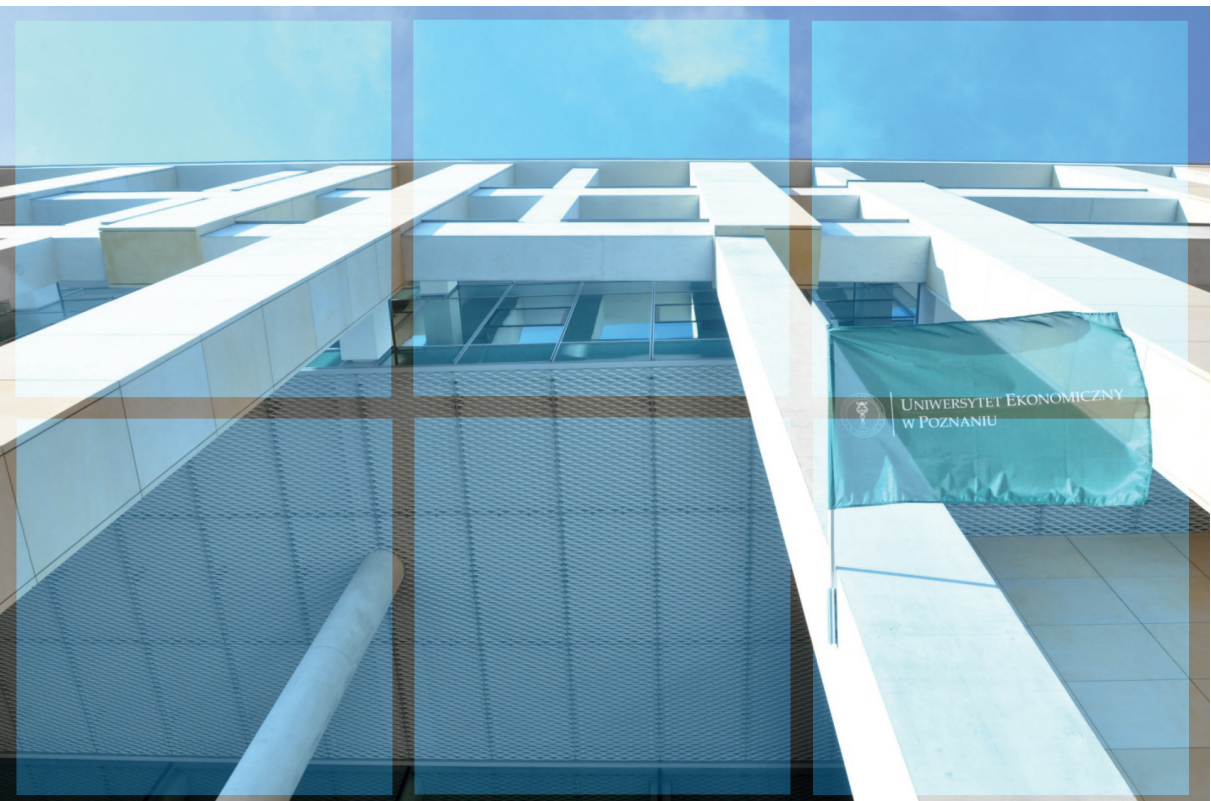


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Young customers' expectations in terms of implementing PropTech (Property Technology) on the local primary residential market in Poland¹

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Abstract: The real estate market is considered to be one of the least technologically advanced markets. Despite this, attempts are made to implement modern technologies referred to as Prop-Tech. The aim of this study is to assess customers' expectations in the use of modern technologies in the process of buying and subsequent use of flats on the local primary residential real estate market.

The study has been conducted in order to achieve the above-mentioned goal. A survey questionnaire was used as a research tool. The subjects were young people (up to 35 years of age) from the area of Poznań (non-random sample selection, sample size n=220). Based on the research, it can be concluded that there is a large group of customers that are aware of modern technologies and claim that they would be willing to pay more for the technologies they choose. Probably this number could be increased if the buyers were pointed to specific savings from investing in modern solutions.

The adopted spatial scope (city of Poznań) results from the specificity of this research area. And although there are no substantive grounds for major generalisations, taking into account the size of the market in Poznań, it can be assumed that in other large Polish cities customer preferences are similar.

Keywords: residential real estate market, PropTech, preferences of customers.

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Introduction

The real estate industry is currently undergoing a digital transformation that is not only changing its nature, but also contributing to its growth. This transformation is the result of a phenomenon known as PropTech, which is characterised by the massive implementation of emerging technologies such as drones, virtual reality, building information modelling (BIM), data analysis tools, artificial intelligence (AI), Internet of Things (IoT) and blockchain, smart contracts, crowdfunding in real estate, smart city, smart home or the sharing economy (Siniak, Kauko, Shavrov, Marina, 2020). Unfortunately, digital and information technologies on the real estate market are introduced late, but they still constitute an important element of innovation of entities in the field of online brokerage and sales, space commercialisation, handling the development process and the use of FinTech in mortgage and equity financing.

Research within PropTech is becoming an increasing challenge and a necessity for the Polish real estate market. This is due to the fact that not only investors, but also developers, tenants, managers and real estate brokers are involved in the PropTech revolution (Cushman&Weakefield, 2021). The leaders in this regard are the United States and China. It is admitted, however, that countries such as Spain, Finland and Poland may be important players in this sector (Tagliaro, Bellintani, Ciaramella, 2021).

However, it is a common view that there is still no systematic PropTech analysis on a global scale, but also at the level of local real estate markets, including Poland. Moreover, the experiences of various countries in this field remain insufficiently researched, since the scientific debate on PropTech has taken place only recently. Taking up the topic of PropTech on the local real estate market is aimed at joining the discussion in this area and determining the possibilities of absorption of new technologies in Polish conditions. The areas of primary residential market and preferences of customers were selected for the analysis. The importance of knowledge about modern technologies in the development industry is of interest on many local markets. Maududy and Gamal (2019) emphasise that failure to use the available PropTech technologies can lead to lower sales, a decline in competitive position, and eventually exit from the market. For this reason, identifying the needs of potential customers seems crucial for developers as providers of new housing.

1. Literature review

According to the CBRE report (2021), AI, Big Data and IoT are the main technologies used by PropTech that are changing the real estate sector, which is in the phase of advanced technological transformation. Innovation and digitisation serve to search for solutions that will increase efficiency and create new

business models. Sensory and IoT offer a wide range of possibilities by generating millions of data on any resource that can be used with technologies such as artificial intelligence or machine learning, which was much more complicated just a few years ago. In addition, the COVID-19 pandemic has accelerated other trends such as virtual and augmented reality that became very important during lockdowns, allowing remote resource insight, and Blockchain or BIM, more advanced and cutting edge technologies.

Technology is at the heart of major business and real estate trends. This includes hybrid work, health and safety, and sustainability initiatives, all of which are in high demand (JLL, 2021). Nearly 8,000 JLL-identified companies that deliver technology solutions in the construction environment have raised over \$ 97 billion in total equity financing over the past decade. Embedded environment technology start-ups can now be found in most countries around the world.

There are various definitions of the term PropTech. Generally, this concept is a combination of two words “property” and “technology”. Shaw (2018) views PropTech as the sum of digital platforms that connect different real estate stakeholders. Rather than classifying digital real estate platforms, Shaw (2018) categorised stakeholders into four clusters and presented their interrelationships to facilitate different PropTech applications. “FinTech” and “ConTech” refer to technological applications in the financial and construction sectors, but are often difficult to distinguish from PropTech (Mauddy, Gamal, 2019). PropTech has also been defined by the Royal Institution of Chartered Surveyors (2018) and addresses all aspects of technology and its impact on built-up properties, including software, hardware, materials or the development process itself. Furthermore, according to RICS (2018), the term PropTech is often overused and should refer to small start-ups that use technology to solve market problems. The companies that make this move are also called PropTech and are mostly start-ups (Hasenmaile, Rieder, 2017; Mauddy, Gamal, 2019) even though many small and medium-sized enterprises (SMEs) and corporations also play a significant role in introducing technology in the real estate sector (Baum, 2017). The social engineering aspect is also emphasised in PropTech terminology. The concept of Shaw's (2018) platforms is largely based on the essence of network infrastructure as an opportunity to create additional network effects and interactions.

Baum (2017) defines three PropTech sectors: smart real estate, shared economy and FinTech. Smart Real Estate includes technology-based platforms that facilitate the operation and management of real estate. Platforms can provide information on the performance of buildings or urban centres, or they can directly facilitate or control construction services. This sector supports real estate management (Baum, 2017). The shared economy describes technology-based platforms that facilitate the use of real estate assets. Assets can be land or buildings, including offices, shops, warehouses, flats and other types of real estate. Platforms can simply provide information to potential users and space sellers, or they can more directly facilitate or conduct rent or fee-based

transactions. This sector supports the real estate tenant markets. Real Estate FinTech describes technology-based platforms that facilitate real estate trading. Assets can be buildings, stocks or funds, debt or equity; property may be owned or leased. Platforms can simply provide information to prospective buyers and sellers, or they can more directly facilitate or carry out asset or lease ownership transactions with a (negative or positive) capital value. This sector supports real estate capital markets.

According to Baum (2017) three basic phases of the evolution of modern technologies in the real estate sector can be distinguished (Table 1).

Table 1. Evolution of PropTech

Phase	Sources and Features
PropTech 1.0	<ul style="list-style-type: none"> - the first wave of PropTech in 1980-2000 took place mainly in the US and UK. - the development of real estate indirect investment vehicles, debt and asset based securitisation, the development of REITs and the derivatives market - all of these changes required a much more quantified and research-driven approach to performance measurement and investment strategy; - The rapid globalisation of the real estate industry in terms of investors, capital sources and advisory services has significantly diminished the local nature of the industry and increased demand for a more research-driven product. - the increasing availability of data allowed for effective quantitative modelling, and valuation software, property and portfolio management systems became computer and technology based, - Excel has become an indispensable real estate tool.
PropTech 2.0	<ul style="list-style-type: none"> - PropTech 2.0 continues PropTech 1.0 focuses on residential real estate as a homogeneous type of real estate assets with more public information (prices and rents), - the FinTech industry - in particular online payment systems, crowdfunding, equity and debt platforms as well as online exchanges - is the basis of a large part of the PropTech 2.0 revolution, - the online housing sector (e.g. AirBnB) seems to be the bridge between PropTech 1.0 and PropTech 2.0
PropTech 3.0	<ul style="list-style-type: none"> - the most technologically advanced wave of PropTech, defined in 2017 at the Oxford University School of Business in Great Britain. - blockchain, big data, artificial intelligence (AI), internet of things (IoT), cloud computing and software as a service (SaaS), drones and 3D scanning, virtual reality (VR) and augmented reality (AR)

Source: Own study based on (Baum, 2017).

An important element of the technological revolution in the real estate sector is FinTech. In the 2015 report of the World Economic Forum, *The Future of FinTech* (developed in collaboration with Saïd Business School at the University of Oxford) FinTech was defined as the use of technology and innovative business

models in financial services. On the other hand, a report by KPMG (2018) and CB Insights The Pulse of Fintech (2016) suggests that although FinTech covers a diverse range of companies, business models and technologies, companies are generally divided into several key industries (industry sectors), including Lending tech, Payments/billing tech, Personal finance/wealth management, Money transfer/remittance, Blockchain/bitcoin, Institutional/capital markets tech, Equity crowdfunding, InsurTech.

FinTech can be seen as a very good guide to where a large proportion of PropTech activities will go. All of the above categories are for real estate and there are examples of PropTech companies operating in all of these industries. PropTech is not a subset of FinTech. For example, a technology designed to make a building intelligent by collecting and analysing data and reacting with controls is not FinTech. PropTech and FinTech are to be separate groups, sharing a single overlay, which is Real Estate FinTech. Smart buildings (or more generally smart real estate) and the shared economy are examples of non-FinTech PropTech sectors (Figure 1).

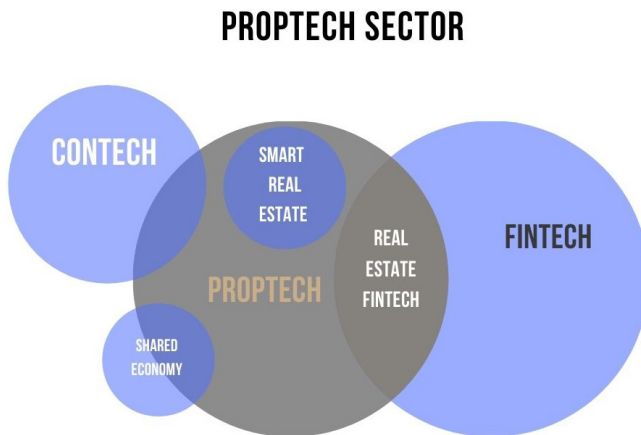


Figure 1. PropTech sector

Source: (Baum, 2017).

There are several PropTech classifications in literature and practice, which are mainly due to the following criteria (Tagliaro, Bellintani, Ciaramella, 2021):

- implemented technology that can be distinguished in evolutionary stages, such as PropTech 1.0, 2.0 and 3.0 (JLL, 2021; Baum, 2017);
- a supply/value chain or development process that is broken down into the following stages: (1) pre-construction, (2) construction and (3) as-built (Maududy, Gamal, 2019);
- factors such as information, transaction/market and management/control (Baum, 2017) or production, construction and operation, management and marketing, and transaction (Gamal, Maududy, 2019);

- the stakeholders involved, which can be divided into four main market segments, namely investment activity, commercial market, building management and residential market (Shaw, 2018).

Another classification of PropTech segments is proposed by MIPIM, divided into: smart buildings/IoT (internet of things), smart city sustainability, market place, crowdfunding, ConTech, 3D/VR (virtual reality), data and research analytics. Additionally, Venture Scanner says it tracks more than eleven hundreds of real estate technology companies in 12 categories, with a combined funding of nearly \$ 30 billion. Within PropTech, you can also categorise activities and services in a variety of ways. Baum and Dearsley (2021) points to: e.g. big data, software providers, lending/crowdfunding, news/advice, Lending: peer-to-peer, virtual and augmented reality, property management, lending—mortgages, co-working, internet of things, online agent—brokerage, online agent—sales, online agent—lettings, payment operations, blockchain, artificial intelligence (AI), accelerators and VCs.

3. Methodology

The following goals were adopted in the research undertaken in the field of modern technologies on the local residential real estate market:

- C1: identifying the sources that are taken into account in the process of acquiring a flat,
- C2: indicating the key elements that should be on the developers' website,
- C3: identifying new technologies that young people take into account in searching for their target premises,
- C4: presenting young people's views on modern technologies.

It was decided that in order to achieve them, a survey should be conducted among mainly young people—the methodological assumptions are presented in Table 2. It should be added that the main group of respondents to whom the questionnaire was addressed were young people, most often defined as those whose maximum age does not exceed 35 (Kusińska, 2005). This intention was not accidental. This is because, according to the research, in the structure of flat buyers, it is the young that constitute the largest percentage (see Strączkowski, 2021; NAR, 2017; NAR, 2029). Their decisions and housing choices are influenced by key life moments, such as: leaving the family home, employment, marriage, having children (Finlay, Pereira, Fryer-Smith, Charlton, Roberts-Hughes, 2012; Wu, 2010). Besides, the generation of young people is unique, not to say revolutionary, when it comes to market behaviour. No other user group changes so quickly in terms of needs and behaviour. They use digital tools without restrictions or inhibitions—over 90% of the people from this group, when looking for a flat, access information via the Internet (Chimczak, 2017; Kaya, Ozdemir, Dal, 2019). Thus, like no other generation, they are ex-

ceptionally open to the use of modern technologies, including the residential real estate market.

The ability to reach respondents was also of key importance. Originally, the collection of data was to take place using two channels, i.e. through: (1) an au-

Table 2. Basic information on research in the field of modern technologies on the local residential real estate market

Specification	Description
Information gathering time	4 months - from May to August 2021 The time spent collecting data took into account problems that arose due to the COVID-19 pandemic.
The spatial scope of the study	the local residential real estate market in Poznań The housing market has a local character (each is different, which is due to the characteristics of the real estate market), which has already been proven in many scientific studies, both domestic and foreign (Schmitz and Brett, 2001, pp. 3-18; Stefaniak, 1997, p. 33; Bryx, 2013, p. 190; Kucharska-Stasiak, 2016, p. 59; Belniak, 2001, p. 42; Strączkowski, 2021, p. 39).
Material scope of the study	research subject: mainly young people (up to 35 years of age) the purpose of this research was to take into account young people as a group most frequently purchasing apartments, especially on the primary market. Such research subject was also adopted due to greater openness to modern technologies. The generation of young people is unique, not to say revolutionary, in terms of market behavior. No other group of users in the housing market is changing so rapidly in terms of needs and behavior, and the reason is the dynamics of changes in the environment, including technological progress, which changes the behavior of the young generation, the approach to habitation (Chimczak 2017, p. 32). The generation of the so-called Millennials is looking for different content in the products offered to them. Like no generation before, without restrictions and inhibitions, they use digital tools—more than 90% of the people in this group, looking for housing, reach information through the Internet (Kaya, Ozdemir, Dal, 2019). the subject of the study: sources of information about flats, information important for potential buyers, which should be on developers' websites, new technologies that can be taken into account when purchasing flats, views on modern technologies in the place of residence
Time range of the study	coincides with the time the information was collected
Research tool	internet survey questionnaire The authors originally planned to conduct a face-to-face survey but due to pandemic constraints it was not possible to reach respondents directly.
Selection and size of the sample	sampling non-random, purposeful, sample size n = 220 units

Source: Own study.

ditorium survey and (2) an online survey. Due to the outbreak of the COVID-19 pandemic and limitations in social contacts, collecting data using an auditorium survey turned out to be impossible and, consequently, the first channel was abandoned. Ultimately, we managed to reach 220 respondents, among whom:

- 53% were women, the rest—men;
- the percentage of people aged up to 25 was 64%, and those aged 26-35 - 24%. The rest of the respondents were older (the oldest respondent was 58 years old). Thus, the average age of the respondent was 27, and the median was 24;
- the relatively largest group of people (47%) plan to create a family with two children, 17%—with one child. Every fifth respondent (22%) did not intend to have children, and every seventh (15%)—three or more children;
- the largest group were those respondents who would like to buy a flat located in a block of flats, in a housing estate (49%). A fairly large percentage also indicated a desire to buy a detached house (42%). The remaining people declared their intention to buy a flat in a terraced house or a semi-detached one;
- the expected average budget for the purchase of a flat reaches the level of PLN 482 thousand. PLN (median at the level of PLN 450 thousand).

4. Results and discussion

The first of the examined issues was related to the possibilities of obtaining information. As you know, these can be obtained from various places and from many entities, including people professionally related to the real estate market, but also from friends or family. The respondents were asked to indicate three

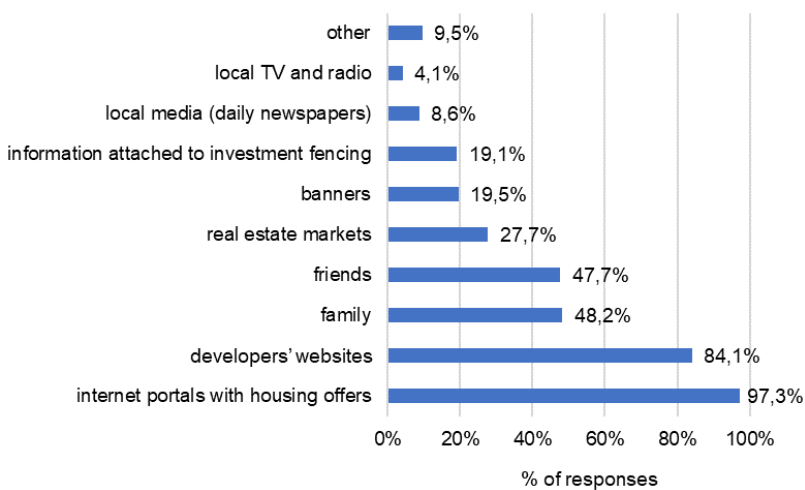


Figure 2. The most popular sources of information about housing

Source: Own study.

sources of information that they would use in the search for their flat. The results of their indications are shown in Figure 2.

It turned out that the first position was taken by internet portals with housing offers (97%), which present information on both the premises and entire investments. The second place—out of 84% of responses—was taken by developers' websites, where you can find not only the previously presented news, but also often their experience and housing projects completed so far. This means that the digital tool—the internet, is of primary importance in the search for housing, as the first two sources together cover 181% of responses.

The following places seem to confirm the importance of the human factor. It turns out that people whom we see often or even on a daily basis play an important role in the search. It is about the closest family and friends (in both cases, almost 48% of responses). Finally, other sources take further places, including: housing fairs, banners, or information that is presented on investment fences or in local media (television, radio, daily newspapers).

The respondents also indicated other sources, referred to as “other”. According to the answers provided, information can also be provided by: magazines (in which you can find apartment sales offers), leaflets (e.g. dropped into mailboxes), billboards, real estate agents, housing cooperatives (advertisements), groups created on social networks (e.g. Facebook).

The results presented above were basically in line with the expectations. By assumption, today's internet allows for quick access to information about housing investments, comparing (also at home) various housing projects as well as the initial selection and selection of places and premises that are of particular interest to the customer. For this to be the case, the developers' websites should contain such data that would actually allow the potential customer to meet their information needs. For this reason, the next question concerned those elements that should be on the developer's website. The respondents gave graded answers on a five-point scale (from 1—not important, to 5—important).

According to research on the preferences of flat buyers, the key role in making a decision to buy a flat is assigned to its price (Strączkowski, 2021). Probably for this reason, the most important element of the developer's website should be the ability to check housing prices—the respondents' answers gave an average of 4.89 points (91% of respondents stated that it is important for them)—see Table 3. Among the other elements, forming the so-called The top 5 of the most important ones include the following: information on the availability of individual flats (the average was 4.78 points), the possibility to see projections of flats (4.75), visualisation of the investment (4.41) and information about the investment environment (4.38). It is worth noting that these are elements that can be described as traditional. They are not a new addition to websites, although of course the information the customer needs can be presented in a more modern, attractive way. In turn, those elements that can be considered more technically advanced appear in further places—e.g. those

Table 3. Important elements for the Customer that should be on the developer's website

No.	specification	mean (points)	structure of responses (%)				
			un-important	rather un-important	in-different	rather important	important
1	ability to check prices of flats	4.89	0.0	0.5	0.9	8.2	90.5
2	information about availability of individual flats	4.78	0.5	0.0	0.5	19.5	79.5
3	possibility to see projections of flats	4.75	0.5	0.5	2.7	16.4	80.0
4	investment visualisation	4.41	1.4	0.5	8.7	35.2	54.3
5	information about investment environment	4.38	0.9	2.3	5.5	40.9	50.5
6	visualisations of individual flats	4.16	1.4	3.6	15.9	35.5	43.6
7	apartment search engine	4.04	0.5	5.9	17.3	41.8	34.5
8	interactive building plans	3.61	2.7	7.7	29.5	45.5	14.5
9	ability to send emails via contact form	3.55	3.6	12.3	30.5	33.2	20.5
10	possibility of taking a virtual walk	3.53	6.4	6.4	32.7	37.3	17.3
11	interactive location map	3.46	5.5	8.6	34.5	37.3	14.1
12	virtual arrangement of space	3.36	5.5	11.4	36.4	35.0	11.8
13	possibility of filling in a short questionnaire and selecting the flat to needs	3.36	9.5	13.2	25.5	35.5	16.4
14	possibility of online meeting with flat sellers	3.35	5.5	15.9	30.0	35.9	12.7
15	photos from the progress of works on the construction site	3.28	7.3	15.9	32.7	29.5	14.5
16	social media links (Instagram, Facebook, Twitter)	3.10	12.7	14.1	37.7	21.8	13.6
17	transition from website to mobile application	2.99	12.7	21.8	30.5	23.6	11.4
18	QR code enabling quick access to selected parts of the offer	2.61	18.2	25.5	38.6	12.3	5.5
19	chat bots	2.46	27.3	24.5	27.7	15.9	4.5
20	direct video transmission from the construction site	2.29	30.0	24.1	35.9	6.8	3.2

Source: Own study.

that are based on interactivity (location map, projections, on-line meetings with sellers) or on the use of virtual solutions (walks around the building, arrangement of space), obtained average marks at a level lower than 4 points. This means that, in the opinion of the respondents, their existence is indifferent or of little importance. Among the latter, the following elements can be distinguished: a QR code enabling quick access to selected parts of the offer (average at the level of 2.61 points), chat bots (2.46) and direct video transmission from the construction site (2.29).

As modern housing construction allows the application of various modern technologies, the respondents were asked about the ones that would be most important for them when choosing a flat, and each of the respondents had the opportunity to indicate up to 5, in their opinion, most important. The list of possibilities was created on the basis of consultations, thanks to which the ones that can realistically be introduced into today's offer of flats for sale were specified. The election results are presented in Figure 3.

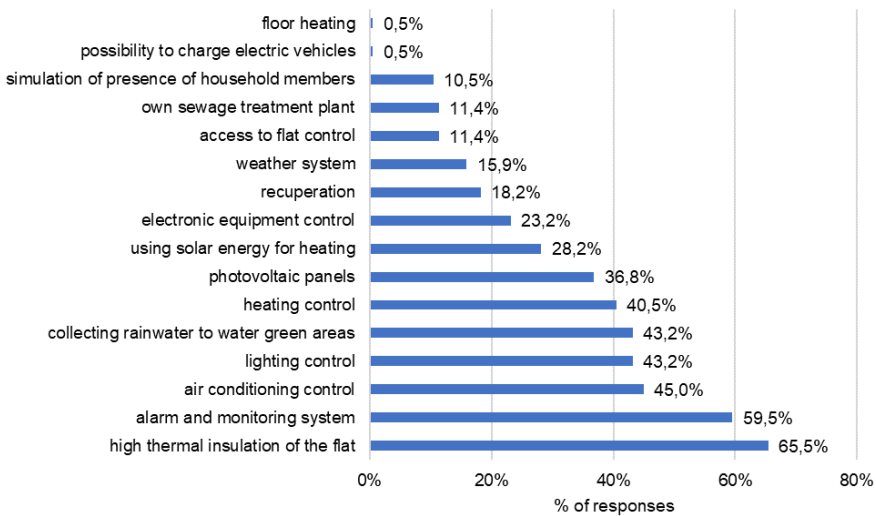


Figure 3. Technologies taken into account when looking for a flat

Source: Own study.

The following issues attract attention:

1. the highest percentage of responses concerned the issue related to the thermal insulation of a flat (66%). Such a result may be a consequence of the promotion and implementation of wide-ranging thermo-modernisation activities, observed, for example, in housing cooperatives with resources built before 1989;
2. quite a large percentage of indications is recorded for technologies that allow electronic control of various functionalities (e.g. air conditioning con-

trol—45%, lighting—43% or heating—41%). On the one hand, it is believed that this is the result of the widespread use of electronic devices, mainly smartphones, which, thanks to applications, make it relatively easy to control specific areas. On the other hand, the possibility of simple control of these areas seems to make life easier for young people, but also to stand out and treat this element as increasing value in the eyes of friends;

3. a relatively smaller percentage of indications concerns issues related to water and sewage. While 43% is related to collecting rainwater for watering green areas, only 11% of the respondents' votes refer to their own sewage treatment plant;
4. the respondents show few answers when it comes to connecting the place of residence with the use of electric vehicles (cars, bicycles or scooters). The possibility of charging electric vehicles received only less than a percentage of indications.

In relation to the above, it is interesting to look at the budget that is planned for the purchase of a flat, and more importantly—what percentage in relation to the price of the flat the respondents would be willing to pay more in connection with the modern technologies used.

In the case of spending on the purchase of a flat, more than half of the respondents (54%) predict that the amount they will allocate for this purpose will not exceed PLN 450,000. Almost every fifth person (19%) estimates that they can pay the price between PLN 450 and 500 thousand, and every fourth (26%) that even more than PLN 550 thousand. However, when it comes to the percentage of the price of the flat they would be willing to pay to have modern solutions in their home, 41% of the respondents (the largest group) indicated that they would accept the maximum level of 5% of the flat price, a further 31%—from 6 to 10% of the flat price, and 23%—up to 20% of the flat price. All the answers allowed estimating the level of acceptable expenses for new technologies at 11% of the price of a flat (median 10%).

The use of modern technologies in flats must be connected with convincing the users of the premises about the safety and the rightness of their use. In order to spread, these solutions must win people's trust and convince them that they can be important in reducing the cost of living, as well as positively influencing the natural environment (rational management of resources). In order to check the opinions about modern technologies the respondents expressed, their attitude towards them was assessed (the results are presented in Table 4).

When it comes to the general feeling of modern technology, it seems to be positive in young people. This is evidenced by the results obtained. The vast majority of the respondents (78% in total) noticed that they agree to a greater or lesser extent with the statement that modern technologies reduce the cost of maintaining a flat. Only 8% of the respondents were of the opposite opinion. Importantly, 83% of people claimed that they would be willing to pay more for the technologies they choose. Probably this percentage could

Table 4. Opinions of respondents about modern technologies used in housing construction

specification	mean (points)	structure of responses (%)				
		no	rather no	neither no nor yes	rather yes	yes
The indicated technologies cause a reduction of the cost of maintaining the flat	4.06	1.4	6.8	14.1	40.0	37.7
The presence of modern technologies in investments causes greater interest in a given housing offer	4.00	2.3	4.1	12.7	53.2	27.7
When I buy a flat, I will be willing to pay more for the technologies I choose	3.90	2.7	6.8	7.3	64.5	18.6
The use of modern technologies makes me feel safer in my flat	3.84	2.7	6.4	22.7	40.9	27.3
The use of modern technologies gives me a sense of fulfilling responsibility for the natural environment	3.68	6.4	7.3	19.5	45.5	21.4
The use of modern technologies in the environment gives me a sense of prestige and recognition from other people	3.56	7.3	12.3	19.5	39.1	21.8
The use of modern technologies causes a feeling of being controlled	2.47	22.7	31.4	28.6	10.9	6.4

Source: Own study.

be increased if the buyers were pointed to specific savings from investing in modern solutions.

It was further observed that over 80% of them believe that the presence of modern technologies in investments causes greater interest in a given housing offer. Therefore, it can be used by developers as a competitive advantage on the market. Moreover, the respondents agreed that the use of modern technologies makes them feel responsible for the natural environment (67% in total). Thus, it has a pro-ecological dimension. For 61%, the use of modern flats, i.e. those equipped with specific amenities, creates a sense of prestige and recognition from the environment. For 68%, it gives a sense of security.

During the consultation stage of the questionnaire, it was noted that for some people, the use of modern technologies may cause discomfort and a sense

of being controlled. In the case of the conducted research, the percentage of respondents pointing to this problem reached the level of 17% (almost every fifth person). 54% of respondents were of the opposite opinion, while 29% had ambivalent feelings in this regard.

Conclusions

Summarising the above results, the following research conclusions can be formulated:

- identifying the sources that are taken into account in the process of acquiring a flat:
 - today's internet allows for quick access to information about housing investments, comparing (also at home) various housing projects as well as the initial selection and selection of places and premises that are of particular interest to the customer
 - the developers' websites should contain such data that would actually allow the potential customer to meet their information needs
- indicating the key elements that should be on the developers' website—the most important elements include the following: information on the availability of individual flats, the possibility to see projections of flats, visualisation of the investment and information about the investment environment
- identifying new technologies that young people take into account in searching for their target premises:
 - the highest percentage of responses concerned the issue related to the thermal insulation of a flat (66%)
 - quite a large percentage of indications is recorded for technologies that allow electronic control of various functionalities (e.g. air conditioning control—45%, lighting—43% or heating—41%)
 - a relatively smaller percentage of indications concerns issues related to water and sewage. While 43% is related to collecting rainwater for watering green areas, only 11% of the respondents' votes refer to their own sewage treatment plant
 - the respondents show few answers when it comes to connecting the place of residence with the use of electric vehicles (cars, bicycles or scooters)
- presenting young people's views on modern technologies:
 - the vast majority of the respondents (78% in total) noticed that they agree to a greater or lesser extent with the statement that modern technologies reduce the cost of maintaining a flat
 - 83% of people claimed that they would be willing to pay more for the technologies they choose
 - over 80% of them believe that the presence of modern technologies in investments causes greater interest in a given housing offer

- the respondents agreed that the use of modern technologies makes them feel responsible for the natural environment (67% in total).

The results of the above research can make an important contribution to the literature dealing with PropTech in Poland. As already mentioned, the national literature on the subject has not really dealt with this topic so far. Therefore, it can be considered that this study fills a research gap on the domestic market. At the same time, it is a voice in the international discussion in the PropTech area that has been going on for several years.

The local housing market is undergoing numerous changes, including changes in the use of modern technologies at the stage of design, implementation and use of residential facilities. These changes are dictated, in a large part, by the need for different groups of actors involved in the investment process to respond to the evolution of customer needs. The study points out the importance of analysing the preferences of housing buyers, which has not been previously considered in academic discussions. It is worth noting that it is the customers, especially on the housing market, who should be taken into account when setting directions and areas for the implementation of digital tools in property development investments.

The surveyed age group of customers under 35 is obviously one of the groups of customers who make purchases on the primary residential market. It is the most active and, at the same time, technologically aware group of buyers. The authors are aware of the need to encompass other age groups, including seniors. The above study is an initial work, and further stages include further research work in which other groups will be included.

Undoubtedly, an important aspect of the conducted research is the question of its usefulness for various groups of entities active on the housing market:

- developers—the need to tailor the offer to customers' needs. Adjusting the offer should not only include the basic characteristics of an apartment, such as size, number of rooms, etc., but also equipping the apartment with modern digital technologies to facilitate its use. This type of research can allow developers to increase their awareness of customers' expectations. Developers, who in recent years have been selling everything they could get their hands on, may not have noticed the changing needs of users precisely in the area of innovative techno-solutions
- housing market start-ups in the field of innovation in the design, implementation, sale and use of products of the development process
- researchers and academics, as a voice in the international discussion on the importance of PropTech on the local real estate markets, especially in the context of competitiveness of development entities.

Of course, there are significant research limitations including:

- the COVID-19 pandemic—difficulty in reaching respondents
- the local market, which may be a limitation since it is an example.

However, despite these limitations, the above study can provide a starting point for examining the sophistication of developers on local real estate markets, taking into account the needs and expectations of potential customers.

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