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Changing Consumer Preferences in the Prefabricated Housing Sector in Hungary: Construction Companies' Experiences and Statistical Data on Consumer Behaviour

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Abstract

The study aims to explore the consumer behaviour of prefabricated house owners, by analysing the insights of 12 managers of domestic construction companies in Hungary. These interviews reveal consumer behaviour and value considerations in purchasing decisions. The study's strength lies in the relevance of the interviewed firms, representing 20.45% of production value in domestic single-family housing construction in 2022, according to the Central Statistical Office. Data from three housing-related censuses further complements the interview findings. Despite the ecological advantages of technology, the surveyed consumers are characterised as self-conscious, prioritising self-interest factors such as price, speed, predictability, reliability, and low maintenance costs in their choices. The research also indicates that consumer resistance to the concept of prefabricated housing is diminishing, something that is most likely to be due to generational shifts.

Keywords

consumer behaviour, consumer resistance, assembled technology, interview

1 Introduction

1.1 Added value, consumer behaviour, and consumer resistance

The relationship between consumer behaviour in purchasing decisions and the added value of products is currently a significant research area. One reason for this is that there are industries where exploration in this area is not yet extensive – such as the field of houses built with assembled technology. Furthermore, with regard to changing demand-supply dynamics, the relationship between product added value and consumer behaviour is constantly changing (Lányi et al., 2024).

Many researchers have already dealt with the relationship between added value and consumer behaviour. Numerous studies can be found on the universality and temporal stability of individual values, the significance of individual value systems, and the appearance of values in consumption decisions (e.g., Csernák-Csorba et al., 2023; Kamakura and Mazzon, 1991; Hofmeister-Tóth, 2016; Wedel et al., 1998). Based on these studies, we can conclude that consumer behaviour and consumption decisions stem from individual value systems, which are determined by the perceived value of the product/service and its identification as added value.

Dudás states in her study (2011) that conscious consumer decisions are based on preliminary information gathering, and important aspects for consumers (such as brand, price, quality, environmental consciousness, health consciousness, etc.) are reflected in these preliminary consumption decisions. Based on consumer motivations, conscious consumer behaviour is divided into two directions: self-conscious and responsible consumer behaviour. In self-conscious consumer behaviour, consumption decisions focus on self-interest, while in responsible consumer behaviour, they focus on the interests of others. The study also identifies an intermediate sphere, which includes, for example, financial awareness.

Consumer behaviour is also part of the decision-making process associated with purchasing (Pólya and László, 2019). The decision-making process of consumer behaviour has also been the subject of numerous studies (e.g., Blackwell et al, 2006; Fodor et al., 2012; Hoffmann, 1977; Hofmeister-Tóth, 2003; Howard and

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Sheth, 1969; Sheth, 1974; Süle, 2012; Törőcsik, 2007). These studies generally agree that the typical consumer purchase process consists of five stages. The stages of the process are named by Törőcsik (2006) as follows: problem recognition-interest, information gathering, evaluation, decision, and post-decision behaviour.

During the purchase process, the risks perceived by consumers also play a significant role in consumers' decisions. This consumer-perceived risk is of particular importance in high commitment purchases such as home buying (Babos et al., 2024). Risk assessment has been the subject of a number of studies (e.g., Bauer, 1960; Cox, 1967; Cunningham, 1967; Mitchell, 1999; Ross, 1975). Jacoby and Kaplan (1972) classify risks into five categories: financial, functional, physical, psychological, and social. This categorisation is also used by Peppels (2018), among others, in his study.

The assessment of risks can change the consumer's decision to buy (Balogh, 2019). Jakopánecz's study (2015) highlights that consumer resistance can manifest as an enhancement of conscious consumer behaviour and as compliance with market pressure from a corporate perspective. Törőcsik's study (2011) focuses on the fact that the factors of consumer resistance are constantly changing, and they are doing so due to the uncertainty caused by the current characteristics of information flow, the increasing awareness of consumers, and the growing demand for transparency. There is still no consensus on the measurability of consumer resistance, although many studies have addressed this issue (Fournier, 1998; Izberk-Bilgin, 2010; Talwar et al., 2023). One of the earliest studies in this area is Elgin and Mitchell's paper (1977).

Consequently, in our research, we sought to determine which factors trigger resistance in consumers' housing decisions. This study examines this question in the field of consumers of properties built with assembled technology.

2 Introduction of the research area

The research area comprises single-family residential buildings constructed with assembled technology. According to the 2022 census data in Hungary, there were a total of 4,008,541 inhabited dwellings, out of which 3,868,954 were owned by private individuals. Looking at construction activities, out of the 35,002 building permits issued in 2022, 10,727 permits were for single-family residential buildings, and 16,190 were for apartments to be established by simple notification (KSH, 2023).

Buildings whose framework consists of column and beam structures, with individual spaces separated by layered wall systems and assembled on-site, are referred to as buildings constructed with assembled technology. These include buildings constructed using prefabricated and pretreated lightweight load-bearing and space-dividing elements (steel, wood, etc.) (Dudás, 2008). Innovations in prefabricated housing offer the opportunity to diminish the environmental footprint of construction by enhancing efficiency and quality standards (Steinhardt et al., 2013). Ecological benefits can also be associated with this technology. Ecological performance can be measured according to standardised methods, life cycle analyses, or databases developed by research groups. Lányi (2013) compared various building materials based on ecological criteria, concluding that in Hungary, the most advantageous choice from an ecological perspective is the use of wood as a building material.

Data on housing construction, understanding ecological aspects, and the experiences of organisations dealing with assembled technology all contribute to the current relevance of researching consumer behaviour in this field. However, alongside these factors, the significance of applicable regulations must be mentioned, too, as they can influence consumption decisions in the studied area (such as Act LXXVIII of 1997 – Construction Act (Hungarian Ministry of Justice, 1997)). According to research conducted by the Hungarian Life Cycle Analysts Professional Association (LCA Centre), public awareness of the environmental impacts of buildings is significantly limited. The selection of building materials is primarily based on technical, economic, and aesthetic considerations (Émi.hu, 2020).

3 Research methodology

Three research questions (see Sections 4.1–4.3) were defined during the research, and 12 interviews were conducted with senior executives and owners of companies that apply assembled technology for building houses in Hungary. A strength of our interview-based research is that the combined production value of the 12 interviewed companies represented 20.45% of the total production value of single-family housing construction in 2022, according to data from the Central Statistical Office. Qualitative, semi-structured self-reporting methods were employed during the interviews (Kiss et al., 2006). The questions focused on consumer awareness, decision-making factors, and processes based on their own experiences and

opinions. The Hungarian Association of Environmentally Conscious and Assembled Technology Companies (hereafter MAKÉSZ) is the organisation representing companies employing construction technology corresponding to the concept. Its members include companies engaged in the construction of houses in an environmentally conscious and sustainable manner, using dry construction methods (screw, nail), prefabrication, and minimal on-site construction (MAKÉSZ, 2019). Assistance in selecting participating companies was provided by MAKÉSZ's 2022 and 2023 membership directories (MAKÉSZ, 2023).

The activities of the interviewed companies typically involve the use of wood-based construction materials, and they execute residential houses using assembled technology and prefabrication. The interviews were conducted between February and May 2023, with an average duration of 49 minutes, predominantly with male company owners and executives over the age of 40. On average, the companies have been engaged in house construction for nearly 20 years, enabling them to provide relevant answers to the interview questions derived from the research questions. The sizes of the companies and the number of residential houses built annually vary widely, so median values were considered most illustrative for the purposes of the study. The median values for the net revenue of the interviewed companies ranged from 616 to 855 million Hungarian Forints in 2022 (KSH, 2022).

Furthermore, during the research, we analysed data on housing provided by the Central Statistical Office (KSH). Data on inhabited dwellings obtained from the office's website were grouped and filtered based on wall material, floor area, and construction period. Regarding wall materials, individual apartments were classified into 5 categories: "1: Brick, stone, manual masonry elements" (hereafter brick); "2: Panel walling" (hereafter panel); "3: Concrete, medium or large block walling" (hereafter concrete); "4: Adobe, mud walling" (hereafter adobe); "5: Other walling" (hereafter other walling). After comparing the data uploaded to the KSH website regarding housing constructions in 2022 with data obtained from censuses, it was determined that the research area – namely, the area of houses constructed with assembled technology – falls into the "other" category. Within the "other walling" category, houses constructed with assembled technology predominantly appear, allowing the research to be conducted using data from the three censuses (2001, 2011, 2022).

Using statistical data, we examined correlations and significance between different types of residential buildings based on wall material, with particular emphasis on the relationship between the occupancy of other apartments and the total number of apartments and apartments with other types of walling. The study of housing decisions is a complex area of investigation. There are many types of housing and many reasons for consumer behaviour. Within this broad area, the present study examines the segment of consumer behaviour associated with other wall construction. The statistical method used in this research investigates direct correlation and significance between occupancy and building structure, floor area and year of construction. The reason for choosing this method is that the outcome of the consumer (housing) decision is a strong manifestation of consumer behaviour, which, using census data, sheds light on trends in the occupancy of building structures. Correlations were determined using Pearson correlation coefficients to evaluate relationships between different types of walling for individual apartments. Significance testing was conducted using the ANOVA single procedure (Hair et al., 2010).

4 Research questions and findings

4.1 First research question

How do companies in Hungary using prefabricated technology perceive their customers and those potential customers who will not ultimately become buyers – in terms of their conscious consumer decisions?

Of the business leaders surveyed, 7 reported that their customers personally choose the company and/or owner rather than the technology used when making consumption decisions. A further 5 managers also reported repeat customers, but with new customers being more prevalent due to higher annual house building volumes. Consumer decisions are influenced by the trustworthiness and credibility of the construction company already at the problem identification and information gathering stages of the decision-making process. The choice of technology only appears at the evaluation stage. In terms of risk assessment, these consumer decisions include consumer assessment of financial, functional, and psychological risk. Consumers are mainly in the 30–50 age group and have children. Respondents agreed that their consumers tend to be more highly educated and that customers who visit businesses in person are informed and come for confirmation on their first visit. Thus, consumers usually come to businesses at the decision stage in the consumer decision-making process, with which they seek to reduce psychological risk. They also agreed that customers who come via the internet

are mostly uninformed about construction technology and the company's activities. Price-sensitive consumers seek out companies that offer construction at lower prices. These customers are in the problem identification and interest stage and are mainly concerned with financial and functional risks. Price-sensitive customers are looking for companies that offer construction services at lower prices. "The Hungarian population is price-sensitive, and at the same time, environmental protection and sustainability are becoming increasingly important to them. Moreover, these two areas are traditionally intertwined, as environmentally conscious behaviour is often motivated by economic considerations" (Lányi et al., 2024:p.28). These consumers typically have higher state subsidies and loans, have low equity, and often build on inherited plots. Half of the respondents stated having a price-sensitive target group, while the other half reported that their buyers were middle-class and usually financed with equity. Builders expect personalised plans from companies, and 92% order turnkey constructions, mainly to enforce the warranty. This behaviour occurs mainly at the stage of evaluation of alternatives and after the decision, and the need for tailored designs refers primarily to the reduction of psychological (and partly functional) risks, while turnkey design refers primarily to the reduction of financial risks and secondarily to the reduction of psychological risks. This is also a common indicative of conscious consumer behaviour.

Among the added values identified by consumers, completion time (9; stage: assessment of alternatives, risk: financial and psychological), good insulation (8; stage: assessment of alternatives, risk: financial and functional), low maintenance costs (7; stage: assessment of alternatives, risk: financial), and predictable construction (6; stage: assessment of alternatives, risk: financial and psychological) are most mentioned. Environmental consciousness and lower energy demand are only mentioned in 3 of the interviews, due to the fact that these are rather added values than decision factors in consumer behaviour (stage: evaluation of alternatives, risk: functional and sociological). In identifying factors influencing consumer decisions, company familiarity (stage: problem awareness-interest, information gathering, decision, risk: psychological), price of installation (stage: evaluation, risk: financial), low maintenance costs and energy efficiency (stage: evaluation, risk: financial) were mentioned by 4, while energy efficiency (stage: problem awareness-interest, information gathering, decision, risk: psychological), completion time and credibility were mentioned by 3. This corresponds to added values, indicating that self-interest type of consumer behaviour is dominant in the study area.

Thus, the answer to my research question was that the consumers prioritise the reputation of the company and the owner over the technology itself and emphasise factors such as reliability, credibility, and affordability. Consumer choices are heavily influenced by factors such as construction time, quality of insulation, maintenance costs, and predictability of construction. In addition, there is a trend towards environmental awareness and sustainability, although this is not reflected in direct consumer decision-making, but is typically only reflected in consumer behaviour as added value. Based on the interviews, we conclude that the consumption decisions and the added value associated with technology in this area occur mainly in the evaluation stage of the decision process, and secondarily in the problem identification and information gathering stages. One of the reasons for their emergence is that builders want to reduce their financial risks first, their psychological risks second and their functional risks third before making a decision. Overall, consumers are price-sensitive and self-conscious in their behaviour in this sector.

4.2 Second research question

The second research question is: where do consumer fears and resistance towards assembled technology designs come from? Thus, in the second research question, we investigate the presence and causes of consumer fears of technology and the resulting consumer resistance as experienced by domestic companies through interviews.

The announcement of Knauf Insulation and the National Association of Building Contractors (ÉVOSZ) addresses consumer resistance to houses built with prefabricated technology, which reports a decreasing trend. It identifies good thermal properties (the 20/2014 (III.7.) Hungarian Ministry of Interior (2014) regulation also contributes to this – nearly zero-energy buildings can be built), designability, fast construction, and predictable costs as reasons (Magyar Építéstechnika, 2019; Portfolio, 2019). According to the interviews, those who are interested but lack sufficient knowledge are more likely to experience consumer fears, but even informed consumers are not familiar with standards and permits. Consumers most commonly mention the following fears/stereotypes: rodents (9), knocking walls (7), low load-bearing capacity (6), wood-eating insects (5), wind damage (5), fire damage (3), which are mainly fears about physical and functional risks. In addition, questions about move in date are most

frequently raised. The answers received about the origin of consumer fears and prejudices also help to answer the second (and third) research questions. The reason for prejudices is identified by the interviewees in the social opinion formed about low-quality lightweight structures called "Czech wooden houses" appearing in the 1980s and '90s. Furthermore, low-quality houses made of OSB panels compiled by non-experts are mentioned. The respondents uniformly report that consumers opt for other construction technologies due to the bad experiences of their ancestors. As far as risks are concerned, in addition to physical, functional, and financial risks, sociological risk also appears here, since the opinion of the family is also an influencing factor for builders, especially in the stages of problem awareness-interest and information gathering. Dóra et al. (2018) provide a possible answer to the compliance with parental pressure: "It is well known that since the regime change, the importance of intergenerational assistance between families and generations has been increasing in terms of the chances of obtaining housing". (Dóra et al., 2018:p.79). Company executives report that there is now less fear about the area than there used to be. They experience consumer knowledge often comes from word of mouth.

Therefore, in light of the above data, the response to the second research question reveals that consumer resistance to prefabricated technology in housing construction is decreasing, attributed to factors such as improved thermal properties, design flexibility, rapid construction, and predictable costs. Nonetheless, lingering consumer fears and stereotypes stem from historical perceptions of low-quality lightweight structures and limited familiarity with standards and regulations.

4.3 Third research question

What changes do domestic companies building houses with prefabricated technology perceive in the sector and what relationship do these changes show with the consumer behaviour of builders?

This question was examined with the help of interviews and data from the 2001, 2011, and 2022 censuses of the Central Statistical Office (hereinafter referred to as KSH). Regarding consumption trends, it is worth mentioning the changes and state subsidies, the increase in interest rates on construction loans, the search for inflation-proof solutions, the impact of the Ukrainian-Russian conflict, measures taken due to the coronavirus epidemic, periodic closures, the increase in utility costs, and changes related to photovoltaic systems. According to the statements of the interviewees, these events both negatively and positively affected demand. Overall, however, they reported a slight decline in demand. Regarding the annual construction volume of single-family residential buildings constructed with prefabricated technology in Hungary and its proportions, different opinions were received during the interviews. According to the interviewees, the proportion was 5–15%, while according to the 2022 data of the KSH, it was 3.9%. According to the announcement of Knauf Insulation and ÉVOSZ, what was previously a 3% ratio increased to 15% by 2019 (Magyar Építéstechnika, 2019; Portfolio, 2019).

During the analysis of housing information from the census, 4 areas were examined:

- General correlations between wall types by occupancy;
- Correlations between wall types by occupancy and floor area;
- Correlations between wall types by occupancy and the year of construction of the inhabited apartment;
- Correlations between wall types by occupancy, floor area, and the year of construction of the inhabited apartment.

The results of the statistical test are presented in detail in Tables 1 and 2. It was concluded from the research that the occupancy of apartments with other walls increased to a greater extent by 2022 compared to 2001 than the other walls and the total occupancy of walls. Based on the cross table of 5 wall types and data from 3 censuses, the differences between wall types are not significant. There is no significant difference in the distribution by floor area, and there are no strong relationships between the different wall types. There are no significant differences between the wall types by occupancy of residential buildings based on the year of construction, but strong correlations appear between the changes in wall types and the years of construction (note: the census data of the KSH only refer to the years of construction of apartments in the 2022 census, thus the examinations regarding the year of construction are based on the data of the 2022 census). There are clearly strong correlations between the year of construction, floor area, and wall types, and significant differences in terms of significance, as $F = 4$ and $p < 0.05$.

Fig. 1 illustrates that the occupancy of residential buildings with other types of walling is increasingly evident in houses built between 1961 and 1980 and those built more recently. The highest occupancy rate is observed in houses built between 1946 and 1960, with significantly lower occupancy rates in houses built more recently, while for residences with other types of walling, this decrease is not evident. From this we can infer that the proportion of

Table 1 Changes in the occupancy of dwellings with other types of walls compared to the overall changes in dwelling occupancy by wall type

Changes in the occupancy of dwellings with other types of walls and the overall changes in dwelling occupancy				
Census years	2001	2011	2022	2001–2022
Total dwellings	3 690 773	3 912 429	4 008 541	108.6%
Total wall types	3 674 814	3 844 759	3 852 441	104.8%
Other wall types	15 959	67 670	156 100	**978.1%**
Changes in occupancy of dwellings with other wall types compared to changes in occupancy of all dwellings by wall type				
	2001	2011	2022	Correlation
Other wall type: total	0.4%	1.7%	3.9%	0.930727595
Other wall type: adobe	2.4%	11.6%	29.9%	−0.963758084
Other wall type: concrete	8.2%	26.3%	68.9%	0.364676915
Other wall type: panel	3.1%	13.0%	30.3%	0.039716501
Other wall type: brick	0.7%	2.7%	6.0%	0.948589397

Table 2 Results of statistical analysis

Correlation	Wall type – wall type		Wall type – floor area		Wall type – year of construction		Wall type – year of construction – floor area	
	Other walls		Other walls		Other walls		Other walls	
Total wall type	0.93	Strong	0.53	Mild	0.86	Strong	0.75	Strong
Brick wall type	0.95	Strong	0.63	Mild	0.91	Strong	0.88	Strong
Panel wall type	0.04	Weak	−0.16	Weak	0.87	Strong	−0.33	Mild
Concrete wall type	0.36	Mild	0.14	Weak	0.91	Strong	0.47	Mild
Adobe wall type	−0.96	Strong	0.41	Mild	−0.08	Weak	0.39	Mild
Significance								
F value	0.00755		0.04526		1.7503		**4**	
p value	0.992		0.956		0.138		**0.001**	

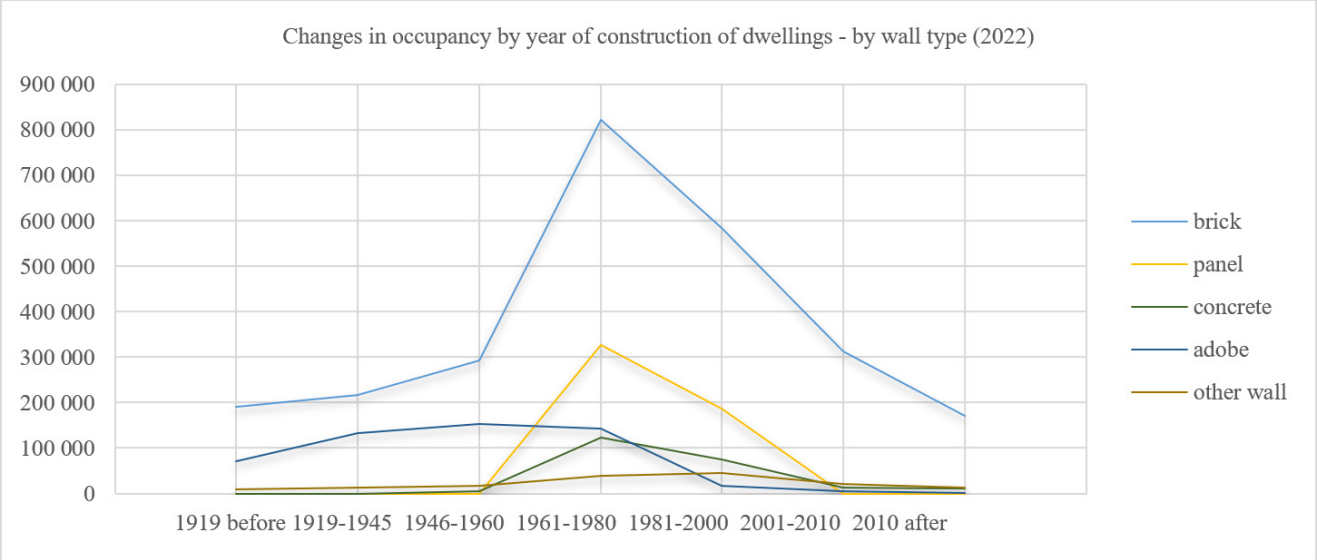

Fig. 1 Changes in occupancy by year of construction of dwellings – by wall type (2022)

residential buildings with other types of walling compared to other types is increasing.

It can be concluded that there is a significant difference among different types of wall structures based on the floor area and year of construction concerning the occupancy of residential properties. After examining the correlation while at the same time giving consideration to floor area and year of construction, it was concluded that other types of wall structures show strong associations with all types of wall structures and with the occupancy of brick-walled

residential buildings, where the differences can be considered significant.

Therefore, in response to the third research question, which investigates the changes perceived by domestic companies employing prefabricated technology in the housing sector and their relationship with the consumer behaviour, it was found, based on interviews and statistical analysis, that the disparities among different types of wall structures are becoming increasingly apparent in the occupancy rates of residential buildings. Specifically, the occupancy rates of buildings with other types of walling have been observed to increase notably in houses built between 1961 and 1980 and in newly constructed ones. While the occupancy rates of older buildings are rising, those of recently constructed houses are significantly lower, although this decrease is not observed in residences with other types of walling. Consequently, it can be inferred that the proportion of residential buildings with other types of walling is increasing compared to other types.

5 Conclusion

Based on the qualitative and quantitative research conducted in this study, it can be inferred that consumers exhibit self-interest-driven and self-aware consumption behaviour. In their purchasing decisions, they are price-sensitive, they demonstrate financial awareness, and attribute significant importance to added values associated with technology. The consumption decisions and the added value associated with technology in this area occur mainly in the evaluation stage of the decision process, and in the problem identification and information gathering stages. Because the consumers want to reduce their financial, psychological, and functional risks. Consumer resistance in the area stems from negative consumer experiences in the 1980s and 1990s and from being under-informed, which is gradually diminishing due to generational shifts in the target group and technological advancements. Interviews, construction-related statements made by experts, as well as census data, consistently indicate decreasing consumer resistance in the study area. Statistical data from the 2022 census reveal that other types of wall structures show significant and strong correlations with all types of wall structures and with the occupancy of brick-walled residential buildings based on floor area and year of construction.

The statistics show that the use of prefabrication technology is on the rise, with a steadily increasing share compared to other construction technologies. Consistent with the conclusion of our research, Halman et al. (2008) argue that traditional on-site construction methods alone are not sufficient to achieve efficiency and ensure the sustained success of the housing industry, and that prefabricated construction technology may be the future of housing technology.

The interviews show that the domestic companies building houses with prefabricated technology perceive several changes in the sector. These changes include advancements in construction technology, increased demand for sustainable and energy-efficient housing solutions, and evolving consumer preferences towards faster construction timelines and cost-effectiveness.

The relationship between these changes and the consumer behaviour of builders is intricate. Builders must adapt to meet the evolving demands of consumers, incorporating prefabricated technology to offer efficient and environmentally friendly housing solutions. Consumer behaviour plays a significant role in driving these changes, as builders need to align their offerings with consumer preferences to remain competitive in the market. Moreover, consumer awareness of environmental concerns and the desire for cost-effective solutions further influence the adoption of prefabricated technology by domestic companies.

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