COVID-19 pandemic accelerates the perception of digital transformation on real estate websites

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Abstract

In early March, the newspapers reported the arrival of the Coronavirus in Brazil. The period of confinement directly affected our routines and transformed our consumption habits. Amidst the fear of contagion and uncertainty, people isolated themselves and postponed changes. Previous studies indicate that digital practices were accelerated after the onset of the COVID-19 pandemic, facilitating communication and improving the performance of various sectors of the economy. Thus, to better understand the behavior of Brazilian real estate market professionals in this period, the objective of this research was to verify whether the COVID-19 pandemic accelerated the process of perception of digitalization in real estate websites. To this end, five experts in the digital real estate market were interviewed, asked what are the main items that a quality real estate website should have to improve user experience. Based on the items selected by the experts, a questionnaire was developed and a question was constructed for each item. The questionnaire was sent online to 2144 realtors, asking about the importance of these items before and after the pandemic started. Using a 5-point Likert scale, and strict criteria for analysis, our survey yielded 423 valid responses. The results indicate that regardless of the groups analyzed, the hypotheses confirm that after the beginning of the COVID-19 pandemic, the perception of the importance of digital technology in Brazilian real estate websites was enhanced, increased. Managers took advantage of the pandemic and the availability of digital technology to offer specialized service to customers, thus creating a new competitive scenario. The tools associated with the visualization of the property and information such as '360°/Video Tour', 'Video Visit Broadcast', 'Chatbots' and 'FAQ List' had the greatest increase in perception.

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1 Introduction

In late 2019, a new Virus disease (COVID-19) appeared suddenly and spread quickly to become a global pandemic. At the end of November 2020, COVID-19 had infected more than 65 million people worldwide, including more than 6.3 million people in Brazil. Several communities have chosen to adopt social isolation to combat the spread of the disease and preserve health systems. The period of confinement directly affected routines and transformed consumption habits.

Thus, the COVID-19 pandemic generated great challenges for the survival and development of companies in various sectors of the economy (Guo, Yang et al. 2020). Many of these organizations were forced to adopt new internal work practices and felt a strong need to offer products through digital channels. This sudden change, therefore, had a significant impact on business. If for some companies, digitization was an advantage, now it has become essential. Many companies are still at the beginning of the digitization journey and are now forced to accelerate this process and test ideas. It is a fact that some sectors were better prepared, such as the Information Technology sectors, however, traditional businesses suddenly lost their support base and were forced to transform themselves digitally, rather than in a planned and strategic way.

In the case of the Brazilian real estate market, the current scenario has demonstrated the urgent need to accelerate the sector's digitalization process. From one moment to the next, the entire real estate industry, especially the buying, selling, and leasing intermediation segment, had its operations strongly impacted by the restriction of personal contact with customers. In many places in Brazil, visits to developments and properties were prohibited or had limited access. A survey by Grupo Zap in March 2020 (the first month of the pandemic in Brazil), conducted only with those interested in real estate, showed that 38% of respondents want visits transmitted by video tools and 37% would like to take a 360° tour of the property offered. On the other hand, the survey points out that only 25% of real estate websites offer video visits and only 11% offer 360° Tour.

This discrepancy is aligned with the fact that the digital transaction journey in real estate has been seen in the background, as many real estate managers still rely on the power of contact and in person experience to influence the prospective client's decision making. In this way, many real estate companies had their websites without any strategic form, just to post their ads and in any way. With the arrival of the pandemic and confinement, the companies had to rethink their websites.

The aim of the study is to verify whether the COVID-19 pandemic accelerated the process of perceiving digitalization on real estate websites. For this, we interviewed 423 real estate managers, asking them about the perception of digital practices before and after the start of the pandemic. Digitization, also addressed as Digital Transformation, refers to the use of digital technologies, such as information, computing, communication and connection technologies to promote organizational changes (Sebastian, Ross et al. 2017, Vial 2019). Supported by Ding et al. (2020) we consider that digitalization is defined as the changes that a company goes through as it starts using digital technologies to develop or modify a digitally enabled business model to create more value for the company. Thus, we will limit our study to digital solutions adopted on real estate websites to improve the user experience when choosing a property.

2 Literature review

The real estate market has long been regarded as an opaque market (Fabozzi et al. 2009), and usually real estate transactions and property-specific information were not available to the public. However, as well as changing the way of searching for information, products and services in the most varied sectors (Vasudevan and Kumar 2019), the internet has become a significant transaction platform for the real estate sector. The volume of available real estate market data increases dramatically each year on real estate websites and integrated platforms. The goal is to allow the user to contact (with the real estate agency) to find the best options for buying or selling real estate.

Real estate websites are a way for many people to start their home searches, so these sites play an important role in defining property choice (Yuan, Lee et al. 2013). Therefore, it is important that these sites provide tools to assess how a specific property can meet the interrelated criteria of residence, construction and neighborhood (Baum 2017). Technological innovations have resulted in features that allow users to select affordable price ranges, take virtual tours, get information about the neighborhood, access comparative data for different neighborhoods and view property values over time (Cherif and Grant 2014).

In Brazil, real estate transactions generated R$ 473 billion in 2017, representing about 7.2% of the national GDP. According to SECOVI-SP, 90% of real estate transactions in the country start over the internet, with 60% of the property purchase process being carried out online. It is a fact that the internet has become a significant transaction platform for the real estate sector (Yuan, Lee et al. 2013). While the internet is a significant channel for the real estate market, there are indications that real estate websites have not developed this potential, that is, they are not meeting users' expectations. Traditionally, Brazilian real estate companies rely in person contact to win a customer.

With the advent of the COVID-19 pandemic and the consequent confinement of the population, this strategy can no longer be adopted and the contact between the real estate agent and the user is now entirely or partially online. Thus, poorly built sites, with incomplete information, poor ads and no resources for quick contact with the real estate agency began to be criticized. In this way, real estate managers began to focus on digital solutions. Solutions that many real estate companies have implemented on their websites, standing out in this pandemic moment. Grant and Cherif (2016), in 2016 already emphasized that technology allows real estate companies to innovate, meet customer demands and remain competitive.

For Vial (2019), digital solutions have the potential to help companies respond effectively to public crises by activating their dynamic capabilities. In the context of the COVID-19 outbreak, much research suggests that the adoption of digital technologies plays an important role in responding to the crisis (Guo, Yang et al. 2020). Zemtsov (2020) points out that the pandemic is accelerating the digital transformation.

However, in Brazil, digital practices start to be implemented in large cities and then spread in small and medium urban centers (Cunha, Przeybilovicz et al. 2016). In addition, the training of managers has a very important role in this scenario, and they are responsible for directing their teams towards innovation (Jin, Zheng et al. 2020). They are the key to the success of digital transformation. For example, managers are responsible for identifying, with their teams, the technologies capable of simplifying the business routine to amplify their results. Therefore, it is up to them to be the first to understand digital transformation well. As such, the following hypotheses are proposed:

H1 The general perception of the importance of digital practices increased significantly after the start of the pandemic.

To be sure of H1, we propose three more hypotheses to ensure that if there was a significant increase after the start of the pandemic in the perception of the importance of digital practices, this increase occurred in all types of cities, regardless of the time of activity of the real estate and training of the manager, therefore:

H2 The perception of the importance of digital practices does not differ significantly in relation to the size of the city where the real estate company is located.

H3 The perception of the importance of digital practices does not differ in relation to the time of activity of the real estate company.

H4 The perception of the importance of digital practices does not differ in relation to the level of education of the real estate manager.

3 Methodological procedures

3.1 Instrument and sample

First, five experts in the digital real estate market in Brazil were interviewed. They were asked what the main items that a quality real estate website should have to improve the user experience. Items related to the technical part (such as accessibility and design) and basic items (basic information of the properties and presentation of values, for example) were understood as essential items of any website, therefore they were not used in the analysis. After two rounds of interviews, nine items were raised. In this way, a questionnaire was developed, and a question was constructed for each item. The instrument can be seen in Table 1. Reliability tests were conducted, were found a 0.812 Cronbach's alpha for nine questions before the pandemic and 0.826 for nine questions afterwards.

The questionnaire was sent online to 2144 real estate managers (one for each real estate agent) from all over Brazil, being asked about the perception of the importance of making a certain item available, before and after the start of the pandemic. The study data were obtained from a survey conducted from August to October 2020. The scale used was a 5-point Likert scale, where 1 corresponds to "nothing important" and 5 "very important". Strict criteria were applied to identify low quality responses (substantially incomplete; completion time less than 1/3 of the average; very fast first click on any of the sections), resulting in a total of 423 valid responses (423 managers, 423 real estate agents many different). The sample composition can be seen in Table 2.

After data collection, the present study revealed that most respondents (65.49 percent) were male, while women were 146 (34.51 percent). Regarding the education level of the respondents, more than half of the survey respondents had an undergraduate degree (55.56 percent), while 20.09 percent and 24.35 percent had only High School or less and Graduate or more, respectively. Regarding the age of the real estate company, 40.19 percent is over 10 years old, 35.22 percent and 24.59 percent is up to 3 years old and 3 to 10 years old, respectively. 38.06 percent of real estate agencies are in cities with less than 100,000

**Table 1** Instrument and description of the nine items

	Items	Description
(Before) In your opinion how important was it, before the pandemic Alpha = 0.812 (After) After the start of the pandemic, in your opinion how important is Alpha = 0.826	Provide professional photos of the properties? (1)	Professional photos have a better performance when viewing the property, as they are made with better angles, greater lighting, portraying the property better
	Provide chatbots available for users to contact the real estate company? (2)	The chatbot is an artificial intelligence capable of interacting with website visitors through previously programmed responses, simulating the behavior of a humanized service
	Provide contact link via messaging application? (3)	The chatbot is an artificial intelligence capable of interacting with website users through previously programmed responses, simulating the behavior of a humanized service
	Provide users with the possibility to visit the Properties through 360° tour or videos? (4)	The 360° Tour (Virtual Tour) consists of a complete 360-degree presentation of the properties. The experience is like a face-to-face visit, as visitors have the possibility to change the viewing angle as if they were on site. In this criterion we also use videos of the properties
	Provide information regarding the neighborhood where the property is located? (5)	The neighborhood (district) information helps the user in the decision of the real estate transaction, as he will know information such as the lifestyle, profile and average age of those who live in that region, as well as infrastructure and commerce
	Provide a geolocation tool for properties? (6)	Geolocation tools integrated with the real estate website show the complete address of the property, being able to see the regional position and which infrastructure is nearby

Table 1 (continued)

Items	Description
Provide a list of FAQs (Frequently Asked Questions)? (7)	It consists of a page on the website that presents the most frequently asked questions and answers asked by users. The FAQ list increases real estate productivity. This is because it takes questions from it that can be solved with self-service and the customer has the answers without needing to contact the real estate agency
Provide a digital transaction process? (digital contract signature) (8)	Digital contract is any adjustment made between two or more parties and registered by computer means, that is, created, shared, signed and archived digitally. This process reduces the transaction time and the user does not have to travel to sign the contract
Provide the transmission of the visit available through video tools? (9)	The video visit takes place with the broker making a video call to the user, showing the property and answering the user's questions in real time

Table 2 Profile information of sample

		Frequency	Percentage (%)
Gender			
	Men	277	65.49
	Women	146	34.51
Manager´s age (mean)		41.95	
Manager´s education level			
	High School or less	85	20.09
	Undergraduate	235	55.56
	Graduate or more	103	24.35
Time of real estate agency activity			
	Until 3 years	149	35.22
	3–10 years	104	24.59
	Over 10 years	170	40.19
City size			
	< 100,000	161	38.06
	100,000–500,000	109	25.77
	> 500,000	153	36.17
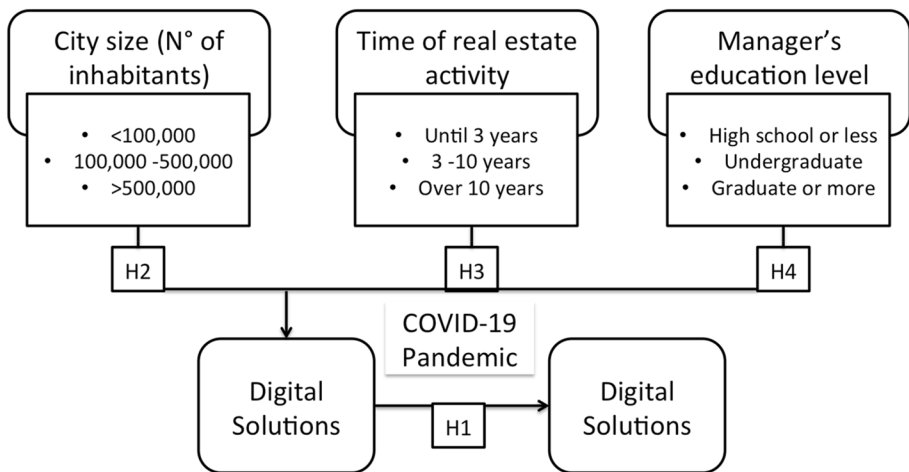
Fig. 1 Research outline

inhabitants, another 25.77 percent are in cities between 100,000 and 500,000 inhabitants, and 36.17 percent are in cities with more than 500,000 inhabitants.

3.2 Statistical analysis

In Fig. 1, a schematic of the research can be observed containing the four hypotheses. First, a normality test of the difference between the responses before and after was performed. For all tests performed, both by Shapiro–Wilk and Kolmogorov–Smirnov, the p-values found were above 0.20, confirming the hypothesis of normality.

The first analysis is performed using the paired t-test, containing the entire sample, to prove H1. Thus, we analyzed for a general scenario, regardless of groups, if after the pandemic the perception of importance of the items increased. To prove H2, a paired t-test (before and after) is performed for each of the three groups: (i) Real estate agencies that are located in cities with less than 100 thousand inhabitants; (ii) Real estate agencies that are located in cities with more than 100 thousand and less than 500 thousand inhabitants; and (iii) Real estate agencies that are located in cities with more than 500 thousand inhabitants. Thus, it is verified whether the perception of the importance of digital solutions increased after the beginning of the pandemic, regardless of whether real estate companies are in small, medium or large cities.

To prove H3, a paired t-test (before and after) is performed for each of the three groups: (i) Real estate agencies that have been operating for less than 3 years; (ii) Real estate agencies that are operating between 3 and 10 years; and (iii) Real estate agencies that have been operating for more than 10 years. Thus, it will be verified if the perception of the importance of digital solutions increased after the beginning of the pandemic, regardless of the time that the real estate agents are in the market.

Finally, a paired t-test (before and after) is applied to prove H4, in the three groups: (i) Real estate agency managers with high school or less; (ii) Undergraduate real estate agency managers; and (iii) Real estate agency managers with graduate degrees. Thus, it will be verified if the perception of the importance of digital solutions increased after the beginning of the pandemic, regardless of the manager's training level. The tests were performed using the Stata software version 15.

4 Analysis and results

Our first hypothesis stated that:

H1 The general perception of the importance of digital practices increased significantly after the start of the pandemic.

Survey participants were asked to assess the importance of digital solution items on their real estate websites. To determine the importance, a five-point Likert scale response format (1 Not important and 5 Very important) was used. Table 3 presents the means and standard deviations of the attributes reported by the respondents as the level of importance. For each item, a unilateral dependent t test was performed to test whether after the start of the pandemic there was an increased perception of the importance of a certain attribute.

In a general scenario, regardless of groups, the results indicate that the perception of the importance of the analyzed items increased after the beginning of the pandemic. All items showed statistical significance. The item 'professional photos' had the highest average before and after the pandemic, however the difference in means was the smallest among all items, followed by 'messaging app'. The items 'FAQs' and '360° Tour/Video' were the items that had the greatest increase in the perception of managers.

As the t-statistic was significant for all items, H1 is accepted, concluding that there was a significant increase in the importance of the items after the start of the pandemic.

Our second hypothesis stated that:

Table 3 Important items for the real estate website

Items	Before		After				
	M	SD	M	SD	Diff	t	Sig
Professional photos	4.338	0.962	4.827	0.436	0.489	− 10.42	0.000*
Chatbots	3.324	1.312	4.227	0.959	0.903	− 15.538	0.000*
Messaging application	4.191	1.287	4.794	0.46	0.603	− 9.845	0.000*
360° Tour/Video	3.168	1.248	4.329	0.734	1.161	− 18.82	0.000*
Neighborhood information	3.917	1.154	4.513	0.741	0.596	− 13.017	0.000*
Geolocalization tool	3.539	1.283	4.336	0.739	0.797	− 15.584	0.000*
FAQs	2.934	1.529	4.144	0.952	1.21	− 16.677	0.000*
Digital Contract	3.418	1.422	4.265	0.877	0.846	− 16.072	0.000*
Broadcast visit by call video	3.274	1.408	4.118	0.892	0.844	− 15.406	0.000*

M Mean; *SD* Standard deviation; Diff. (after-before); *t* t statistic (dependent t-test); and *Sig* Significance
* <0.001

H2 The perception of the importance of digital practices does not differ significantly in relation to the size of the city where the real estate company is located.

To test this hypothesis, we divided the cities where the real estate agencies are located in three sizes, thus, we check if there is an increase in the importance of the items after the start of the pandemic, regardless of the size of the city where the real estate agent is located. Table 4 shows the means and standard deviations of the attributes reported by the respondents for each city size. For each item, a unilateral dependent t test was performed to test whether after the start of the pandemic there was an increase in the perceived importance of an item.

In a scenario of analysis by the size of the city where the real estate company is located, the results indicate that the perception of the importance of the analyzed items increased after the beginning of the pandemic. All items were statistically significant (<0.001). The items 'professional photos' and 'messaging app' showed the two highest averages for the three groups of cities before the pandemic. These items also had the highest averages after the start of the pandemic. However, the items that had the greatest difference between before and after the start of the pandemic were 'FAQs' and '360° Tour/Video' and 'Broadcast visit by call video'.

It is important to note that the values of standard deviations decreased after the pandemic, indicating that there is less discrepancy between the perceptions of managers. As the t-statistic was significant for all items, H2 is accepted, concluding that there was a significant increase in the importance of the items after the start of the pandemic regardless of the size of the city where the real estate company is located.

Our third hypothesis stated that:

H3 The perception of the importance of digital practices does not differ in relation to the time of activity of the real estate company.

To test this hypothesis, we divided the real estate companies into three groups. Those who are in the market for less than 3 years, those who are in the market for 3 to 10 years and those who have been in business for more than 10 years. Table 5 shows the means

Table 4 Important items for the real estate website by city size

Items	Before		After				
	M	SD	M	SD	Diff	t	Sig
< 100,000							
Professional photos	4.193	1.084	4.835	0.373	0.642	− 6.282	0.000*
Chatbots	3.349	1.265	4.294	0.885	0.945	− 8.495	0.000*
Messaging application	4.128	1.255	4.844	0.364	0.716	− 5.752	0.000*
360° Tour/Video	3.018	1.269	4.202	0.767	1.183	− 9.407	0.000*
Neighborhood information	3.743	1.287	4.523	0.740	0.780	− 7.701	0.000*
Geolocalization tool	3.312	1.317	4.229	0.867	0.917	− 9.657	0.000*
FAQs	3.119	1.438	4.202	0.960	1.083	− 8.176	0.000*
Digital contract	3.303	1.469	4.229	0.919	0.927	− 8.704	0.000*
Broadcast visit by call video	3.073	1.445	4.101	0.912	1.028	− 9.136	0.000*
100,000–500,000							
Professional photos	4.348	0.983	4.783	0.533	0.435	− 5.456	0.000*
Chatbots	3.342	1.365	4.286	0.938	0.944	− 9.113	0.000*
Messaging application	4.255	1.305	4.814	0.391	0.559	− 5.504	0.000*
360° Tour/Video	3.292	1.223	4.298	0.805	1.006	− 10.490	0.000*
Neighborhood information	3.938	1.160	4.491	0.751	0.553	− 7.399	0.000*
Geolocalization tool	3.596	1.272	4.360	0.755	0.764	− 8.872	0.000*
FAQs	2.826	1.599	4.211	0.832	1.385	− 11.170	0.000*
Digital contract	3.640	1.399	4.354	0.832	0.714	− 8.089	0.000*
Broadcast visit by call video	3.354	1.416	4.099	0.930	0.745	− 8.681	0.000*
> 500,000							
Professional photos	4.431	0.833	4.869	0.357	0.438	− 6.559	0.000*
Chatbots	3.488	1.296	4.318	1.026	0.830	− 9.446	0.000*
Messaging application	4.310	1.297	4.839	0.571	0.529	− 5.853	0.000*
360° Tour/Video	3.440	1.254	4.451	0.606	1.011	− 12.644	0.000*
Neighborhood information	4.020	1.035	4.529	0.735	0.510	− 7.615	0.000*
Geolocalization tool	3.641	1.260	4.386	0.608	0.745	− 8.791	0.000*
FAQs	3.215	1.513	4.433	1.054	1.218	− 9.384	0.000*
Digital Contract	3.268	1.391	4.196	0.889	0.928	− 11.324	0.000*
Broadcast visit by call video	3.073	1.445	4.101	0.912	1.028	− 9.136	0.000*

and standard deviations of the attributes reported by the respondents divided by the time the real estate agency has been operating. For each item, a unilateral dependent t test was performed to test whether after the start of the pandemic there was an increase in the perceived importance of a particular item.

In a scenario of analysis by time in the real estate market, the results indicate that the perception of the importance of the items analyzed increased after the beginning of the pandemic. All items were statistically significant (< 0.001). The items 'professional photos' and 'messaging app' showed the two highest averages for the three groups before the pandemic. These items also had the highest averages after the start of the pandemic. For real estate companies that have been in the market for more than 10 years, the item 'Chatbots' obtained the highest average after the start of the pandemic.

Table 5 Important items for the real estate website by time of activity of real estate company

Items	Before		After				
	M	SD	M	SD	Diff	t	Sig
Until 3 years							
Professional photos	3.663	1.304	4.894	0.309	1.231	− 9.182	0.000*
Chatbots	3.548	1.173	4.500	0.668	0.952	− 9.118	0.000*
Messaging application	4.163	1.514	4.750	0.435	0.587	− 3.785	0.000*
360° Tour/Video	2.548	1.379	4.500	0.763	1.952	− 12.559	0.000*
Neighborhood information	3.519	1.215	4.462	0.891	0.942	− 7.359	0.000*
Geolocalization tool	2.702	1.441	3.952	0.805	1.250	− 8.854	0.000*
FAQs	2.788	1.617	3.913	0.967	1.125	− 6.730	0.000*
Digital contract	2.683	1.388	3.481	0.955	0.798	− 5.744	0.000*
Broadcast visit by call video	3.058	1.420	3.577	0.809	0.519	− 4.331	0.000*
3–10 years							
Professional photos	4.69	0.54	4.86	0.45	0.17	− 4.00	0.000*
Chatbots	4.05	0.82	4.48	0.58	0.42	− 7.38	0.000*
Messaging application	4.33	1.15	4.83	0.38	0.50	− 5.28	0.000*
360° Tour/Video	3.60	0.98	4.31	0.67	0.71	− 10.75	0.000*
Neighborhood information	4.09	0.74	4.68	0.48	0.59	− 11.14	0.000*
Geolocalization tool	4.03	0.61	4.46	0.56	0.44	− 9.10	0.000*
FAQs	3.38	1.03	4.27	0.84	0.89	− 15.39	0.000*
Digital contract	3.44	1.24	4.29	0.73	0.85	− 13.59	0.000*
Broadcast visit by call video	3.66	0.94	4.42	0.71	0.76	− 10.58	0.000*
Over 10 years							
Professional photos	4.441	0.784	4.759	0.481	0.318	− 5.845	0.000*
Chatbots	3.547	1.328	4.841	1.218	1.294	− 11.670	0.000*
Messaging application	4.088	1.249	4.794	0.532	0.706	− 8.192	0.000*
360° Tour/Video	3.171	1.221	4.241	0.758	1.071	− 12.040	0.000*
Neighborhood information	4.006	1.348	4.394	0.802	0.388	− 6.100	0.000*
Geolocalization tool	3.624	1.367	4.459	0.755	0.835	− 11.145	0.000*
FAQs	2.629	1.740	4.176	1.011	1.547	− 11.368	0.000*
Digital Contract	3.853	1.417	4.724	0.555	0.871	− 10.404	0.000*
Broadcast visit by call video	3.071	1.655	4.188	0.942	1.118	− 12.137	0.000*

For real estate agents that have been operating in the market for less than 3 years, the items that had the greatest increase were '360° Tour/Video', 'Geolocation tools', 'Professional Photos' and 'FAQs'. For real estate agencies operating between 3 and 10 years, the items that had the most increase were 'FAQ' and 'Digital Contract'. As for the real estate agencies that have been operating in the market for more than 10 years, the items that most increased the average were 'FAQs', 'Chatbots', 'Video Visit Broadcast' and '360 Tour/Video'.

It is important to note that the values of standard deviations decreased after the pandemic, indicating that there is less discrepancy between the perceptions of managers. As the t-statistic was significant for all items, H3 is accepted, concluding that there was a significant increase in the importance of the items after the start of the pandemic regardless of the duration of the real estate activity in the market.

Table 6 Important items for the real estate website by managers education level

Itens	Before		After				
	M	SD	M	SD	Diff	t	Sig
High school or less							
Professional photos	4.359	0.938	4.806	0.466	0.447	− 5.011	0.000*
Chatbots	3.282	1.263	4.194	0.971	0.913	− 7.007	0.000*
Messaging application	4.087	1.329	4.777	0.418	0.689	− 5.450	0.000*
360° Tour/Video	3.039	1.252	4.311	0.792	1.272	− 10.560	0.000*
Neighborhood information	3.777	1.128	4.408	0.747	0.631	− 6.745	0.000*
Geolocalization tool	3.612	1.254	4.369	0.642	0.757	− 7.058	0.000*
FAQs	3.212	1.465	4.224	0.713	1.012	− 6.780	0.000*
Digital Contract	3.369	1.414	4.252	0.837	0.883	− 8.386	0.000*
Broadcast visit by call video	3.136	1.469	4.029	0.965	0.893	− 7.798	0.000*
Undergraduate							
Professional photos	4.357	0.970	4.838	0.443	0.481	− 7.392	0.000*
Chatbots	3.233	1.370	4.238	0.962	1.005	− 11.841	0.000*
Messaging application	4.294	1.265	4.826	0.480	0.532	− 6.606	0.000*
360° Tour/Video	3.221	1.238	4.391	0.673	1.170	− 14.130	0.000*
Neighborhood information	3.940	1.161	4.523	0.747	0.583	− 9.545	0.000*
Geolocalization tool	3.485	1.334	4.340	0.765	0.855	− 11.921	0.000*
FAQs	2.928	1.516	4.089	1.036	1.162	− 12.488	0.000*
Digital Contract	3.400	1.427	4.294	0.859	0.894	− 12.214	0.000*
Broadcast visit by call video	3.238	1.409	4.132	0.884	0.894	− 12.173	0.000*
Graduate or more							
Professional photos	4.259	0.978	4.824	0.383	0.565	− 5.442	0.000*
Chatbots	3.376	1.215	4.235	0.947	0.859	− 7.395	0.000*
Messaging application	4.035	1.286	4.729	0.447	0.694	− 4.921	0.000*
360° Tour/Video	3.176	1.274	4.176	0.804	1.000	− 6.993	0.000*
Neighborhood information	4.024	1.165	4.612	0.709	0.588	− 5.680	0.000*
Geolocalization tool	3.600	1.177	4.282	0.781	0.682	− 7.418	0.000*
FAQs	2.717	1.587	4.204	0.922	1.486	− 8.884	0.000*
Digital contract	3.529	1.428	4.200	0.973	0.671	− 6.305	0.000*
Broadcast visit by call video	3.541	1.305	4.188	0.824	0.647	− 5.540	0.000*

Our fourth hypothesis stated that:

H4 The perception of the importance of digital practices does not differ in relation to the level of education of the real estate manager.

To test this hypothesis, we divided managers into three groups, referring to levels of education. Table 6 shows the means and standard deviations of the attributes reported by the respondents divided by the manager's level of education. For each item, a unilateral dependent t test was performed to test whether after the start of the pandemic there was an increase in the perceived importance of a particular item.

In a scenario of analysis by the manager's education level, the results indicate that the perception of the importance of the analyzed items increased after the beginning of the pandemic. All items were statistically significant (<0.001). The items 'professional photos' and 'messaging app' showed the two highest averages for the three groups before and after the start of the pandemic. Regardless of the manager's level of education, the items that had the greatest increase in the average were '360° Tour/Video', 'FAQs' and 'Chatbots'.

It is important to note that the values of standard deviations decreased after the pandemic, indicating that there is less discrepancy between the perceptions of managers. As the t-statistic was significant for all items, H4 is accepted, concluding that there was a significant increase in the importance of the items after the start of the pandemic regardless of the manager's education level.

5 Discussion

The objective of this study is to verify if the COVID-19 pandemic accelerated the process of perceiving digitalization on Brazilian real estate websites. For this, successive T tests were conducted to prove the four hypotheses developed.

The results of this research showed that after the start of the pandemic, the perception of real estate managers (representing real estate agencies) regarding items related to digital solutions to improve the user experience, increased by approximately 24% (see Table 3; Mean before = 3.567 and Mean after = 4.395). Thus, demonstrating that Pandemic has accelerated digital thinking in managers. Although there are no studies related to this sector, other studies have shown that the pandemic has accelerated digital practices. Small and Medium Enterprises (SMEs) in China started to adopt more digital practices after the start of the pandemic, improving their performance (Guo, Yang et al. 2020). Indriastuti and Fuad (2020) stressed that during the Covid-19 pandemic, online practices can result in sustainability in SMEs in Indonesia. Ivanova (2020) describes that even though retail is a pioneer in digitalization, the sector had to seek new technologies because of the pandemic. Barnes (2020) says that a key aspect of the pandemic was the increase in digitalization and the accelerated implementation of trends previously discussed many years ago. Our results are moving in the same direction.

Digital thinking in the Brazilian real estate market has been discussed for many years and there is a consensus that the national market is lagging behind in this regard. This occurs, perhaps because the sector is marked by formal requirements, where eye-to-eye contact can establish a relationship of trust. But that is changing, with some disruptive real estate companies on the national scene, which end up winning new customers and making other real estate companies move in order not to lose clients. These real estate companies have turned their websites into true virtual platforms, improving the customer experience when searching for properties, providing video of the properties, 360° Tour, as much information as possible, such as a list of FAQs, Chabots, Link to messaging applications. All these tools are to try to clarify the client's main doubts and obtain additional information without the need for contact by phone or in person interaction at the real estate agency. Thus, the real estate company improves its time management and increases the productivity of its employees, in addition to preventing the user from traveling to visit a property without having the least interest.

Social isolation and the consequent resistance of people to leave their homes, was the biggest enemy of real estate professionals during the pandemic. This resulted in the

impossibility of a in person visit to the property, causing a lack of contact with the customer, a traditional negotiation way in the Brazilian real estate market. In this way, real estate agents sought digital solutions that contribute to reducing the number of trips and maintaining interactions with the prospective client, at the same time looking for solutions that do not overwhelm their employees with basic questions about the properties.

All of this can be seen in our results, where the solutions that had the greatest increases in averages, regardless of the group, were '360°/Video Tour', 'Video Visit Broadcast', 'Chatbots' and 'FAQ List'. Although the highest averages are 'Professional Photos' and 'Messaging App' for all groups, before and after the start of the pandemic.

For Allen, Cadena et al. (2015) professional photos and 360° Tour make it easy for users to search for properties. Seiler, Madhavan et al. (2012) point out that during the search for the site, most of the users' time is spent visually browsing the properties. Photos provided by websites or real estate consultants about a property can be misleading. Which have been photoshopped or use wide-angle lenses, and essential details can be left out (Haghbayan, Malek et al. 2020). The authors cite that a good way to improve this would be through a 360° Virtual Tour. In Brazil, some real estate companies have adopted videos instead of 360° Tour, this is due to the cost of the virtual tour. Our results also show the increased importance of the Transmission of Visit by video tool. These results are consistent with the users' desire. In a report presented by the Grupo GrupoZap (2020), shows that 35% of the interviewed users wish on the sites, 360° Tour (or videos) and Transmission of visits by video tools during the pandemic. In addition, 32% would like professional photos to view the properties.

The FAQs Lists is an alternative to avoid overloading employees, especially in times of reduced budget and fewer hours to complete the ever-increasing workload (Pearson 2006). Agrawal, Menon et al. (2020) corroborate when saying that FAQ list and Chatbots help to significantly reduce the traffic received by human support. Cao and Nguyen (2021) say that real estate websites are increasingly getting more access, and real estate agencies tend to have a small number of employees, so demands are not always answered instantly. Therefore, the trend of using chatbots to help customers is getting more and more attention. The real estate chatbot system can capture the user's intention and assist in extracting important information in the user's request. In this perspective of interaction between the real estate agent and the user, a website integrated with a messaging application is very important. In Brazil, 99% of smartphone users have WhatsApp installed on their cell phone (Statista 2020), of these, 79% use the application as the main source of communication (Oberlo 2020). Thus, the integration of the application with the real estate website helps the user's communication with the real estate company, improving the user experience.

6 Conclusion

The COVID-19 pandemic has created an environment of insecurity around the world. It is affecting people's lives in terms of health and food safety issues, has hampered business activities and has dramatically affected the world economy. Many countries are struggling to recover their economies during the lockdown period. This crisis has highlighted the important role of digital technologies in the response to the pandemic in various sectors, such as healthcare, education, telecommuting, as well as the real estate sector. Digital technology in healthcare and education, for example, has provided support tools for doctors, patients, teachers and students during the COVID-19 lockdown period (Singh et al. 2020a,

b; Singh et al. 2020a, b), but they can be used forever. Digital transformation is helping many companies to adapt and overcome the problems caused by COVID-19. Digitalization is considered as a powerful tool that adds value to the business. This study aims to verify if the COVID-19 pandemic accelerated the process of perception of digitalization in Brazilian real estate websites. Our study demonstrated the change in the manager's perception, represented here by the real estate company, about the new digital tools in the companies' websites. Digital tools have enabled real estate companies to generate new ways to present their product and services to clients. The results indicate that regardless of the groups analyzed, the hypotheses confirm that after the beginning of the COVID-19 pandemic, the perception of the importance of digital technology in Brazilian real estate websites was enhanced, increased. Managers took advantage of the pandemic and the availability of digital technology to offer specialized service to customers, thus creating a new competitive scenario. Technology has made it possible to modernize many processes, from the way properties are made and the way they are advertised to the way they are purchased. The results also show that the technological solutions that had the greatest increases in the averages in the perception of managers, regardless of the analyzed group, were '360°/Video Tour', 'Visit Broadcast Video', 'Chatbots' and 'FAQ List'. Although the highest averages are 'Professional Photos' and 'Messaging App' for all groups, before and after the start of the pandemic. With the '360°/Video Tour' technology, it is possible to see the place, the enterprise from different perspectives, without the necessity of being in person at the place. According to Allen, Cadena, Rutherford and Rutherford (2015), the 360° Tour makes it easier for users to search for properties. With the use of chats such as 'Chatbots', the customer began to be served in the first contact with the company. Managers have realized that technological advances have brought a volume of information, and that this data can be used to generate reports that help improve the performance of businesses, properties and improve the user experience in the search for properties, especially during the pandemic, where social isolation occurs. The growth in the use of technology in the daily lives of people and companies to face this exceptional situation is evidence of the digital acceleration process.

Declarations

Conflict of interest The authors declare no conflict of interest.

Consent for publication The authors consent to the publication.

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