THE FUTURE OF THE GLOBAL TOURISM SYSTEM POST COVID-19

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It is challenging to write and analyze an event when the person is in the middle of it and the game is unfolding on a daily and hourly basis. Notably, in case of such a catastrophic event as COVID-19 that we are all emotionally invested, it becomes even more challenging to activate the neutral scientific observation ability and pull resources to evaluate the situation accurately. I am trying to put the current situation in perspective from my point of view as a trained network science and system science researcher with close to 18 years of academic experience. I will try to analyze the situation from a complex system/network perspective.

COVID-19 Today

We are in the midst of a global pandemic, a dangerous one, and whether we like it or not, panic is part of our daily life. I am writing this piece to answer some of the questions that a significant portion of the population might have in mind; People who are/were working in travel, tourism, hospitality, leisure, and recreation industries; Individuals who wonder what tomorrow will look like if there is no industry, job, or reliable source of income. As the most human-oriented, labor-intensive industry, tourism is the future of millions of hard-working service people who might feel they are left alone in a collapsed post-apocalyptic world. Guess what! I have news for you: It is going to get worse before it gets better. Let's get to know our scary friend, COVID-19, first.

SARS-CoV-2 (aka novel coronavirus, or 2019-nCoV, or COVID-19) is from the family of coronaviruses that affects the respiratory tract (air passage organs including mouth, nose, throat, and lungs) in mammals and results in mild to severe infection. Coronaviruses are part of the subfamily of Orthocoronavirinae in the family of Coronaviridae and the order of Nidovirales. These viruses are named after their crown-like viral particles. In the past two decades, we have witnessed the outbreak of two other members of this family including severe acute respiratory syndrome coronavirus (SARS-CoV) in 2002, which started from China and became a pandemic in 2003, and Middle East respiratory syndrome coronavirus (MERS-CoV), which was first reported in Saudi Arabia in 2010. Over the past eight years (as of November 2019), MERS has infected 2,494 people and has killed 858 individuals in a relatively limited geography that is mostly contained in Saudi Arabia. In SARS pandemic, 8,098 individuals became infected which resulted in 774 death around the world in a short period of time. Despite being less deadly compared to MERS (9.6% SARS death rate compared to 34.4% MERS death rate), SARS's vast geographic dispersion cost the global economy $30 to $100 billion. Despite being less lethal (so far, about 1-4%) than SARS, COVID-19 has demonstrated to be more pervasive. Even with the largest containment efforts in the history and vigilant responses of most of the countries around the globe, we have not been successful in controlling this pandemic. COVID-19 is more infectious than seasonal flu and Avian flu A (H7N9) but is less contagious than SARS and Ebola.

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Until now, SARS has been used as the reference point in modeling the impact of COVID-19 on various economic and social sectors, including tourism. Newer waves, however, stress the need to look for much more drastic measures as the gap in the severity of COVID-19 compared to SARS is increasing on hourly basis. As of now (April 1, 2020), COVID-19 has infected 784,716 individuals around the world, which has resulted in 37,639 death. To find a different reference point, we can have a look at influenza

breakouts. However, 1918 influenza pandemic (aka Spanish flu) and H1N1/09 (aka Swine flu 2009) are not appropriate for our purpose due to the following reasons. Spanish flu, as the deadliest pandemic of human history, infected 27% of the known world population (500 million infections) and eradicated one-tenth to one-fifth of the infected people. Spanish flu cannot be compared to COVID-19 as the crisis is significantly different technologically and chronologically. H1N1/09 infected about 700 million to 1.4 billion individuals in its one-year reign, which resulted in 150,000 to 575,000 deaths. H1N1/09 cannot be considered as a reference point for COVID-19 since origin and spread pattern are critical factors in studying the behavior of a pandemic. Dr. Nicholas Christakis suggests that COVID-19, although being a different type of virus, is a once-every-50-years type pandemic that is not as bad as 1918 Spanish flu but is similar to H2N2 in 1957. H2N2 originated in China in 1956, spread to Singapore in February of 1957, Hong Kong in April, and then to the U.S. by June 1957. The attack rate and transmissibility of H2N2 is similar to that of COVID-19 (2-4 new cases per old case). H2N2 killed about 1.5 million people with a U-shaped age-related mortality, killing the very young and very old. COVID-19, similarly affects both the elderly and young population but it seems like it kills the elderly the most while sparing the younger demographic. It took three years for people to become immune, and for the virus of H2N2 to become less viral. The same can be expected with COVID-19 after a few waves. It is true that we now have more and advanced facilities, better technologies, and better information flow, but at the same time, the world is more populated and better connected which makes the spread of the virus easier. Therefore, in order to determine a reasonable reference point, one should imagine a condition between SARS/09 and H2N2/1957 when contemplating the impact of COVID-19 on tourism system.

Tourism and its Complex System

Tourism is a complex system consisting of multiplex networks. This means that millions of components interact with each other in a global, interwoven network of local networks in various layers. Tourism is also an open system which exchanges material, energy, and information with its environment. At the same time, the umbrella nature of tourism puts this huge complex system in contact with so many other systems, such as global and local economic and health systems. A specific type of behavior known as hub and spoke emerges from the complex system nature of tourism. In other words, in every layer of the network, we are dealing with a few major players that are connected to so many other components of the system. In contrast, many components are only connected to a few of their neighbors (power-law distribution of edges). Structurally, this combination and behavior result in a robust system that is resilient in the time of accidental/unintentional crises. The logic is simple; if at any given time, randomly, one of these components fails, this component is more likely to be a spoke (e.g., a small local pub) than a hub (e.g., a major airline) because there are fewer hubs and many more spokes. These systems, however, are vulnerable in times of deliberate attacks (e.g., terrorist attacks) because if a few hubs are eliminated, the whole structure collapses.

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The scenario of deliberate attack seems to be off the table for now. Conspiracy theorists might not be convinced yet, but genetic analysis of COVID-19 RNA sequences (similar to our DNA, but for viruses) does not support a bioengineered and bioweapon origin of this virus. Assuming the validity of the analysis, deliberate attack is not the case in resilience analysis of the tourism system. Therefore, one might assume that since tourism is resilient to random failures, then we shouldn't worry about COVID-19 impact on tourism. While this assumption is not entirely wrong, I should point out that the effect of COVID-19 on tourism highly depends on the properties of the crisis, length of exposure, and the situation of the other systems around tourism. Before I explain what will happen with the current tourism system and what we should expect, I should go over the impact of some of the crises (especially health issues and outbreaks) on the tourism system.

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Health Crises Effects on Tourism

Broadly speaking, compared to terrorism, environmental, and political disasters, health crises have a less slippery slope in terms of the relationship between the depth of impact and recovery time. This means that even in case of a profound impact of over 30% drop in monthly visitors due to health crisis, recovery time of the tourism system would not increase drastically. Based on the available data, the time range for destinations to recover from health crises is between 12 and 34 months. This means that, on average, it usually takes destinations about 22 months to recover from health crises, which is slightly shorter than natural disasters and political turmoils but somewhat longer than events such as terrorism and oil spills. The good news is that the standard deviation of health crises is much smaller than natural disasters and political turmoils, meaning that the average recovery period is more or less the same for most of the health crises events. That being said, recovery time is case based. For example, Ebola that spread among West African countries is considered to have one of the most devastating effects on tourism at the regional level. In case of Ebola, 35 months after the outbreak, international arrivals to Sierra Leone remained over 50% below the pre-epidemic visitor peaks. The rate of return to normal is related to destination's and health disaster's properties. Among the destination properties, level of destination development, crisis management system, sustainability level, training and readiness, and potential reservoirs of necessary items/tools are influential. Concerning health disaster properties, disease properties and our reaction to disease, such as depth of virus attack, rate of hospitalization, transmissibility, death rate, target population, resilience of the virus, incubation period, and virus treatment and vaccination are among the critical factors that have an impact on destination's return to normal rate. When we combine the destination and health disaster properties, an ample sample space of various probabilities emerges. As a result, every destination has its own story of coping with crises, and the demand curve behavior can be drastically different from one circumstance to another. For example, in case of Ebola, a sharp decline was prolonged for about four quarters, and then a gradual increase in the number of visitors was seen. In case of Zika in Brazil in 2015, the seasonal pattern of demand was preserved as the impact followed the sinusoidal pattern, experiencing both growth and decline in the number of visitors. In case of U.K.'s hand-foot-and-mouth disease in 2001, the seasonality of demand eradicated, and the condition put a halt on tourism growth, keeping it on the same level as before the outbreak for two years. In case of SARS in Hong Kong, there was a sharp decline in tourism demand for a

short period (two quarters) followed by an abrupt increase for one quarter which returned the demand to normal (before the event). Demand then gradually grew for the rest of the two years. Finally, region also influences the impact of health crisis on tourism system and its recovery. The region where outbreak starts usually takes the hardest hit. In case of SARS, Asia and the Pacific experienced a 9% decline in the number of visitors while the Middle East was on the path of growth with a 3.4% increase in the number of visitors. Accordingly, the average global rate of visitors dropped by 1.7%, from 703 million to 691 million, which also resulted in the decline of tourism receipts by the similar rate. That being said, the year after the pandemic in 2004, Asia and the Pacific's tourism increased by 27.9% and we witnessed a 10.7% increase in global tourism from 690 million to 763 million visitors. Even in a more dramatic case of H2N2 in 1957, tourism recovered quickly with the number of global tourists increasing by 126% from about 50 million visitors in 1955 to more than 112 million in 1965.

COVID-19 Effects on Tourism

In the case of COVID-19, initial evaluations and estimation suggested an average decline of 1%-3% in visitors' volume globally. With horror unfolding, more severe scenarios are expected such as at least a 3%-6% decline in arrivals (or up to 30% in worst case scenarios), which translates to loss of minimum of $80 billion in income. This is in addition to the massive losses of the travel industry, in which only one section of it (i.e., aviation) has already lost more than $100 billion in the first couple of months (equal to the total economic impact of SARS). Unlike previous pandemics, COVID-19 is attacking the tourism system in a much harsher capacity, the likes of which have never been seen before. It is not only spokes that are under attack (e.g., SMEs are going bankrupt daily), but hubs are also under tremendous pressure (e.g., cruise industry, aviation industry, hotel chains, urban tourism, theme park and casinos). Apart from the aviation industry mentioned above, cruise ships have pulled into the harbors in Florida and California, Marriott International has announced a temporary layoff of tens of thousands of its employees globally, most of the Florida beaches and all of Orlando's theme parks have closed, and Las Vegas's hotels and casinos have shut down. In a similar vein, New York, the city that never sleeps, is also now in an induced coma. The fact that COVID-19 is attacking both hubs and spokes simultaneously with intense and forceful waves is very concerning. If attack on hubs continues long enough, the system will collapse. Moreover, other systems that are in contact with the tourism system, including economic and health systems, are also on the edge of self-organized criticality; if they fail, we can expect so many other systems, including tourism, to fail as well. All these events are extremely concerning and are taking us to the edge of chaos. That being said, complex systems are not foreign to walking on the edge of chaos. As a result, the system utilizes its free capacities in its equilibrium parts to distribute the pressure on the disturbed components (region). While the northern hemisphere has been affected the most by COVID-19, the southern hemisphere has been less impacted. With lag-factor as a buffer to keep the system away from disintegration, the impact will be distributed over time. Considering past experiences, it seems that, from the whole system perspective, tourism will be fine in a matter of a year or two after the end of the COVID-19 pandemic. Previous experiences show that the system rebounds strongly a short while after the crisis is over. Apart from the hub-and-spoke structure, complex systems are more robust because, by default, they utilize a combination of two strategies of resisting change and adapting to change. In other words, the system avoids change of state and keeps the equilibrium to the

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extent that resources are not overconsumed and components are not overburdened. However, the moment that perturbation forces overcome the system's resilience and components become overloaded, the system permits the perturbation to pass without any resistance. In fact, the system tries to employ the entropy of perturbation and distress to ease the change process. As a result of this change in strategy, the system might end up in a state of soft failure in order to avoid a catastrophic failure. The first strategy (i.e., resisting change) is similar to building a dam for the flooding area, while the second strategy (i.e., adapting to change) is like making an extensive network of storm drains to avoid the flood. Passing from one strategy to another, however, is not without cost. Depending on the scope and intensity of the perturbation, systems show a range of responses. One of the last stands and drastic interventions in keeping the system's integrity is a phase transition. After phase transition, the system looks for a new equilibrium to settle down. Phase transition is like melting a piece of ice. The system is the same, but instead of a solid state (i.e., ice), we are dealing with a liquid state (i.e., water) with many different and similar properties to the previous state. It seems that with COVID-19, we are dealing with a phase transition that will change the industry. Some of these changes will be in forms of business models. For example, after 9/11 resulted in the bankruptcy of many major airlines, the aviation industry started to create different alliances of airlines, and low-cost carrier business models took the place of most of the traditional aviation business models. The same kind of structural and functional changes in tourism can be expected from the effects of COVID-19. Another significant change in the state of tourism system is going to be deglobalization. While globalization has shown to be extremely efficient in some aspects, there is a high tendency to increase the local autonomy by empowering local structures. There is a globalization threshold and it is imperative to find the optimal value to advance it. Over-globalization has made most of our systems vulnerable and susceptible to various disasters; and no day will pass without news of a system failure as a result of over-globalization. Therefore, it is time for some localization (if we survive).

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Tomorrow will come and there will be a day with zero new cases of COVID-19 around the world. That day is going to be very different. When we come out of our self-imposed isolation and quarantines, we might not see our favorite local café anymore. The bed and breakfast around the corner might be gone. We might start seeing new airline brands, but we will be there, the system will be there, and recovery will begin. No one can deny the impact of the travel and tourism industry on COVID-19 spread. We were part of the problem, but we will be part of the solution as well (post COVID-19). Still, many youths will be employed in this industry, tourism will still empower many women in remote villages of West Africa, Europe will still be the beating heart of the tourism industry, and poverty alleviation will be on top of our to-do list. Complex systems usually synchronize very well, and tourism is not an exception. It will be aligned with other social, economic, and environmental systems soon. When the horror is over, we will find ourselves in a new world with new norms and new normal. Complex systems are adaptive as they learn through their feedback loops. The self-organization capacity of these systems will let them evolve into new beasts that are much harder to defeat. They will learn their lesson; the question is, will we learn our lesson? The next outbreak is around the corner. Much sooner than later, a new virus or natural disaster will consume our attention, but are we ready? A few countries like Hong Kong and Singapore, who were hit the hardest with SARS, did much better (so far) with COVID-19; does it mean that others will do the

same next time? (Note: the population of these countries, however, should be considered. Together, Hong Kong and Singapore have a population less than 15 million, compared to larger countries like China, India, United States, etc.). The answers to the above questions are not clear, but what is clear and proven again and again over the millions of years is that nature always find a way to put the system back in equilibrium, be it by the extinction of 98% of the known flora and fauna, by a meteorite, or by a virus. It is on us to synchronize our systems with nature and find a way to keep the harmony.

Infectious diseases were not among the most likely risks predicted for 2020. In fact, there were 27 crises that we thought were more likely than pandemics to take place, such as natural disasters, water crises, food crises, information infrastructure breakdown, data fraud, energy price shock, unemployment, and interstate conflicts, among others. Infectious diseases are among the emergencies with the highest impact on our life; so are weapons of mass destruction, information infrastructure breakdown, cyberattacks, human-made environmental disasters, natural disasters, water crises, biodiversity loss, extreme weather, and climate action failure. In fact, climate action failure, biodiversity loss, and extreme weather are not only more likely than epidemics but also have a much severe impact on the tourism system than epidemics. Most of these risks are due to our way of life and what we are doing today. If we deny climate change and keep exploiting the nature, animals, and ecosystems, then it is us who will eventually pay the price. COVID-19 most likely originated in wild animal farms due to our exotic/luxury food consumption culture. There are so many more COVIDs and other viruses and disasters that can easily eradicate human beings as if we have never lived. We are not faster than time and bigger than space; we are only a small part of the system and our existence is infinitesimal to the universe.

About the Author

Dr. Jalayer (Jolly) Khalilzadeh earned his associate degree in Travel and Tourism Services, bachelor's degree in Hotel Management, master's degree in Tourism Management with a concentration in Tourism Marketing, and Ph.D. in Hospitality Management. Dr. Khalilzadeh has a passion for applications of network and system science in tourism and hospitality research. His works have been published in top-ranked journals such as Annals of Tourism Research, Tourism Management, Current Issues in Tourism, Computers in Human Behavior, International Journal of Contemporary Hospitality Management, and Journal of Destination Marketing and Management. He has also been involved in various editorial roles, such as the methodology editor of The Service Industries Journal. Currently, he is serving as an assistant professor of hospitality and tourism at East Carolina University (ECU). Dr. Khalilzadeh has various work experiences in the hospitality and tourism industry and is involved in various projects related to the applications of network science in destination management and tourism consumption.

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