

RESEARCH ARTICLE

WILEY

Chaos theory perspective on tourism crisis management: A case study of the COVID-19 pandemic in South Korea

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Funding information

National Research Foundation of Korea (NRF) grant funded by the Korea government (*MSIT), Grant/Award Number: No.2018R1A5A7059549; *Ministry of Science and ICT

Abstract

The global tourism industry has been significantly affected by the COVID-19 pandemic, underscoring the importance of innovative crisis management. Traditional crisis management approaches based on the generalized assumption of linearity fail to account for the complex and chaotic nature of tourism crises and systems. Chaos theory, well-known for its ability to manage unpredictable events and facilitate the emergence of new orders, provides a useful framework for tourism crisis management. Thus, this study aims to investigate the application of chaos theory principles to crisis management during the COVID-19 pandemic in South Korea. This study provides a synthesis of theoretical perspectives and practical examples with significant implications for tourism crisis management, emphasizing the importance of flexibility, adaptability, and collaboration. Overall, this study contributes to the theoretical discourse on tourism crisis management and provides practical guidance for industry stakeholders to navigate potential future crises effectively.

KEYWORDS

chaos, chaos theory, COVID-19, crisis management, tourism crisis

1 | INTRODUCTION

In the 21st century, the global tourism industry as one of the most fragile sectors during crises, has become increasingly exposed to uncertainty and vulnerability (Nair & Dileep, 2020). Tourism crises such as natural disasters, political turmoil, safety incidents, and infectious diseases are becoming increasingly common and severe worldwide (Pennington-Gray, 2018). While previous outbreaks like SARS, Ebola, and MERS had little impact on the tourism industry, COVID-19 emerged as a pandemic with profound repercussions, causing a global healthcare crisis, financial upheaval, and economic depression (Fotiadis et al., 2021).

The COVID-19 pandemic exemplifies a “transformational crisis” (Gössling et al., 2021), and its severe and long-term effects on the tourism industry highlight the critical need for effective crisis management and adaptive strategies (Utkarsh & Sigala, 2021). The pandemic

led to significant changes in tourists' travel behavior, travel and transportation patterns, distribution channels, and risk management practices (Wen et al., 2021). The ability of tourism destinations to rebound in the post-pandemic era depends on their capacity to adopt lessons learned from the pandemic (Ghosh, 2022).

While several studies have focused on the immediate effects of COVID-19, such as the suspension of travel activities and their influence on tourists' decision-making, the literature addressing the navigation of change and transformation in the aftermath of tourism crises shows a notable gap (Utkarsh & Sigala, 2021). Suitable methodologies, such as systemic thinking and chaos theory, are recommended to address the intricate challenges the pandemic and complex systems have posed, along with the unforeseen and unprecedented effects on industry (Zenker & Kock, 2020). Chaos theory has been introduced in several social science fields, including education, politics, and sociology, and is widely accepted as a

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new paradigm for analyzing complex and nonlinear systems and phenomena (Kim, 2014).

Historically, tourism crisis management has relied heavily on linear deterministic models; however, these fail to account for the complex and chaotic nature of tourism systems. Chaos theory, as a crisis management framework (Zamoum & Gorpe, 2018), encompasses the management of unpredictable and unexpected events that lead to the reorganization and emergence of new orders (Russell & Faulkner, 2004). Applying the chaos theory to crisis management in the tourism industry during the pandemic is an emerging area of research that has yet to be fully investigated. Therefore, this study aims to fill this gap by applying chaos theory to examine tourism crisis management during the COVID-19 pandemic in South Korea. Specifically, this study seeks to answer the research question: "How did the principles of chaos theory manifest in the tourism crisis management strategies employed during the COVID-19 pandemic?"

2 | LITERATURE REVIEW

2.1 | Tourism crises and COVID-19 impact

The concept of a "crisis" combines elements of both risk and opportunity (Kim & Seo, 2016). How one responds to a crisis can transform it into an opportunity or worsen the situation if mismanaged. Academically, crises have been studied from various perspectives across numerous fields, with the most comprehensive view defining a crisis as a "turning point" where change occurs (Millar & Heath, 2003; Oh, 2018). Friedman (2002) described a crisis as a "radical change that includes both positive and harmful changes," focusing on the transformation before and after a specific point in the historical process (Oh, 2018).

Laws and Prideaux (2005) defined a tourism crisis as an event that adversely affects the tourism industry, while Faulkner (2001) viewed it as a state that triggers significant changes in the tourism sector's systems, operations, and organizations. From a systematic perspective, tourism is a social system, making a tourism crisis a crisis for the entire tourism system (Lee et al., 2023; Oh, 2018). Key characteristics such as regionality, secondary nature, and the expandability of a target distinguish between tourism and general crises (Blackman & Ritchie, 2008; Ritchie et al., 2014; Yasumoto et al., 2017).

Tourism crises can be categorized as either direct or indirect based on their relevance to tourism destinations (Yu, 2011). Infectious diseases, such as SARS, swine flu, foot-and-mouth disease, and avian flu, and emerging diseases, such as super bacteria, represent indirect risk factors. Recently, disease crises have significantly affected the tourism industry. Environmental factors act as stimuli that influence individual cognition and emotions, thereby shaping behavior (Chen, Lee, & Hyun, 2022). Travelers' concerns regarding health risks or the possibility of contracting an infectious disease affect their travel behavior and destination selection (Chinazzi et al., 2020). Travelers are more likely to change their destination preferences if they

perceive travel as hazardous, potentially leading to adverse effects on tourism destinations (Zhong et al., 2024).

Global infectious diseases have emerged every five to six years since 2000, with increasing diversity. Together, SARS in 2003, swine flu in 2009, and MERS in 2015, COVID-19 in 2019 illustrate a repetitive pattern of infectious disease crises. The World Health Organization declared COVID-19 a pandemic in March 2020 owing to its rapid spread and high fatality rate (Shafi et al., 2020). As illustrated in Figure 1, the spread of COVID-19 caused the tourism market and industry in South Korea to contract significantly. Accordingly, the discourse surrounding over-tourism shifted toward concerns regarding under-tourism during the pandemic, significantly affecting tourism destinations (Pai et al., 2023).

The effects of COVID-19 have extended beyond medical concerns to economic, social, and political issues (Yeh, 2021). Globally, the tourism industry has been directly affected by the lack of economic benefits from business and border closures. The rapid spread of COVID-19 resulted in a significant reduction in global tourism activity, as evidenced by how the related travel restrictions and decreased demand affected the aviation and travel sectors (Pai et al., 2023). This situation has affected local economies, as unemployment and decreased purchasing power reduced the financial resources available to businesses and consumers (Hagan, 2021). The worldwide lockdown and suspension of tourism-related enterprises in the aftermath of COVID-19 has had an unparalleled socioeconomic impact (Dolnicar & Zare, 2020; Qiu et al., 2020).

2.2 | Tourism crisis management approaches

A crisis management system encompasses an organization's crisis management activities, processes, and procedures (Unlu et al., 2010). Phased and structural approaches are the two main approaches for crisis management systems. The phased approach follows a lifecycle model based on the progression of a crisis (Ritchie, 2004), whereas the structural approach focuses on the attributes of the crisis management system such as integration, organicity, cooperation, and learning. Enhancing crisis management in tourism requires a deeper understanding of crises in terms of nature, type, and scale, as the field currently lacks robust conceptual and theoretical foundations (Radic et al., 2020).

The phased approach has been primarily implemented in tourism crisis management, by following a fundamental linear sequence of stages: mitigation, preparedness, response, and recovery (Center for Policy Research for the National Governors' Association, 1978). This framework forms the basis for actionable crisis management and has been used to develop step-by-step strategies based on the type of crisis (Cronstedt, 2002). Faulkner (2001) introduced the first tourism-specific crisis management framework and identified six phases in the disaster lifecycle: pre-event, prodromal, emergency, intermediate, long-term(recovery), and resolution. However, this stepwise paradigm is limited by its linear response to changes during complex crises.

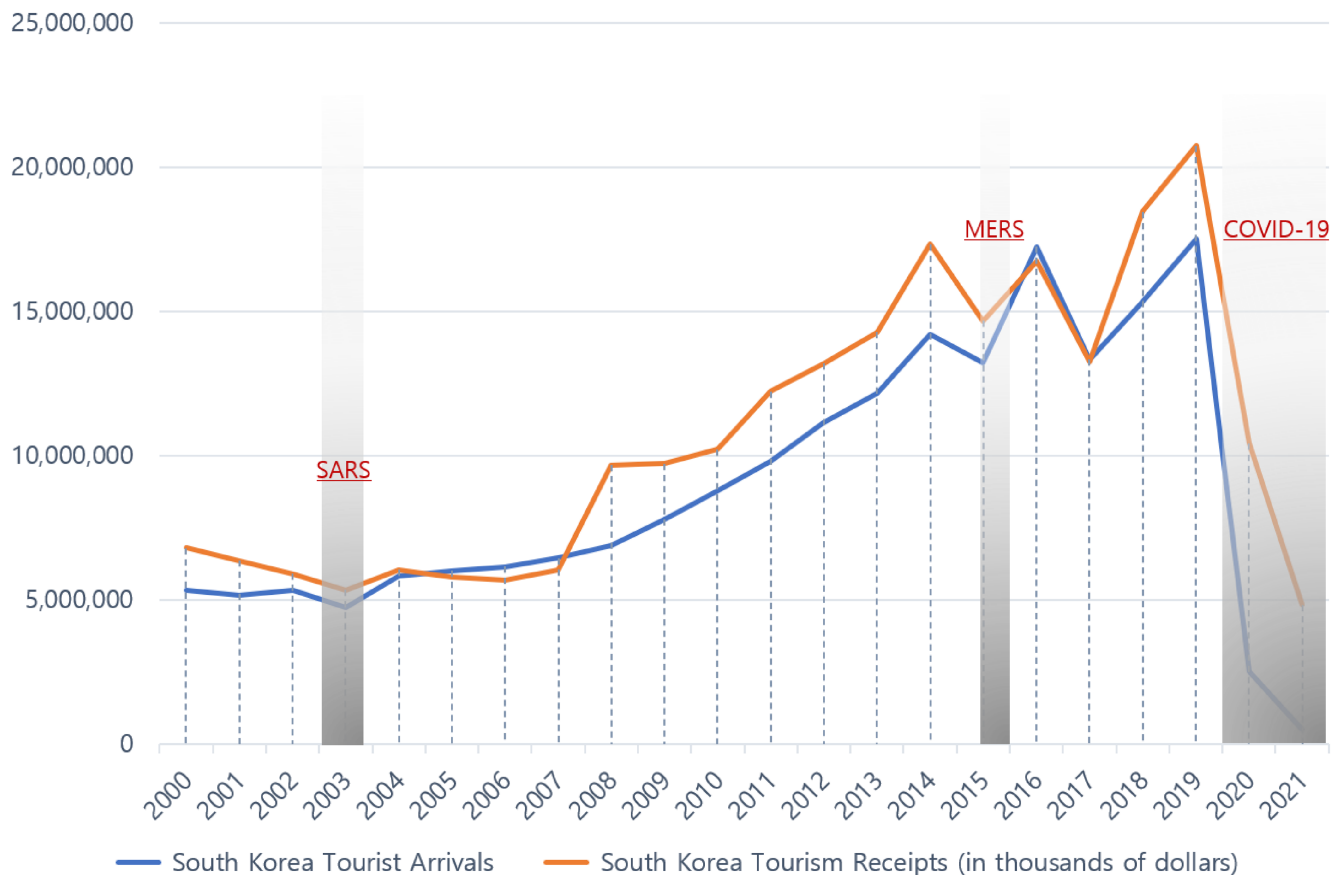


FIGURE 1 Impact of global infectious diseases on the tourism industry in South Korea. Source: Korea tourism knowledge & information system.

Tourism crisis management studies have also suggested strategies centered on official actors, such as governmental and tourism organizations. As a major actor in crisis management policy, the central government is responsible for designing and implementing policies and creating a legal, institutional, and organizational environment for policy execution (Unlu et al., 2010). Local governments are primarily responsible for local crisis management activities and play a crucial role in crisis preparation and immediate response.

Based on a review of 142 tourism and hospitality journal articles published between 1960 and 2018 on tourism crisis management, Ritchie and Jiang (2019) concluded that understanding the nature of crises can provide managers with deeper insights and practical advice. However, tourism research often overlooks the nature and type of crises, with more than half of studies focusing on the response or recovery phases. The lack of research on preparedness or planning may be attributable to the secondary nature of tourism crises (Avraham, 2013; Pforr & Hosie, 2008; Sigala, 2011) and the perception that crises are phenomena over which managers have little control (Na & Yoon, 2021).

Despite the significant academic interest in tourism crisis management over the last decade, several approaches are based on the generalized assumption of linearity. Crises frequently strike without warning, and a destination may immediately enter the emergency

phase, necessitating a rapid response. Alarms caused by such sudden events can lead to confusion and poor decision-making (Sellnow et al., 2002). Moreover, crises are characterized by complex and chaotic situations that constantly evolve. Recent crisis management research has proposed a series of lifecycle stages without considering the underlying complexity of a crisis, thereby limiting its applicability to real-world scenarios.

2.3 | Chaos theory perspective and tourism crises

Chaos theory, which originated in natural science fields such as biology, chemistry, and mathematics, has been adopted by tourism researchers as an alternative approach to traditional tourism crisis models (Kwok & Koh, 2022). It emphasizes tourism systems' inherent instability and change, as well as their role in enabling destinations to reinvent themselves (McKercher, 1999). As a complex crisis, the COVID-19 pandemic disrupted the existing structure, routine operations, and existence of organizations, forcing the tourism industry to adapt and transform along novel and dynamic trajectories (Baggio & Sainaghi, 2011).

Chaos theory provides new insights into how order emerges from chaos during the process of dynamic change. In a non-equilibrium

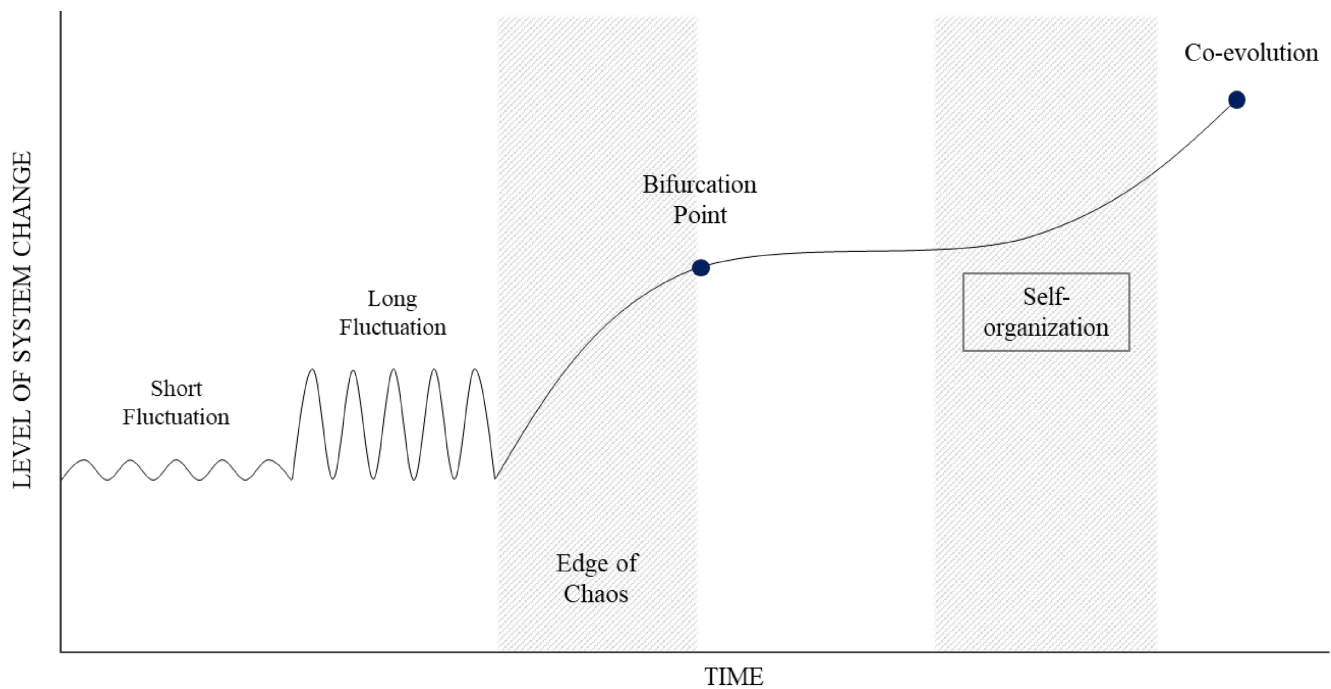


FIGURE 2 Transformation process of a chaotic system.

state, a structure is unstable and constantly in flux. When these fluctuations intensify and reach a bifurcation point, the existing structure collapses and a new one emerges. Through a series of variations or transformations, the structure then operates in a completely different manner and can handle increased complexity. Crises create chaotic situations in which prior knowledge is an insufficient guide for handling the disorder (Xu, 2018); however, they can also serve as triggers for change moving toward more comprehensive regeneration (Barbosa, 2020). Chaotic systems can re-establish stability, structure, and order over time (Seeger, 2002). This transformation process is depicted in Figure 2.

Key concepts in chaos theory include “sensitivity of initial conditions,” “feedback attributes,” “edge of chaos,” “bifurcation,” “strange attractors,” and “self-organization.” As systems constantly transform and evolve, feedback is required to maintain a sense of stability (Lartey, 2020). Feedback may be positive, causing an unstable state to change, or negative, promoting stability through convergence. “Sensitivity of initial condition” is the distinguishing feature of all chaotic systems, indicating that minor disturbances can result in unpredictable future states (Korsch et al., 2008). The phenomenon in which a small difference in initial conditions is amplified into a large one in a complex system appears through interactions such as positive and negative feedback.

Although chaos theory emphasizes unpredictability and disorder, its key component is emergent self-organization, which eventually leads to order (Vanderford et al., 2007). The order that emerges from chaos is characterized in terms of “attractors” at the center of chaotic systems (Lorenz, 1993). Tracking the path of a particle moving randomly in space reveals that a pattern eventually forms, known as a “strange attractor.” This concept refers to techniques that promote

stability, logical thinking, and order emerging from chaos (Altınay & Kozak, 2021). The infinite order of strange attractors generates fractals, which are intricately shaped self-similar structures formed by repeatedly applying a nonlinear formula (Järvensivu & Pulkki, 2020).

Many researchers have argued that the constant fluctuation and uncertainty of tourism make viewing it as a stable system inappropriate (Reddy et al., 2020). Although the feasibility of a chaos theory approach is still being debated (Speakman, 2017), tourism destinations that operate “on the edge of chaos” may be better able to manage crises through self-organization, learning, and transformation (Reddy et al., 2020). Chaos theory has been used in tourism research to address nonlinear interactions and complexities at tourism destinations (Baggio, 2008; McDonald, 2009; Speakman, 2017). For example, Boukas and Ziakas (2014) discovered that the evolution of tourism in Cyprus was a nonlinear but iterative process characterized by the interaction of various endogenous and exogenous events that influenced its systemic transformation.

2.3.1 | Sensitivity of initial conditions

The “Sensitivity of initial conditions” refers to the idea that small variations in the initial conditions of a dynamic system can result in significantly different outcomes over time. This concept, often illustrated by the “butterfly effect,” implies that a seemingly minor event can trigger a major and uncontrollable crisis. External or internal trigger events, whether natural or human-induced, can potentially disrupt the existing structure of a tourism destination and redirect it toward new dynamic trajectories (Reddy et al., 2020). In tourism crisis management, recognizing the importance of early intervention and proactive

measures is critical for preventing or mitigating a crisis. For example, the initial response to a natural disaster or public health crisis in a tourism destination can significantly influence the severity and extent of the damage. Thus, effective crisis management necessitates that the initial conditions that may indicate an impending crisis be identified and monitored.

2.3.2 | Bifurcation points

Bifurcation points occur when fluctuations threaten the structure of an existing system, causing it to deviate from the equilibrium. Recognizing and responding appropriately to these issues is critical for crisis management. Bifurcation can cause a system's structure to collapse, leading to the organization's demise, or it can cause a breakthrough in one of several new states of order (Paraskevas, 2006). In tourism crisis management, bifurcation points represent critical junctures at which a crisis can either escalate rapidly or be effectively managed and contained. For example, as a crisis worsens, the tourism industry may reach a bifurcation point at which current strategies become ineffective, necessitating significant changes to ensure survival. Inappropriate responses from key stakeholders can exacerbate crises, highlighting the importance of effective strategies for managing these critical junctures.

2.3.3 | Self-organization

Self-organization is a controversial but important aspect of chaos theory (Levy, 1994) referring to a complex system's ability to organize and adapt spontaneously to changing conditions. This occurs through bifurcation, in which order emerges from chaos (Sellnow et al., 2002). In a nonlinear system, infinite interactions between the system and its environment result in a constant state of change, allowing the system to optimize resources and deal with challenges more effectively (Baggio & Sainaghi, 2011). Complex interactions and feedback among stakeholders in the tourism industry generate new patterns and behaviors. Stakeholders can act as strange attractors, bringing order out of chaos, and creating conditions for a new order by facilitating communication platforms and encouraging collaboration (Altinay & Kozak, 2021; Speakman & Sharpley, 2012). This self-organization helps tourism destinations promote emergent patterns that contribute to resilience and sustainable development.

3 | METHODOLOGY

3.1 | Research design

This study adopts a qualitative case study approach to investigate how chaos theory can be applied to understand tourism crisis management in South Korea during the COVID-19 pandemic. A single case study design was chosen to provide an in-depth contextual

analysis of the unique circumstances and responses within this setting. South Korea was selected because of its unique and effective response to the COVID-19 pandemic, particularly in the tourism industry. The country's technological advancements, public health strategies, and tourism policies create a rich context in which to apply chaos theory. This methodological choice allows for a thorough and detailed examination of how theoretical concepts can manifest in real-world crisis management scenarios.

3.2 | Data collection and analysis

Data were collected from both primary and secondary sources. The primary data were collected through semi-structured interviews with key stakeholders in the South Korean tourism industry, including government agencies, tourism organizations, and industry experts. The participants were selected based on their direct involvement and expertise in managing tourism crises during the pandemic. Secondary data were gathered through a review of official documents, policy briefs, press releases, and reports from government agencies as well as media analysis of news articles and press coverage. Thematic analysis was used to identify and interpret the underlying themes or patterns of meaning in the qualitative data. Triangulation ensured the reliability and validity of the findings by cross-verifying data from multiple sources, thereby providing a comprehensive understanding of the case.

4 | TOURISM CRISIS MANAGEMENT IN RESPONSE TO THE COVID-19 PANDEMIC IN SOUTH KOREA: CHAOS THEORY PERSPECTIVE

4.1 | Initial responses to the COVID-19 pandemic

The initial conditions of tourism crisis management in South Korea during the COVID-19 pandemic were influenced by various factors, including the government's response to and the structure of the tourism industry. Korean tourism authorities were unprepared for the crisis and their initial response was limited. Despite the government's commitment to preventing the spread of the virus, their measures significantly affected tourist behavior and the tourism industry, leading to collapsed businesses, unemployment, and economic difficulties. A tourism organization official stated, "Governments responded quickly and effectively to the spread of COVID-19. However, the primary issue with the tourism industry was the initial inadequacy of tourism-related support and intervention measures." Another official emphasized, "The government should view the tourism industry as an interconnected ecosystem and develop comprehensive measures, rather than supporting individual companies or specific targets."

A social distancing campaign was implemented to prevent the spread of COVID-19, which included regulatory policies that led to a decrease in overall tourism activity. According to research, the

government's social distancing policy, which directly or indirectly restricted tourism activities, caused tourism expenditures and domestic tourism activities to decrease significantly (Song et al., 2022). This phenomenon demonstrates the mutual influence of a tourism crisis, people, and national policies. A travel agent expressed disappointment with the government's measures, saying, "As tourism is the industry that has suffered the most from various government restrictions and social distancing, we demand realistic damage support measures."

Policies aimed at preventing viral spread exacerbated the damage to small- and medium-sized tourism businesses. The travel industry, which is largely comprised of these businesses, was especially vulnerable to the impact of the crisis. Between January and mid-March 2020, 107 travel companies in South Korea reported business closures. An official from the tourism industry association stated, "Most employees in the travel industry have been struggling to survive from drastic wage cuts, being on unpaid leave, or being at risk of losing their jobs." He emphasized the importance of measures to sustain tourism businesses and immediate government assistance. The lack of government support for the tourism industry had serious economic consequences, highlighting the need for a more integrated and comprehensive approach to crisis management in the future.

4.2 | Identification of bifurcation points

As the pandemic worsened, South Korea faced critical junctures at which the tourism industry could undergo significant changes. Several measures implemented to mitigate negative effects on the tourism industry influenced crisis management strategies. First, the government's international travel restrictions triggered a bifurcation point, dramatically altering tourists' travel behavior and tourism businesses. The government attempted to mitigate this damage by stimulating domestic tourism demand. This emphasis on domestic travel aimed to fulfill individuals' intrinsic desire for travel while also meeting their psychological needs such as by relieving stress caused by overseas travel restrictions and social distancing measures (Cha et al., 2024). This shift resulted in an urgent need for research and strategies to revitalize the domestic tourism sector, using the crisis as an opportunity for significant progress (Kim & Hyun, 2024).

At the end of April 2020, the government launched a domestic travel promotion policy to stimulate the shrinking travel demand for tourism businesses in at-risk regions. The rapid development of the Internet infrastructure, social media, video platforms, and promotional materials in South Korea provided numerous opportunities to use advanced promotion and marketing strategies (Li et al., 2024). Key initiatives included insurance for national tourism vouchers, an extension of the "Travel Week" operating period, and the "Vacation Support Project for Workers." However, the spread of COVID-19 worsened in metropolitan areas after August, causing all policies to promote domestic tourism to be suspended. This demonstrates the difficulty in balancing public health concerns with efforts to support the tourism industry. This period emphasizes the significance of adaptability and continuous reassessment in tourism crisis management. An expert in

tourism management noted the importance of ongoing monitoring and flexibility, stating, "It is critical to adapt these policies as the situation evolves, ensuring they remain effective and relevant."

Second, the government implemented stimulus measures to support the tourism industry, creating a bifurcation point that led to a resurgence in tourism activity. The government announced low-interest loans, credit guarantees, employment assistance, and business expense support policies for airlines and travel agencies that suffered severe damages. The overarching goal was to ensure the survival of tourism businesses and job retention. For example, the Ministry of Culture, Sports, and Tourism introduced a special loan with a credit guarantee that utilized tourism funds to support industries such as travel and accommodation. A travel agent stated, "The government's financial support, particularly special loans and credit guarantees, has been pivotal in preventing the tourism industry from collapsing. These measures have provided much-needed relief to businesses while also assisting with job retention."

The tourism industry crisis support project included both employment and financial assistance and entailed prepaying for cultural and tourism interpreter activities, offering job experience, and providing career exploration opportunities through youth internships. Furthermore, the Ministry of Employment and Labor increased its support for job maintenance subsidies by designating the travel industry and tourism accommodation and transportation businesses as special employment sectors. However, some aspects of the government's support policies for the tourism industry required improvement despite these efforts. A tourism association official stated, "Tour guides, individual freelancers, and restaurants, despite being heavily reliant on tourism, were not classified as tourism industry and thus struggled without assistance from the government or local authorities. A comprehensive and macro-scale support policy is required to sustain the entire tourism industry ecosystem." This point emphasizes the significance of recognizing the interconnectedness among various sectors within the tourism industry.

4.3 | Emergence of new patterns

The self-organization of tourism crisis management in South Korea in response to COVID-19 demonstrates the importance of flexibility, adaptability, and collaboration in mitigating the impact of a crisis and providing innovative solutions. A tourism expert stated, "The evolution of crisis management strategies in the South Korean tourism industry reflects a broader trend toward collaborative governance models. We can address complex challenges by engaging diverse stakeholders, such as governments, businesses, and communities." The urgent need for collaborative governance involving both the public and private sectors to address these challenges was apparent, particularly given the fragmented status of data, information, and policies (Gössling & Higham, 2021).

Improvements in communication schemes among stakeholders or central and local governments facilitated more effective decision-making in crisis management issues. For instance, Jeollanam-

do Province established the “Jeonnam Tourism Council,” which includes local tourism departments, associations, and agencies. This collaborative platform was created to develop long-term tourism policies, share tourism data, and discuss COVID-19 countermeasures. The evolution of communication and decision-making processes among stakeholders reflects a proactive approach to managing crises, encouraging greater coordination, sharing information, and engaging in collaborative problem-solving. These initiatives demonstrate that a shift toward more collaborative and inclusive governance structures is required to address complex and dynamic crises such as the COVID-19 pandemic.

Another important aspect of promoting self-organization in crisis management is encouraging local communities and businesses to organize themselves in response to a tourism crisis. Local communities often bear the initial brunt of crises and can significantly contribute to the development of effective responses. In South Korea, the government proactively encouraged local communities to develop tourism promotion strategies. By empowering these communities to take ownership of the crisis response, the government leveraged local knowledge and expertise, resulting in more effective and sustainable crisis management strategies. Sustaining community involvement and fostering collaborative partnerships will be critical for promoting resilience and sustainable tourism practices moving forward.

Several local governments launched public relations and marketing campaigns to promote local tourist attractions. These campaigns aimed to highlight the distinct cultural and natural heritage of each region while emphasizing safety and hygiene standards. Marketing strategies play a crucial role in influencing consumer decision-making, particularly in service-related sectors such as tourism (Praesri et al., 2022). However, to manage visitor expectations effectively, promotions must be balanced with authenticity (Chen, Hyun, & Lee, 2022). Through the “Seoul Now Campaign,” the Seoul tourism organization promoted the image of “Safe Seoul, a safe tourist city Seoul” through social media platforms and international media. Gangwon-do Province launched the country's first electronic access system, called the “Clean Gangwon Passport”, to promote a tourism environment to which people could safely travel as a preferred destination.

Finally, one strange attractor was the implementation of novel and innovative tourism plans to foster “New Normal Tourism.” A tourism organization official emphasized, “The rapid transition to a non-face-to-face society following COVID-19 presented both challenges and opportunities for the tourism industry. It is critical to strengthen the technological competitiveness in the face of the digital paradigm shift.” To improve the composition of the tourism ecosystem and strengthen its competitiveness, new tourism products tailored to the new normal, as well as support for discovering new tourist destinations, should be developed. With the acceleration of the Fourth Industrial Revolution and activation of non-face-to-face online services due to the COVID-19 pandemic, smart tourism has gained attention as a next-generation tourism model that generates high added value through innovation in the tourism content ecosystem and industrial structure. As the world moves toward a new normal, implementing

smart tourism strategies can encourage sustainable growth and resilience in the face of ongoing challenges.

5 | CONCLUSIONS

This study contributes to the theoretical discourse on tourism crisis management by incorporating chaos theory, thereby providing new insights into the complexity and dynamics of tourism crises and systems. Furthermore, this study demonstrates the applicability of chaos theory to tourism crisis management, emphasizing the nonlinear, unpredictable, and dynamic nature of crises. Through the lens of chaos theory, the study highlights the importance of flexibility, adaptability, and resilience in dealing with tourism crises. The findings show how crises such as the COVID-19 pandemic can evolve with abrupt shifts and unpredictable developments. This challenges conventional crisis management models that assume a more predictable progression of events. Understanding the nonlinear dynamics of crises can help tourism stakeholders anticipate potential disruptions and prepare for various scenarios, thereby improving the overall crisis-response framework.

These findings indicate that tourism systems should be viewed as adaptive and capable of self-organization and resilience. This perspective shifts the emphasis from merely reacting to crises to developing adaptive capacities that enable rapid and effective responses. This study underscores the need for tourism organizations to develop robust contingency plans and adaptive strategies that can evolve in response to a rapidly changing crisis environment. According to chaos theory, disturbances in one part of the system can cause ripple effects throughout the network. The interconnected nature of the tourism industry, which includes airlines, hotels, travel agencies, and local businesses, creates a complex web of dependencies. This study recommends a collaborative approach involving multiple stakeholders, such as governments, private sector entities, and local communities, to strengthen the resilience of the tourism ecosystem.

Another theoretical implication of this study is that chaos theory enhances our understanding of the transformation from chaos to the emergence of a new order. This study suggests that such crises provide opportunities for transformation and innovation in the tourism industry. The world is now divided into the pre- and post-epidemic era, with some scholars believing that it can be further divided into BC (before Corona) and AC (after Corona). Disruptions caused by the COVID-19 pandemic may prompt the rethinking and redesigning of tourism practices, making the industry more sustainable and resilient. This can encourage tourism stakeholders to embrace change and seek innovative solutions to transform crisis-related challenges into opportunities for growth and improvement.

Despite these theoretical insights, applying chaos theory to crisis management presents challenges. One major vulnerability is that the unpredictability inherent in chaotic systems can lead to decision paralysis in which managers are unsure of how to proceed because of a lack of clear patterns. Another critical vulnerability is resistance to change. Organizational culture and existing structures frequently

resist the flexibility and adaptability required for effective crisis management. To address these vulnerabilities, a culture of continuous learning and adaptability needs to be established and decision-making structures decentralized. Decentralization can enable organizations to make decisions based on real-time data, thereby improving their responsiveness to chaotic conditions.

Furthermore, we draw practical implications by emphasizing the importance of tourism organizations adopting flexible, data-driven, and collaborative approaches to crisis management. Tourism organizations and stakeholders should prioritize flexibility and adaptability in crisis management strategies. Owing to the chaotic nature of crises, businesses should quickly adjust their operations, marketing, and service delivery models to reflect changing circumstances. Tourism businesses should embrace new technologies, such as virtual tourism experiences, contactless services, and advanced health and safety protocols, to boost resilience and attract tourists in the post-pandemic era. Furthermore, rethinking existing business models and exploring new market niches can foster long-term growth and sustainability.

Effective crisis management necessitates the use of real-time data and advanced analytics to monitor developments and inform decision-making. Tourism organizations should invest in data collection and analysis tools that can provide real-time insights into market trends, traveler behavior, and potential disruptions. This would allow for more proactive and informed responses to potential tourism crises. Finally, a cooperative approach to crisis management is emphasized, with the participation of tourism stakeholders such as government agencies, private sector entities, and local communities. These stakeholders can contribute significantly to achieving common post-pandemic goals by forming cooperative networks. Close collaboration ensures coordinated and effective crisis responses. The tourism system is interconnected; thus, actions in one sector can have a significant impact on others. Effective communication channels and partnership networks are critical for sharing information and resources during crises, thereby increasing the tourism industry's overall resilience.

Although this study has valuable theoretical and practical implications for tourism crisis management, its limitations must be acknowledged. One significant limitation is the reliance on a single case study that focuses exclusively on South Korea. Although this approach provides in-depth insights into a specific context, its findings have limited generalizability. This study may also have used limited data sources such as government reports, media coverage, and interviews with industry stakeholders, which may have created a distorted view of the crisis management processes and outcomes. Future research should address these limitations by conducting comparative studies across countries and using mixed-method approaches to improve the generalizability and comprehensiveness of the findings.

FUNDING INFORMATION

This work was supported by the National Research Foundation of Korea(NRF) grant funded by the Korea government (*MSIT) (No.2018R1A5A7059549). *Ministry of Science and ICT.

DATA AVAILABILITY STATEMENT

Data sharing not applicable to this article as no datasets were generated or analysed during the current study.

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How to cite this article: Choi, J. O., & Hyun, S. S. (2024). Chaos theory perspective on tourism crisis management: A case study of the COVID-19 pandemic in South Korea. *International Journal of Tourism Research*, 26(4), e2713. <https://doi.org/10.1002/jtr.2713>