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Multivariate Analysis of the Relationship Between Digitalization and Housing Production and Sales in Construction Companies

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Abstract

This research aims to quantitatively analyze the effects of digitalization levels of companies in the construction sector on housing production and sales. Housing sales and production and construction sector digitalization indicators between 2010 and 2023, compiled by the Turkish Statistical Institute (TUIK) and the Central Bank of the Republic of Turkey Electronic Data Distribution System (EVDS), were used. Digitalization indicators generally tend to increase over time. In housing sales, first-hand sales tend to decrease, while second-hand sales tend to increase. While the new housing sales rate was 45.7% in 2013, it decreased to 31.0% in 2023. Housing permits also showed fluctuations similar to the total sales figures. There were statistically significant relationships between first-hand sales and website use; second-hand sales and social media use; and construction permits and ERP use. Only social media usage significantly reduces second-hand housing sales. Digitalization in the construction sector is not reflected in the market at a sufficient level and that studies conducted only on social media reduce second-hand housing sales. The most effective method for construction companies to reach the segment that will buy housing through social media, but this is not yet at a level that will affect first-hand housing sales.

JEL classification numbers: A10, R30, R31.
Keywords: Construction, Digitalization, Housing, Sales, Production.

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1. Introduction

Although there is a serious economic magnitude in public, commercial or non-residential real estate production, when it comes to the construction sector, the first thing that comes to mind is housing production [1-3]. Housing production is not only a subject of commercial activity, but also a production activity that comes to the fore in many areas from shelter to social needs, from architectural and aesthetic structures to civilization and has significant economic value [4-6]. In housing production, there is an economic circulation that affects not only the parties that directly carry out the production and purchase the house as a product, but also all sectors indirectly [7,8]. In this respect, housing has an important place in the economic system, and especially in countries with investment value, housing can be considered an important determinant in the economy.

In housing, which is one of the most basic production items in the construction sector, the current imbalance between supply and demand brings with it different market strategies in the sales and pricing stages [9,10]. In general, homeowners may purchase more than one house for investment purposes or for those who are afraid of banks [11-14]. In other words, it is possible to say that after the first house purchased to meet the need for shelter, the basic variables of the marketing process are more effective, and consumers who buy houses after the first house have become customers and show purchasing behavior accordingly [15,16]. At this point, the concept of digitalization gains importance in the marketing stage and needs determination in housing production and sales.

The digitalization process within a sector can generally be examined under two headings as the digitalization of internal and external processes. The digitalization of internal processes involves transferring all processes in the emergence of the final product, from technological production and inspection methods to marketing processes, to the digital environment as much as possible [17,18]. If we need to evaluate this process from the perspective of the construction sector, the digitalization of all production methods and techniques used in housing production can be an example of this type of digitalization. The digitalization and adaptation process of external processes mostly includes customer relations and public relations processes in general [19-22]. At this point, the use of websites and social media tools, the evaluation of requests and feedback from business intelligence tools, the processing of the obtained data and their use for optimization processes in production are all digitalization of communication between the external environment and the business.

In addition to meeting the need for shelter in the construction sector in Turkey, there is a significant amount of housing purchased for investment purposes [23,24]. Although there are many reasons for this, it is possible to say that the main reasons are the fluctuations and insecurity in the economy, religious sensitivities regarding interest, and political and policy uncertainties regarding the value of other investment instruments. In addition, the fact that the economic policies followed in the country do not offer sufficient solutions to the inequality in income distribution and as a result, the income goes more to a certain segment has resulted in the segment buying housing being limited to a more specific segment with high income rather than a more general population [25,26]. In other words, a limited segment

with high income buys more housing and earns rental income compared to a general population with low income. This situation encourages the use of marketing and digital channels, even if there is a supply gap compared to demand in housing production.

Although there have been studies on technological transformation processes in limited studies in the construction sector and housing production, in general, there has been no sufficient study on the impact of digitalization of enterprises in the construction sector on housing production and sales. On the other hand, knowing the relationship and impact of different digitalization processes with housing production and sales in the construction sector can play an important role in encouraging a more effective and efficient production and sales process within the sector. Therefore, this research aims to analyze the effects of digitalization on housing production and sales in the construction sector.

2. Literature Review

There are limited studies on digitalization in the construction sector in the literature, and these studies are generally addressed on a theoretical or theoretical basis. Among these, Aladağ (2022) examined digitalization in the Turkish construction sector within the scope of Industry 4.0 and reported that the level of digitalization in the sector is still insufficient in his analysis using the relative importance index method [26]. In another study, Dobrucalı and Demir (2022) analyzed the use of artificial intelligence in calculating duration in construction projects and showed the contribution of artificial intelligence and digital analysis to project duration over 71 projects between 2011 and 2016 [27]. Akbay et al. (2023) pointed out that the use of interest modeling and digital technology in construction sites is both insufficient and necessary in the sector [28]. However, in general, there are no sufficient quantitative studies on digitalization in the construction sector in Turkey.

Factors affecting housing prices in Turkey have been the subject of relatively more studies. Among these, Güller and Varol (2022) examined the factors affecting housing prices through the Erzurum sample, and reported the impact of urban development dynamics and building typology together with macroeconomic indicators [29]. In another study, Yeşil and Güzel (2021) examined housing prices through the Giresun sample in terms of structure and environment, and revealed the importance of macroeconomic and environmental factors through 246 projects offered for sale [30]. Muti and Dursın (2022) again conducted hedonic price modeling through the Erzurum sample and revealed the importance of macroeconomic indicators [31].

The common point in all these studies is that the construction sector has not yet reached a sufficient level of digitalization, and that housing in the construction sector has an economic value that is used not only for shelter but also for investment purposes. However, there are no sufficient studies that reveal the effects of digitalization on housing sales both theoretically and theoretically.

3. Methods

In this section, information about the research method, the research model, data set and statistical methods used in the analysis of the data are included.

3.1 Model of the Research

The research was designed in a mixed research model, including the descriptive screening model and the relational screening model. In this model, the subject or phenomenon intended to be examined by the researcher is first defined and described with qualitative or quantitative data, and then the relationships between the described variables are statistically analyzed [32]. In the research, firstly, the status of the digitalization levels of construction companies in Turkey over time and housing production and sales data were described, and then the relationship between them was analyzed.

3.2 Data Set

In the study, housing sales and production and construction sector digitalization indicators between 2010 and 2023, compiled by the Turkish Statistical Institute (TUIK) and the Central Bank of the Republic of Turkey Electronic Data Distribution System (EVDS), were used as the data set. The dependent, independent and control variables of the study are as follows:

Dependent Variables:
- First-hand housing sales data
- Second-hand housing sales data
- Building permits

Independent Variables:
- Online sales
- Social media usage
- Website
- ERP
- CRM

Controlling Variables:
- Consumer Confidence Index
- Exchange Rate
- Housing Price Index

Since the construction sector digitalization indicator data from the research series are given annually, the dependent and control variables were taken annually. While taking annual averages, averages were taken from the EVDS system to reduce the effect of series volatility.

3.3 Statistical Methods

In the research, parity analysis was performed for the temporal distribution and change of the data series, and percentage rates were used to define the series. In addition to housing sales and floor permit information, the share of new housing sales in second-hand housing sales was also used. Kolmogorov Smirnov test was performed for the conformity of the distribution of the data to the standard normal distribution. Since the distribution of the series did not conform to the normal distribution, nonparametric tests were used. In the relational screening analysis, Spearman's rho and year-controlled partial correlation analysis were performed for the relationships between binary series. For the effective analysis, Generalized Linear Model (Logit) analysis was performed due to minimization deviations in linearization [33-35]. All analyzes were performed in SPSS 25.0 for Windows program, with a 95% confidence interval and a significance level of 0.05.

4. Results

Online trade percentage was 6,3% in 2010, whereas 7,4% in 2022 with a peak in 2021 with 10,4% percentage. Social media usage was peaked in 2019 with 43,0% level, and ranged from 20,8% in 2013 to 27,5% in 2023. Web site usage was more common than other digitalization indicators, and its trend was increasing from 44,8% in 2010 to 67,8% in 2023. ERP usage was higher than CRP usage ranged from 10,4% in 2012 to 17,7% in 2023. CRP use was ranged from 4,0% in 2012 to 5,7% in 2023 with a peak in 2017 as 12,0% (Table 1).

Table 1: Digitalization indicators of construction firms according to years

Year	Online trade	Social media	Web site	ERP	CRM
2010	6,3		44,8		
2011	5,2		46,8		
2012	3,7		46,8	10,4	4,0
2013	3,0	20,8	49,2	11,3	4,7
2014	5,2	24,4	48,5	4,0	1,6
2015	6,0	32,6	56,1	10,1	3,5
2016	5,4	34,2	57,7		
2017	3,9	37,8	65,7	5,3	12,0
2018	4,6		51,8		
2019	3,5	43,0	56,1	9,6	10,8
2020	4,1		56,1		
2021	10,4	23,4	58,8	15,5	6,0
2022	7,4				
2023		27,5	67,8	17,7	5,7

ERP: enterprise resource planning, CRP: Customer Relations Management

In 2013, first hand flat sale rate was 45,7% value, and decreased to 31,0% in 2023. permitted flat numbers changed from 429.755 in 2010 to 535.115 in 2023 with a peak in 2018 as 894.240. Second hand flat sales were increasing trend from 2013 to 2022. In 2023, there was a decrease with effect of economical situation (Table 2).

Table 2: First and second hand housing sales with permitted flats

Year	First hand sales	Second hand sales	Percentage	Permitted flats
2010				429.755,00
2011				556.769,00
2012				556.331,00
2013	529.129,00	628.061,00	45,7	726.339,00
2014	541.554,00	623.827,00	46,5	777.596,00
2015	598.667,00	690.653,00	46,4	732.948,00
2016	631.686,00	709.767,00	47,1	754.174,00
2017	659.698,00	749.616,00	46,8	833.517,00
2018	651.572,00	723.826,00	47,4	894.240,00
2019	511.682,00	837.047,00	37,9	738.816,00
2020	469.740,00	1.029.576,00	31,3	599.999,00
2021	461.523,00	1.030.333,00	30,9	626.685,00
2022	460.079,00	1.025.543,00	31,0	642.394,00
2023	379.542,00	846.384,00	31,0	535.115,00

Spearman's rho correlation analysis results showed that only new flat sale percentage ($r=-0.821$; $p<0.05$) and permitted flats ($r=-0.905$; $p<0.01$) were significantly and negatively correlated with ERP usage. All other digitalization indicators were not significantly correlated with flat sales and production over time ($p>0.05$) (Table 3).

Table 3: Spearman's rho correlation analysis results between flat sales and digitalization parameters

	First hand sales		Second hand sales		Percentage		Permitted flats	
	r	p	r	p	r	p	r	p
Online trade	-0.309	0.385	0.273	0.446	-0.273	0.446	-0.181	0.553
Social media	0.405	0.320	0.214	0.610	0.381	0.352	0.524	0.183
Web site	-0.170	0.638	0.602	0.066	-0.304	0.393	0.286	0.343
ERP	-0.750	0.052	0.643	0.119	-0.821*	0.023	-0.905**	0.002
CRM	-0.071	0.879	0.643	0.119	-0.143	0.760	0.143	0.736

*p<0.05, **p<0.01.

According to year controlled partial correlation analysis, first hand sales was significantly and positively correlated with web site usage ($r=0.958$; $p<0.01$). Second hand sales was significantly and negatively correlated with social media usage ($r=-0.900$; $p<0.05$). permitted flats were significantly and negatively correlated with ERP usage ($r=-0.895$; $p<0.05$) (Table 4).

Table 4: Year controlled partial correlation analysis results between flat sales and digitalization parameters

	First hand sales		**Second hand sales**		**Percentage**		**Permitted flats**	
	r	**p**	**r**	**p**	**r**	**p**	**r**	**p**
Online trade	-0.333	0.584	0.728	0.163	-0.443	0.455	-0.639	0.245
Social media	0.651	0.234	-0.900*	0.037	0.762	0.135	0.754	0.141
Web site	0.958**	0.010	-0.355	0.558	0.866	0.058	0.682	0.205
ERP	-0.582	0.304	0.855	0.065	-0.743	0.150	-0.895*	0.040
CRM	0.647	0.238	-0.616	0.268	0.666	0.219	0.759	0.137

*p<0.05, **p<0.01.

Although web site usage was significantly correlated with first hand sales, GLM analysis results showed that its effect on first hand sales was not significant ($p>0.05$). However, social media usage significantly and negatively effects second hand sales with controlling variables ($B=-5633,129$; $p<0.05$). Effects of ERP usage on permitted flats were insignificant, despite of significant correlation ($p>0.05$) (Table 5).

Table 5: Generalized Linear Model (Logit) for effects of significantly correlated factors on flat production and sales

Parameter	B	Std. Error	95% Wald Confidence Interval		Hypothesis Test		
			Lower	Upper	Wald X^2	df	p
First hand sales							
(Intercept)	-157632482,086	34932062,0706	-226098065,650	-89166898,522	20,363	1	,000
Website	-1131,985	2564,1215	-6157,570	3893,601	,195	1	,659
Year	78257,068	17397,9900	44157,635	112356,502	20,232	1	,000
USD	-118334,452	30848,7850	-178796,960	-57871,944	14,715	1	,000
CSI	8345,049	4545,5176	-564,002	17254,100	3,370	1	,066
FPI	19280,931	5754,4204	8002,474	30559,388	11,227	1	,001
(Scale)	632526596,905	282874493,6513	263275162,261	1519664416,333			
Second hand sales							
(Intercept)	-120030182,890	38860041,7828	-196194465,222	-43865900,558	9,541	1	,002
Social media	-5633,129	2368,0461	-10274,414	-991,844	5,659	1	,017
Year	60180,694	19527,6765	21907,152	98454,237	9,498	1	,002
USD	-14104,298	44635,2040	-101587,690	73379,094	,100	1	,752
CSI	-3730,530	5108,3815	-13742,773	6281,714	,533	1	,465
FPI	-820,523	7937,3124	-16377,370	14736,323	,011	1	,918
(Scale)	175234464,623	87617232,3113	65768623,807	466896155,249			
Permitted flats							
(Intercept)	-154114308,367	26939764,1007	-206915275,756	-101313340,977	32,726	1	,000
Year	76549,815	13362,5211	50359,755	102739,876	32,818	1	,000
ERP	-2353,484	4451,8361	-11078,922	6371,955	,279	1	,597
USD	-107245,155	30859,8903	-167729,429	-46760,881	12,077	1	,001
CSI	8913,922	4503,3255	87,566	17740,278	3,918	1	,048
FPI	16736,004	5525,1485	5906,912	27565,096	9,175	1	,002
(Scale)	551328808,925	275664404,4625	206923547,296	1468965033,332			

USD: Exchange rate, CSI: Customer Satisfaction Index, FPI: Flat Price Index.

5. Discussion

In this research, the effects of the digitalization process on housing production and sales in the construction sector were examined, and in this context, the relationship between the digitalization data compiled by TÜİK and the housing production and sales data of the Central Bank of the Republic of Turkey was analyzed. The results obtained in the research revealed that the level of digitalization in the construction sector in Turkey is still developing proportionally, and the use of social media may be the most effective marketing method.

Housing production is an important sector that affects the lives of individuals both economically and socially. While the relationship between the housing needs of

individuals and the concept of family and social structure gives spiritual value to housing, housing is also seen as an investment tool, especially in many belief systems where interest is prohibited [12,36,37]. In addition, the direct and indirect economic relationship of housing production with many different sectors shows the importance of housing production for the economic system in the country [38-40]. In addition, housing exchange and second-hand housing sales and rentals increase the size of the economic value and importance of the sector. As in every sector, digitalization and modernization of such a significant economic value are important in the construction sector. In this regard, in Turkey, TÜİK has been sharing data on digitalization processes in construction companies, starting with online commerce and website usage in 2010. The relationship of this data with the performance of companies in the sector, and revealing which indicator is important to what extent, are important in determining the direction of digitalization in the construction sector.
The study first analyzed the level of digitalization in the construction sector in Turkey. There are limited studies in the literature on this subject, and most of them address digitalization more qualitatively and conceptually [26-28]. In this study, according to TÜİK data, the online sales level, one of the digitalization indicators in the construction sector, increased from 6.3% in 2010 to 7.4% in 2022. Social media use increased from 20.8% in 2013 to 27.5% in 2023. Although the use of ERP and CRM is relatively limited, digitalization indicators generally tend to increase over time. These results show that, although there is a digitalization trend in the construction sector in general, these studies remain at a certain level compared to the size of the sector and that significant developments are needed. In this regard, further studies can be conducted to examine the tendencies of different company structures and sizes in the sector regarding digitalization.
There have been many studies in the literature on housing sales and the factors affecting them in Turkey [29,31,41,42]. In general, two issues that stand out in these studies are that second-hand sales in Turkey are mostly for sheltering purposes and that land or first-hand sales represent an investment value. According to the EVDS data examined in this research, first-hand sales in housing sales tend to decrease, while second-hand sales tend to increase. While the new housing sales rate was 45.7% in 2013, it decreased to 31.0% in 2023. Housing permits also showed fluctuations similar to the total sales figures. When the economic situation in Turkey is evaluated, these results are consistent with the literature. Because the banks had significant interest rate hikes and investment alternatives during the period when the research was conducted, the decrease in housing sales values indicates a decrease in the sales of first-hand houses. In second-hand houses, since shelter is at the forefront rather than investment, there is a different distribution from a macroeconomic perspective.
In the research, in order to make a significant contribution to the field, according to the correlation analysis results that reveal the digitalization and housing sales and production data examined quantitatively, there are statistically significant relationships between first-hand sales and website use; second-hand sales and social media use; and construction permits and ERP use. According to the Generalized

Linear Analysis results, it is seen that only social media use significantly reduces second-hand housing sales. These results show that construction companies choose social media as the primary and most important channel to reach consumers, and that other digitalization channels are not yet at a level that will affect sales and production levels. The increase in first-hand sales figures and the decrease in second-hand sales in the construction sector may be due to the use of social media by companies. Further studies are needed for this. However, the current results indicate that the rates of choosing first-hand housing compared to second-hand housing, especially for those who buy housing for investment purposes, are significantly related to the levels of social media use by companies in the construction sector.

Limitations of the research

The most important limitation of the research is that the data is general and does not allow for more specific evaluations due to the diversity of the distribution and company structure of the construction sector in Turkey. However, although this situation is seen as a limitation in generalization, it also brings with it the fact that the research is a pioneer in the field and forms the basis for specific studies to be conducted in the future.

Another important limitation of the research is that the criteria of the digitalization process are broad both in terms of measurement and indicators. Data such as social media usage, website presence, ERP and CRM usage are mostly dichotomous data, and there is not enough information about the level, intensity and form of their usage. For example, a business that shares social media once a month and a business that shares five times a day both appear to be using social media marketing. Although this limitation actually stems from TÜİK data, it is also reflected in the research results.

Contributions of the research to the literature and the field

The most important contribution of the research to the literature is that it is a pioneer in the field and has been conducted in an area that has significant economic value in terms of both the construction sector and digitalization, as well as being socially important. Although digitalization has been addressed on a theoretical basis for the construction sector, no sufficient quantitative studies have been found. In this respect, the research provides significant contributions to the literature.

The contribution of the research to the field is that it numerically reveals the direct reflections of the digitalization process on the field and gives construction company managers an idea about which digitalization process can be more important and effective. Undoubtedly, the importance of social media communication is estimated in every sector. However, the research has both numerically revealed its importance and shown the level of impact within other digitalization levels.

6. Conclusion

It reveals that digitalization in the construction sector is not reflected in the market at a sufficient level. Although the share of digitalization indicators among companies in the sector is above the limit of significance, it is seen that there are businesses that do not yet have the most basic digitalization processes such as websites or social media. Today, digitalization is not a choice, but a necessity and need, both in terms of increasing competition and efficiency in domestic markets and in terms of businesses having a sustainable financial activity cycle on a global scale. In this respect, the necessary steps should be taken for the digitalization of construction companies, public and scientific studies should be carried out, and the necessary support should be provided.

Another important result that stands out in the research is the finding that studies conducted solely on social media reduce second-hand housing sales. Considering that second-hand housing sales are mostly through individuals, it is seen that the most effective method is for construction companies to reach the segment that will buy housing through social media, but this is not yet at a level that will affect first-hand housing sales. Advanced studies and field applications are needed in this regard. In addition, according to the findings obtained in the research, more specific data and feedback systems are needed in second-hand housing sales. The sector can be supported by providing more data and evaluations, especially in housing purchase processes for sheltering purposes, especially by banks and financial institutions.

As a result, the construction sector, like all other sectors, is one of the areas where steps need to be taken in terms of digitalization, where second-hand housing sales are affected through social media communication, and where digital transformation is important. For this, first of all, serious economic and structural, administrative studies, public supports and scientific research are needed in the sector, from the purpose of buying a house to the valuation process, from the economic process to the social process.

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References

[1] Çetin, A. C. (2021). Türkiye'de konut fiyatlarına etki eden faktörlerin analizi. Mehmet Akif Ersoy Üniversitesi Uygulamalı Bilimler Dergisi, 5(1), 1-30.

[2] Kedir, F., & Hall, D. M. (2021). Resource efficiency in industrialized housing construction–A systematic review of current performance and future opportunities. Journal of Cleaner Production, 286, 125443.

[3] Purkis, S. (2016). İstanbul'da inşaat odaklı birikimin durdurulamayan yükselişi: konut fazlasına karşın artan konut açığı. Mülkiye Dergisi, 40(4), 91-112.

[4] Marrero, M., Rivero-Camacho, C., Martínez-Rocamora, A., Alba-Rodríguez, D., & Lucas-Ruiz, V. (2024). Holistic assessment of the economic, environmental, and social impact of building construction. Application to housing construction in Andalusia. Journal of Cleaner Production, 434, 140170.

[5] Mast, E. (2023). JUE Insight: The effect of new market-rate housing construction on the low-income housing market. Journal of Urban Economics, 133, 103383.

[6] Fedorova, I. Y., Urunov, A. A., Rodina, I. B., & Ostapenko, V. A. (2020). Financing and quality of housing construction: introduction of information systems as a regulatory tool. Revista Inclusiones, 7(S2-1), 328-339.

[7] Romero Quidel, G., Soto Acuña, M. J., Rojas Herrera, C. J., Rodríguez Neira, K., & Cárdenas-Ramírez, J. P. (2023). Assessment of Modular Construction System Made with Low Environmental Impact Construction Materials for Achieving Sustainable Housing Projects. Sustainability, 15(10), 8386.

[8] Sobieraj, J., & Metelski, D. (2023). Identification of the key investment project management factors in the housing construction sector in Poland. International Journal of Construction Management, 23(1), 1-12.

[9] Molloy, R. (2020). The effect of housing supply regulation on housing affordability: A review. Regional science and urban economics, 80(C), 1-5.

[10] Strobel, J., Nguyen Thanh, B., & Lee, G. (2020). Effects of macroeconomic uncertainty and labor demand shocks on the housing market. Real Estate Economics, 48(2), 345-372.

[11] Coşkun, Ş., Turanlı, M., & Yılmaz, K. (2024). Katılım Bankalarında Toplanan ve Kullandırılan Fonların Sektör Paylarıyla İlişkisi ve Makroekonomik Göstergelerin Etkisi. Journal of Islamic Research, 35(2), 240-53.

[12] Akinsulire, A. A., Idemudia, C., Okwandu, A. C., & Iwuanyanwu, O. (2024). Strategic planning and investment analysis for affordable housing: Enhancing viability and growth. Magna Scientia Advanced Research and Reviews, 11(2), 119-131.

[13] Christophers, B. (2022). Mind the rent gap: Blackstone, housing investment and the reordering of urban rent surfaces. Urban Studies, 59(4), 698-716.

[14] Yılmaz, K., & Turanlı, M. (2022). Türkiye'de Katılım Bankalarının Finansal Performanslarının Hane Halkı Gelir Grupları İle İlişkisi. İşletme Araştırmaları Dergisi, 14(4), 2785-2795.

[15] Kuchler, T., Piazzesi, M., & Stroebel, J. (2023). Housing market expectations. In Handbook of economic expectations (pp. 163-191). Academic Press.
[16] Hala, Y., Abdullah, M. W., Andayani, W., Ilyas, G. B., & Akob, M. (2020). The financial behavior of investment decision making between real and financial assets sectors. The Journal of Asian Finance, Economics and Business, 7(12), 635-645.
[17] Li, D., & Shen, W. (2021). Can corporate digitalization promote green innovation? The moderating roles of internal control and institutional ownership. Sustainability, 13(24), 13983.
[18] Zhou, D., Yan, T., Dai, W., & Feng, J. (2021). Disentangling the interactions within and between servitization and digitalization strategies: A service-dominant logic. International Journal of Production Economics, 238, 108175.
[19] Carlsson, L. (2023). Strategizing organizational capabilities for industrial digitalization–exploring managers' technological frames. Journal of Manufacturing Technology Management, 34(9), 20-39.
[20] Radicic, D., & Petković, S. (2023). Impact of digitalization on technological innovations in small and medium-sized enterprises (SMEs). Technological Forecasting and Social Change, 191, 122474.
[21] Miceli, A., Hagen, B., Riccardi, M. P., Sotti, F., & Settembre-Blundo, D. (2021). Thriving, not just surviving in changing times: How sustainability, agility and digitalization intertwine with organizational resilience. Sustainability, 13(4), 2052.
[22] Vasilev, V. L., Gapsalamov, A. R., Akhmetshin, E. M., Bochkareva, T. N., Yumashev, A. V., & Anisimova, T. I. (2020). Digitalization peculiarities of organizations: A case study. Entrepreneurship and Sustainability Issues, 7(4), 3173.
[23] Bayrak, İ. C., & Telatar, O. M. (2021). İnşaat sektörü ve ekonomik büyüme ilişkisi: Türkiye ekonomisi üzerine ampirik bir analiz. Gümüşhane Üniversitesi Sosyal Bilimler Dergisi, 12(3), 1283-1297.
[24] Tanyılmaz, K., & Karahan, M. (2021). Kalkınma ve inşaat sektörü: Türkiye örneği. Ardahan Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 3(1), 62-68.
[25] Artekin, A. Ö. (2023). Türkiye'de İnşaat Sektörü, İstihdam ve Ekonomik Büyüme Arasındaki İlişkinin İncelenmesi: GMM Yaklaşımı. Selçuk Üniversitesi Sosyal Bilimler Meslek Yüksekokulu Dergisi, 26(2), 491-503.
[26] Aladağ, H. (2021). Türk İnşaat Sektöründe Dijital Dönüşüm Uygulamalari Üzerine Bir Araştırma. Journal of Engineering Sciences and Design, 2022, 10(3), 973-986.
[27] Dobrucalı, E., & Demir, İ. H. (2022). İnşaat Proje Süresinin Yapay Zeka İle Belirlenmesi. Determination of Construction Project Duration with Artificial Intelligence. International Refereed Journal of Engineering and Sciences, 1-13.
[28] Akbay, R. B., Ökten, B. B., & Üstüner, Y. A. (2023). Şantiyelerde Bilgi Modellemesi ve Dijital Teknolojilerin Kullanımı. AJIT-e: Academic Journal of Information Technology, 14(54), 298-319.

[29] Güller, C., & Varol, C. (2022). Erzurum'da Konut Fiyatlarına Etki Eden Faktörlerin Hedonik Analiz Yardımıyla Belirlenmesi. Sosyoekonomi, 30(54), 377-400.
[30] Yeşil, P., & Güzel, M. (2021). Giresun kent merkezi'nde konut fiyatlarına etki eden yapısal ve çevresel etkenlerin belirlenmesi. Akademik Ziraat Dergisi, 10(2), 305-316.
[31] Muti, A., & Dursun, A. (2022). Konut Fiyatlarına Etki Eden Faktörlerin Hedonik Fiyat Modeli ile Belirlenmesi: Erzurum İli Örneği. Bingöl Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 6(2), 349-380.
[32] Karasar, N. (2014). Bilimsel araştırma yöntemi. (26.baskı). Ankara Nobel Yayınevi.
[33] Turanli, M., & Yılmaz, K. (2023). Linearization Problems In Managerial Sciences. Prof. Dursun KOSE, Ph. D., 438.
[34] Yilmaz K, Turanlı M. (2022). A multi-disciplinary investigation on minimizing linearization deviations in different regression models. Change & Shaping The Future, IV. ASC-2022/Fall Congress ISBN 978-625-8048-99-5
[35] Yılmaz K, Turanlı M. (2023). A Multi-disciplinary Investigation of Linearization Deviations in Different Regression Models. Asian Journal of Probability and Statistics. 2023 Apr 29;22(3):15-9.
[36] Power, E. R., & Mee, K. J. (2020). Housing: an infrastructure of care. Housing studies, 35(3), 484-505.
[37] Rodríguez-Pose, A., & Storper, M. (2020). Housing, urban growth and inequalities: The limits to deregulation and upzoning in reducing economic and spatial inequality. Urban Studies, 57(2), 223-248.
[38] Anthony, J. (2023). Housing affordability and economic growth. Housing policy debate, 33(5), 1187-1205.
[39] Guren, A. M., McKay, A., Nakamura, E., & Steinsson, J. (2021). Housing wealth effects: The long view. The Review of Economic Studies, 88(2), 669-707.
[40] Ilyash, O., Hrynkevych, S., Ilich, L., Kozlovskyi, S., & Buhaichuk, N. (2020). Economic assessment of the relationship between housing and communal infrastructure development factors and population quality of life in Ukraine. Montenegrin Journal of Economics, 3, 93-108.
[41] Alas, B. (2021). Şehir İçinden Geçen Karayollarının Konut Alt Piyasasına Etkisi: İstanbul Anadolu Yakasından Geçen D100 Karayolu. Uludağ Üniversitesi Mühendislik Fakültesi Dergisi, 26(1), 269-282.
[42] Gözen, M. Ç., & Bostancı, F. C. (2021). Konut özelliklerinin konut fiyatlarına etkisinin kantil regresyon yöntemi ile incelenmesi: İzmit örneği. Iğdır Üniversitesi Sosyal Bilimler Dergisi, (26), 506- 532.