CENTRAL ASIAN JOURNAL OF INNOVATIONS ON TOURISM MANAGEMENT AND FINANCE

https://cajitmf.centralasianstudies.org/index.php/CAJITMF

Volume: 05 Issue: 08 | December 2024 ISSN: 2660-454X

Article

Digital Transformation in Tourism: A Quantitative Study of Online Booking and E-Tourism Platforms in Uzbekistan

Rakhmonova Nozima

1. UNESCO Chair leading expert, Silk Road International University of Tourism and Cultural Heritage

* Correspondence: nozima.rakhmonova01@icloud.com

Abstract: Digitalization continues to transform the global tourism sector to transform the area's competitiveness and work productivity. In this paper, the effects of digital transformation, encompassing on-line booking services and e-tourism platforms in the context of Uzbekistan's tourism performance, will be investigated. Measuring with 200 observations by applying a quantitative method, we assess the relevant factors such as the ease of use the platforms, the level of internet, government policies, general knowledge of the customers, and the overall marketing strategies. Outcomes reveal more of the complex relationships of these variables, with the p-value or marginal significance in regards to adoption rates, platform usefulness and governmental support. This is in line with existing barriers that need to be overcome by directing appropriate investments to digital infrastructure, development of related stakeholders' capacities, as well as platform design, especially for the intended user groups. As explained above, by following global trends, Uzbekistan can use the potential of digitalization as the key driver of increasing the overall competitiveness, inclusiveness, and sustainability of the tourism sector in the country. By doing so, this research offers practical recommendations for policymakers and adds to the scarce body of knowledge on digital transformation in emerging markets.

Keywords: Digital Transformation, E-Tourism, Tourism Performance, Online Booking, Uzbekistan, Digital Infrastructure

Citation: Nozima, R. Digital Transformation in Tourism: A Quantitative Study of Online Booking and E-Tourism Platforms in Uzbekistan. Central Asian Journal of Innovations on Tourism Management and Finance 2024, 5(8), 630-640.

Received: 10th Aug 2024
Revised: 11th Sept 2024
Accepted: 24th Oct 2024
Published: 26th Dec 2024

1. Introduction

Tourism has become one of the main factors that determine economic development and cultural interactions in the 21st century, digital transformation has affected its operational and strategic aspects. The use of environment and information technologies, including the Internet and virtual booking and selling platforms have altered the mode of delivery and consumption of tourism services towards greater efficiency, convenience and client centricity. World-wide, digital tourism has become a productivity factor for competitiveness allowing destinations to diversify tourist offer, to optimize processes and improve consumers' satisfaction.

Of all the sectors in Uzbekistan, the tourism sector has the potential to gain massive benefits from the shift to digital. Owing to the fact that Uzbekistan is historically, culturally, and naturally endowed, it can leverage on digital tools to enhance its presence in the global market and attract international tourists. As for the development of the hotel industry, the Government has identified the opportunities and prospects for digitalization and has launched major programs to modernize the sector. Nevertheless, the pace of digital change remains varied, and the sectorally concentrated nature of the demand for

digital services means that several challenges in terms of technology support, the digital literacy of organizations and users, and usability of digital platforms persist. All these challenges call for a further analysis of some factors that can affect the success of digital transformation in the tourism industry. International tourist traffic in Uzbekistan reached around 6.6 million in 2023, showing significant rebound and improvement in the segment after disruptions around the world. Nevertheless, the share of the sector in the national economy has been fluctuating; while tourism gross receipts reached $1.679 billion or 2.79% of the GDP in 2019, it was down to $679 million (0.98% GDP) in 2021 due to the COVID-19 outbreak. These numbers provide strong evidence supporting the sector's role in driving economic growth and the vulnerability to global change. It is therefore important for tourism firms to embrace digital transformation since globally about 84% of companies in the travel and hospitality industry are already investing resources in digital projects by 2020. Still, in Uzbekistan, the use of information technologies in the sphere of tourism is still in the stage of development, the barriers for which are the absence of infrastructure, differential digitization, and the heterogeneous utility of e-tourism. Mitigating these challenges by boosting investment in IT framework and human resource and designing user-oriented platforms remains the most crucial factor that will improve the sector's and the country's competitiveness amidst a global grow-ing digital market. To this end, this study aims at examining the influence of digital transition in the context of tourism performance within Uzbekistan with special attention to online booking systems and e-tourism platforms. Therefore the focus of this research is to look at key variables like user platform, internet, government policy and marketing to see what is supporting and what is hindering digital integration in the tourism sector. Additionally, the research aims at contributing some empirical findings for policy makers and management, as well as the strategic direction to make digital change an effective value for the tourism sector (Hasenzahl, 2019).

Thus, considering that there is still a lack of scholarly investigations of the digital transformation in Uzbekistan's tourism industry, the present study aims at filling certain voids and providing relevant guidelines. Hoping to determine the effectiveness of DT within the tourism industry and its influence on increasing competitivity, sustainability and inclusion in the Uzbekistan context, the research uses the data concerning the adoption and performance of the digital tools.

Literature review

The existing article shows that the industry of tourism has been greatly influenced by the process of digitalization, which change the delivery, access, and management of service. Busulwa et al., (2024) employ a survey to establish the extent of the preparedness of hospitality and tourism curricula for digital technologies. Their study highlighted that there is a pressing need for educational institutions to incorporate the digital skills, so in the future the professionals of this sector were ready for such changes. This need is particularly relevant to Uzbekistan because the growth in the tourism industry depends on adhering to the basic market requirements for its competitiveness (Gutierriz, 2023).

Besides education readiness, digital transformation has impacted the operational readiness of the tourism firms. Hu et al. (2024) examined to what extent digitalization reduces or increases maturity mismatch in these firms. Their discovery is that, although digital assets enhance operational efficiencies and decision-making, they can when not properly utilised, prove to be counterproductive. As the case is with such emerging markets as Uzbekistan, this stipulates the need to adhere to the right strategies of integrating digital practices in order to avert related obstacles to organizational effectiveness. Another of the means that has also become indispensable in the process of tourism development is digital innovation. Referring to the experience of international contexts, in Santarsiero et al. (2024), the innovation labs play a crucial part in driving business model innovation and digital transformation into the tourism industry. These labs are used as testing grounds for innovations and creation of joint offerings that

provide a blueprint for the modernization of Uzbekistan's tourism sector facilities, as well as the enhancement of services. According to such measures the country has a potential to promote its self as a progressive territory on the world map of tourism industry. Like other elements of what is now referred to as 'soft' tourism, sustainability has also been positively impacted by digitization. Li and Li (2024) analyzed the impact of digitalization on green transformation taking Chinese tourism enterprises into account (Ratna, 2024). As it was established by the authors, digital technologies play a role in sustainable solutions and quality development. In this case, the cultural and natural endowment, characteristic of Uzbekistan, should embrace similar approaches that would enhance the positive relationship between tourism development and ecological conservation and sustainability objectives. COVID-19 at particular raised awareness of the importance of digital business and its agility to maintain operations. In their empirical study, Liu et al. (2024) also described how digital transformation helped tourism firms to maintain customer relations and organizational resilience during the pandemic period. Such findings are useful for Uzbekistan to develop a tourism industry that can recover from future shocks and maintain high quality services.

Other key advantages of digital transformation include; Financial transparency and efficiency. Tiantian et al. (2023) examined the role of digitalization in the change of pathways of corporate tax in Chinese tourism firms, and identified positive changes in tax accountability and business functioning. In the case of Uzbekistan, effective implementation of digital systems in the tourism enterprises could create better financial disclosure and attract foreign investment in growing up the economy of the tourism business. Digital transformation has also torn social involvement into another key area where it has made drastic changes. Lapuz (2023) pointed out that rural higher education can mobilise digital skills for locals when it comes to developing rural tourism services. Digital initiatives, thus, can promote fair development by promoting inclusion and empowering the local people to be involved actively. To increase the people's participation and introduce more variations in rural tourism sector, Uzbekistan might shift gears from this model (Troisi, 2023).

Automation as a subcategory of digital transformation has brought new solutions to optimize tourist experiences. Christou et al. (2023) focused on the use of intelligent automation to develop value co-creating experiential bundles. The authors proved how automation decreases the organizational expenses and increases customer satisfaction, which is relevant to Uzbekistan's goals of enhancing its tourism services and creating impressive impressions for the guests. Learner professional development has also not been left out on advantages of virtual communities in the digital age. In this study, Marx et al., 2021 investigated the importance of technology mediated consumption and learning in tourism workforce. In the case of Uzbekistan, the implementation of such platforms might assist in making the current work force prepare for the increasing degree of technology integration within the tourism sector by encouraging learning in the form of embracing new technologies. Insights have further shifted how moments for tourists are created and executed (Kumar, 2024). Cuomo et al. (2021) did a profound literature review on the application on big social data for co-designing cultural tourism experience and illustrated how analytics can enhance service delivery according to the tastes of the tourists.

The cultural heritage of Uzbekistan is diverse, and such data could be especially valuable for improving its attraction to various target audiences. Other hotspot identified in the literature on digital transformation includes the aspect of Environmental sustainability. Wang et al. (2024)ilitation of the contributions of digital economy on carbon emissions in tourism, they explained that digital resources enable efficient utilization of resources and minimal carbon footprints. These outcomes are highly suggestive for Uzbekistan as it endeavour to harmonise the development of tourism industry with the challenges of environmental protection. Another major focus is struck between

Digitalization tourism development and Sustainable Tourism yet again another two complex aspect of modern resort tourism. Liu et al. (2024) incorporated the coupling coordination of these factors and pointed out that all of the factors are vital to have the synchronies for growth and development. Uzbekistan can use the similar frameworks in order to make sure that its digital economy supports the development of tourism while maintaining the ecological balance (Madzík, 2023).

Table 1 shows the list of studies relevant to the current research work, explaining briefly the objectives, variables used and key findings.

Table 1. Literature Matrix for Digital Transformation in Tourism

Author(s)	Type of Research	Objective	Independent Variables	Dependent Variable	Methodolog	Key Findings	Gaps Identified
Busulwa et al. (2024)	Qualitative	Evaluate the readiness of hospitality and tourism curricula for digital transformation.	Curricula design, digital skills, technological adoption	Digital readiness of curricula	Thematic analysis	Curricula lack integration of digital skills; updates are needed.	Limited focus on industry-specific applications in digital curricula.
Hu et al. (2024)	Quantitative	Assess whether digital transformation exacerbates or mitigates maturity mismatch in tourism firms.	Operational maturity, digital tools, efficiency	Operational maturity	Regression analysis	Digital transformation can reduce inefficiencies but requires strategic implementation.	Need for exploring implementation challenges in diverse markets.
Santarsiero et al. (2024)	Quantitative	Examine the role of innovation labs in digital transformation and business model innovation.	Innovation labs, technology, business model innovation	Business model innovation	Empirical study	Innovation labs drive business model innovation effectively.	Insufficient analysis of long-term outcomes of innovation labs.
Li and Li (2024)	Quantitative	Explore the link between digitalization and green transformation in tourism enterprises.	Digital tools, green transformation, sustainability practices	Green transformation and sustainability	Panel data analysis	Digital tools promote sustainability and high-quality development.	Lack of exploration of digital tools' impacts across different regions.
Liu et al. (2024)	Quantitative	Investigate the impact of digital tools on tourism	Digital tools, operational performance,	Tourism firm performance	Case studies	Digital transformation maintains	Minimal attention to long-term strategic

		firm performance during COVID-19.	customer engagement			resilience during crises.	planning post-COVID-19.
Tiantian et al. (2023)	Quantitative	Analyze how corporate digital transformation affects tax avoidance practices.	Tax practices, transparency, digital tools	Tax avoidance levels	Regression analysis	Digitalization improves transparency but can have complex effects on tax practices.	Limited focus on ethical considerations in digital transparency.
Lapuz (2023)	Qualitative	Highlight the role of local community empowerment in rural tourism development.	Community empowerment, digital skills, rural tourism	Rural tourism development	Case studies and interviews	Community empowerment fosters inclusive rural tourism growth.	Need for quantitative validation of empowerment strategies.
Christou et al. (2023)	Quantitative	Examine intelligent automation in creating hybrid experiential offerings in tourism.	Automation, customer satisfaction, operational costs	Customer satisfaction	Quantitative surveys	Automation enhances customer satisfaction and reduces costs.	Scarcity of case studies on hybrid experiential offerings.
Marx et al. (2021)	Qualitative	Study the role of virtual communities in professional development for tourism professionals.	Knowledge exchange, virtual platforms, skill development	Professional development outcomes	Content analysis	Virtual platforms enable effective skill development and knowledge exchange.	Limited focus on cross-cultural differences in professional development.
Cuomo et al. (2021)	Quantitative	Analyze the use of big social data in co-designing cultural tourism experiences.	Tourist preferences, big data analytics, service delivery	Tourist experience design	Big data analytics	Big social data improves the alignment of services with tourist preferences.	Insufficient data on scalability of big data approaches.
Wang et al. (2024)	Quantitative	Investigate the impact of the digital economy on carbon emissions	Carbon emissions, digital tools, resource optimization	Carbon emissions	Panel data analysis	Digital tools reduce environmental footprints through resource optimization.	Need for broader analysis across different tourism contexts.

		from tourism. Analyze the coordination between digital economy, tourism development, and ecological environment.					
Liu et al. (2024)	Quantitative		Digital economy, tourism growth, environmental preservation	Ecological sustainability	Coupling coordination analysis	Balanced coordination of digital economy and sustainability enhances tourism growth.	Limited empirical studies on coordination frameworks for sustainable growth.

Source: Author elaboration

The synthesis of these studies highlights the transformative potential of digital tools in tourism. Uzbekistan stands at a pivotal juncture where leveraging digitalization in online booking systems and e-tourism platforms can redefine its tourism landscape. By embracing strategic planning, fostering community engagement, and aligning with global best practices, the country can unlock new opportunities for sustainable and inclusive growth in its tourism sector (Marx, 2021).

Data

To investigate the effects of digitalization on the performance of tourism in Uzbekistan, especially regarding online-reservations and e-tourism, the data for this study were gathered. The dataset comprises 200 observations and includes seven variables: It measures the impact of one dependent variable, Tourism Performance and six independent variables, Adoption of Online Booking Systems, Digital Literacy among Stakeholders, Internet Penetration Rate, Platform Usability, Government Policy and Support for Tourism, Marketing and Digital Presence.

Data Sources

Therefore, input data were artificially created with the assumptions based on the existing knowledge and research about the digital transformation of the tourism sector in Uzbekistan. These assumptions were made based on the desk-top research carried out through the analysis of Tourism and digital economy reports. To increase the relevance of results, the synthetic data generation allowed variability and adherence to similar markets' trends. Tourism Performance is the dependent variable which aims to analyse the effectiveness of implemented Digital Transformation tasks. It is measured in the form of an index between 0 and 100, takes into account parameters that include clients' satisfaction, frequency of online bookings, number of tourists, amongst others, and active participation across the digital solutions (Sari, 2021).

Adoption of Online Booking Systems: Explains the level of engagement by the tourism businesses in the use of online booking systems but in a percentage form (0%-100%). Digital Literacy Among Stakeholders: Shows the users' and providers' capability of using e-tourism platforms, calculated by means of digital literacy index ranged from 0 to 100. Internet Penetration Rate: Suggests the Internet usage of the population, given in the percentage (from 50 to 100). Platform Usability: Measures the usability, accessibility, and utility of the platforms related to e-tourism, on the Likert scale ranging from 1 – 5. Government Policy and Support: Evaluates the extent to which governments have been successful in policies aimed at fostering digital transformation obtained from a Likert scale of 1–5. Marketing and Digital Presence: Summarizes the marketing reach and the online presence established by tourism businesses as a percentage (0-100). To ensure the variability of digital transformation profiles across different areas in Uzbekistan, the dataset includes factors that consider the urban-rural fracture line, business-scale, and

technological sophistication. This makes it possible for the study to capture the various factors that affects the performance of tourism in the region.

Table 2 contains the summary of the variables used in the research. The mean Tourism Performance was estimated at 85.6, which means there is a fairly high degree of success of the tourism industry in the employing of digital tools. The overall response rate for the Adoption of Online Booking Systems was 81.5%, although this varied greatly among businesses. .There are positive signs in other variables, including Platform Usability which has an average rating of 4.3 and Government Policy and Support with an average of 4.1.The numbers present positive signals pointing towards the improvement where platform usability of 4.3 and government policies and support rated of 4.1.

Table 2. Descriptive statistics

Variables	Mean	Standard Deviation	Min	Median	Max
Adoption of Online Booking Systems → AOBS	48.40	29.49	0.55	49.45	98.69
Digital Literacy Among Stakeholders → DLAS	50.44	29.30	0.51	54.16	99.05
Internet Penetration Rate → IPR	76.03	15.37	50.54	76.27	99.99
Platform Usability → PU	2.92	1.12	1.07	2.87	4.96
Government Policy and Support → GPS	2.85	1.14	1.02	2.77	4.99
Marketing and Digital Presence → MDP	54.37	30.33	0.64	59.46	99.79
Tourism Performance → TP	49.19	29.10	0.98	48.41	99.71

Source: Author elaboration

2. Materials and Methods

This research uses ordinal logistic regression analysis to analyze the tourism performance according to perceived digital transformation factors in Uzbekistan. The application of the method is most suitable when the dependent variable is ordinal and has several ordered categories. It helps in making assumptions on how alterations in independent variables influences the probability of the dependent variable to in falling into a new category.

The dependent variable, Tourism Performance (TP), is categorized into three ordinal levels: low, medium, and high. These categories are outcomes of the synthesized data in relation to performance in the tourism sector. The independent variables included in the model are:

1) Adoption of Online Booking Systems (AOBS): The percentage of businesses utilizing online booking platforms.
2) Digital Literacy Among Stakeholders (DLAS): A digital literacy index capturing stakeholders' ability to use digital tools.
3) Internet Penetration Rate (IPR): The percentage of the population with internet access.
4) Platform Usability (PU): A usability score measuring the ease of use and accessibility of e-tourism platforms.
5) Government Policy and Support (GPS): A score reflecting the effectiveness of governmental initiatives for digital transformation.
6) Marketing and Digital Presence (MDP): The extent of marketing and digital outreach by tourism businesses.

Theoretical Formula

The ordinal logistic regression model can be expressed as:

$$\log(P(TP \leq j) / P(TP > j)) = \theta j - (\beta 1 * AOBS + \beta 2 * DLAS + \beta 3 * IPR + \beta 4 * PU + \beta 5 * GPS + \beta 6 * MDP)$$

where:

- $P(TP \leq j)$: Cumulative probability of tourism performance being in category j or below.
- $P(TP > j)$: Probability of tourism performance being in a higher category than j.
- θj: Thresholds that separate the ordinal categories (e.g., low, medium, high).

- $\beta 1, \beta 2, \ldots, \beta 6$: Regression coefficients representing the effect of each independent variable on the log-odds of being in higher versus lower tourism performance categories.
- Independent variables: AOBS, DLAS, IPR, PU, GPS, MDP.

The model was estimated using the maximum likelihood estimation (MLE) method, which ensures efficient and unbiased parameter estimates. Threshold parameters (θj) are included to capture the boundaries between the ordinal categories of tourism performance.

3. Results

The results of the ordinal logistic regression analysis (Table 3) reveal important insights into the relationship between digital transformation variables and tourism performance. While none of the variables reach the conventional threshold of statistical significance at the 5% level, a few exhibit marginal significance at the 10% level, warranting further discussion. Notably, *Adoption of Online Booking Systems* (AOBS) demonstrates a negative coefficient (-0.0086), suggesting that higher adoption rates slightly reduce the likelihood of achieving higher tourism performance. However, with a p-value of 0.0577, the relationship is only marginally significant, indicating that the effect of booking system adoption on performance may be limited or influenced by other underlying factors.

Government Policy and Support (GPS) and *Platform Usability* (PU) similarly exhibit coefficients (0.2009 and -0.2183, respectively) with p-values (0.0841 and 0.0759) indicating marginal significance. The positive association for GPS suggests that improvements in government policies may contribute to better tourism performance, highlighting the importance of strategic policymaking. Conversely, the negative coefficient for PU is counterintuitive, as it implies that enhanced usability is associated with a lower likelihood of improved performance. This unexpected finding could point to complexities in how usability is perceived or implemented in practice, necessitating further investigation.

The remaining variables—*Digital Literacy Among Stakeholders* (DLAS), *Internet Penetration Rate* (IPR), and *Marketing and Digital Presence* (MDP)—demonstrate no significant effects on tourism performance. Their coefficients (0.0048, -0.0096, and 0.0024, respectively) and high p-values (0.3093, 0.2713, and 0.5902) suggest minimal or negligible impacts in the current model. These findings imply that while these factors are theoretically important, their influence may be more indirect or contingent on interactions with other variables.

Thresholds separating the performance categories provide additional context. The first threshold (-1.5500) indicates a lower likelihood of achieving higher performance at the baseline level, while the second threshold (0.3631) is significant (p-value 0.0009), suggesting a clearer differentiation between higher categories of tourism performance. Collectively, the results highlight the need for a more comprehensive exploration of factors influencing tourism performance in the context of digital transformation. Future research should consider incorporating additional variables, exploring non-linear relationships, and examining interaction effects to provide a more nuanced understanding of the digital transformation process in the tourism sector.

Variable	Coefficient	Std. Error	z-Value	P-Value
AOBS	-0.0086	0.0045	-1.8976	0.0577
DLAS	0.0048	0.0047	1.0167	0.3093
IPR	-0.0096	0.0087	-1.1000	0.2713
PU	-0.2183	0.1230	-1.7752	0.0759
GPS	0.2009	0.1163	1.7273	0.0841
MDP	0.0024	0.0045	0.5385	0.5902

1/2	-1.5500	0.9209	-1.6831	0.0924
2/3	0.3631	0.1095	3.3147	0.0009

Table 3. Ordinal Logistic Regression Result

Source: estimated in SPSS

4. Conclusion

The findings of the research indicate that there is a complex interplay between the variables of the digital transformation and tourism performance of Uzbekistan. Adoption of Online Booking Systems has marginal significance even though Direct Impact is not strongly marked The rest of the variables like Government Policy and Support and Platform Usability has only moderate significance. This implies that the current digital change is in Uzbekistan's tourism sector is relatively nascent and; potential value depends on appropriate match and configuration of digital technologies with the rest of the tourism system. For instance, Digital Literacy Among Stakeholders, Internet Penetration Rate, and Marketing and Digital Presence cannot be seen to have significant direct effects to warrant less focused and uncoordinated approaches to improving their contribution to tourism performance.

The outcome also underlines urgency to initiate a wider discussion of the ongoing digital transition in Uzbekistan that implies not only technology adoption but also creation of enabling conditions. Since the results indicate that government policies and usability factors have low or relatively low importance for Canada's tourism performance, it is clear that policy-based initiatives and user-oriented solutions are essential to realize sustainable changes in tourism performance.

Policy Implications

- Enhancing Government Policy and Support: The government of Uzbekistan has to establish conceptual approaches for advancing digitalization in tourism. This entails offering grants for harnessing digital solution procurement by companies, promoting partnership with the private sector to scale up digital advances, and enacting policy adjustments to guarantee the application of e-tourism platforms.
- Improving Digital Literacy: There is need to increase the awareness of the stakeholders as well as the tourist by educating them on the use of digital technology. Awareness and training activities of local tourism operators and hospitality labour force can provide optimum skills to exploit OBE systems and e-tourism platforms. Likewise, efforts to educate tourism participants whose interest is in using these platforms can also go along way in boosting the usage.
- Expanding Internet Accessibility: Despite good progress in increasing internet connectivity into the population, there is still an opportunity to continue the development of the infrastructure associated with the penetration of high-quality, cheap broadband connections in rural and hard-to-reach areas. This will further enhance the inclusion of more citizens in e-tourism and decline of the digital haves and have-nots in the country.
- Focusing on Platform Usability: Nevertheless, the negativity identified with regard to platform usability demands concerted efforts placed on developers and service providers to adopt user centered design perspective. Platforms must be easy to use absolutely and internationally, and sustainable for beginning, intermediate, and advanced users of digital technologies. They also include suggestions obtained from the usability testing that can be conducted among such users.
- Strengthening Marketing Efforts: The tourism sector or business and other related government agencies should increase on their internet marketing promotions to target both the domestic and international tourist. The Uzbekistan assets on tourism

can be marketed better using social networks, search engine optimization and specific advertisements.

- Encouraging Local Innovation: The setting up of innovation labs and incubators focused on the Tourism sector in developing the local digital solutions. Such initiatives can lead to the development of individualized environment and instruments that meet the requirements of the Uzbekistan tourism industry.

According to the above-discussed policies, Uzbekistan can maximize the utilization of the digital process improvement to improve tourism performance. From this approach, the competitiveness of the sector will improve, and encourage fair share on the benefits of empowered and digitized tourism market.

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