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Tourist Preferences for Robotic Services in Hotels During the COVID-19 Pandemic (Case Studies of Iranian and German Tourists)

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Abstract: The study compares the willingness of two groups of Iranian and German tourists to measure their interest in the robotics and artificial intelligence-based services of hotel sectors during the period of health crisis resulting from the COVID-19 disease. This study examines whether travelers are willing to use new-generation services in different hotel sectors, including hospitality, restaurant, and reception, with the help of SPSS software and T-test. The analysis is on an average of 119 and 123 passengers from Germany and Iran, respectively. Following up the results from two different investigations of the Travelzoo questionnaire conducted in 2016 titled: Travelers Expect Robots on their Holidays by 2020, and another research paper published in 2018 by Ivanof and Webster titled: Consumer's Attitudes Towards the Introduction of Robots in Accommodation establishment, this research is aimed for understanding the change in the traveler's behavior in a health crisis. Mainly because in 2016, Germans were among the least nationalities who showed interest in robotic services, whereas Iranians showed much higher interest in utilizing robots. As COVID-19 respiratory disease hinders human interactions, the current research measured their behavior changes under particular circumstances (COVID-19). According to this survey, Iranians showed the same interest in using AI-based services in the hospitality, restaurant, and reception sectors. Whereas comparatively, Germans showed less interest in the reception and restaurant section and a higher level of willingness to the hospitality services. German tourists are much more likely to choose innovative hotel services in the future than in previous surveys. The present research used the cause of the disease as a mediator and a stimulus to advance the goals of setting up and using robots and measuring the change in the behavior of two groups of tourists.

Keywords: Robot in Hospitality, COVID-19, Hospitality Crisis, Tourist Behavior

1. Introduction

Tourism planners and stakeholders have always faced both natural and human challenges. The travel industry is sensitive to a variety of issues, including September 11, landslides, diseases like Ebola and SARS, and government policies and strategies in international relations. Tourism has been experiencing a number of short-term epidemics within a defined geographical area, including yellow fever and Ebola, but after the emergence of COVID-19 acute respiratory syndrome in late 2019 and the announcement of health protocols and emphasis on social distancing by the World

Health Organization, travel decreased significantly. Several countries that have closed their borders, canceled flights, and quarantined their smaller cities, resulting in irreparable damage to airlines, accommodations, and services. As a result, tourism declined by 73%, with more than a hundred million businesses at risk of failure [26].

There is no doubt that human interactions between guests and hosts, as well as the spirit of hospitality, are integral to travel and tourism. However, the use of technology as a threat to the bond between guests and hosts continues to be

discussed [24]. Smart machines are becoming more acceptable in various industries due to the advancement of technology in both the software and hardware sectors and the affordability of new technology [17]. The impacts of the epidemic on this industry, which had the origins of the disease, have been assessed, and hotels are the most vulnerable sectors due to the fear of being put at risk during and after the pandemic. Health risks are considered one of the primary factors affecting travel decisions. Risk reduction strategies can help these centers attract customers in health crises by reducing perceived health risks because using artificial intelligence and service robots in hotel sectors can reduce guest interaction with hotel staff and, as a result, increase hotel hygiene [20]. A change in passenger behavior even after the health crisis hinders returning to prosperity before COVID-19 because sensitivity to personal health and the environment is no longer limited to visual factors. According to previous research, using fourth-generation technology threatens human resource employment and the replacement of unskilled labor since automatic machines and the latest technology always help reduce costs, increase productivity, and reduce human errors [11]. It is not the first time a health crisis has affected tourism; however, it is one of the industry's biggest challenges that can increase the chance of connecting travelers with the latest travel technologies. Since previous research conducted on the acceptance of robots in hotel services, as well as the convenience of tourists using robots in two different nationalities of Iran and Germany showed extreme differences, the researcher aims to measure the acceptance rate of the new generation of services based on artificial intelligence in an area where this is a critical health concern.

2. Methodology

The first step of the research process involved collecting data from articles related to artificial intelligence, robots, and health crises in tourism. The 13-question questionnaire was analyzed in SPSS software to obtain secondary data, and Cronbach's Alphabet was used to determine its reliability. This study evaluated two categories of Iranian and German tourists based on the capacity of two modern hotels in their capital cities, namely (Berlin: Stein Plaza) and (Tehran: Persian Plaza Hotel). According to travelers' opinions on Trip Advisor, these two units are relatively more modern accommodations and are more likely to accept technology in the future. Cochran's formula estimated 128.4 Iranian tourists and 119.97 German tourists, with questions provided in Persian and German on the Likert scale.

Tourism-related diseases and perceived health risks

Health crises such as acute traumatic syndrome in 2003, influenza A in 2009, respiratory syndrome epidemic in 2012, Ebola virus epidemic in 2014, and Zika disease in 2016 have negatively impacted tourism. The spread of Ebola in West

Africa adversely affected tourism throughout the region [18]. As part of its definition of COVID-19 disease, the World Health Organization published a special protocol for places of residence, emphasizing hygiene and continuous sanitation. A particular emphasis is on environmental hygiene and disinfection, frequent hand washing, breathing habits, the use of masks, and the awareness of social distance. According to the World Health Organization, this epidemic has the following characteristics:

COVID-19 is a recent pandemic disease caused by a newly discovered Coronavirus type. The virus usually causes mild to moderate respiratory failure in most people who are infected with it and do not require hospitalization. In contrast, people who are elderly or have a history of respiratory disease or cancer are at higher risk for developing more severe forms of the disease. The virus is transmitted through saliva or nasal secretions when a sick person sneezes or coughs. Keeping a social distance of at least one meter is the most effective way to prevent the spread of this disease. Cover your mouth and nose with a mask, wash your hands frequently, and do not touch your face [29].

According to Haddock's theory, risk types are divided into absolute, perceived, and real risk. Most of the time, people do not pay special attention to real risk and do not consider it beyond their tolerance. As a result, perceivable risk plays an important role in most studies [16].

Perceived risk theory suggests that consumers experience risk in their travel decision-making behaviors because they are uncertain about potential risks. Perceived risks may increase if authorities and travel agents fail to respond appropriately because it can be driven by uncertainty about existing conditions. This theory, presented by Bauer in 1960, prompted tourism sector agents to gain new insight into the importance of this theory in consumer behavior and crisis management. In addition, they implemented crisis management strategies to reduce the risks associated with travel. Perceived health risk, which is considered an external factor and beyond control, refers to the degree of uncertainty of the environment and physical conditions facing the tourist: the risk of terrorism, political conflicts, natural disasters, diseases and epidemics, among others [20]. If the perceived health risk exceeds a tolerable level, consumers choose the most appropriate risk reduction strategy. Risk reduction strategies include a money-back guarantee, choosing a famous brand, purchasing expensive products, and endorsing and supporting a prominent individual [31]. Based on Funker's theory, a crisis strategy can reduce consumers' perception of risk by estimating the difference between a crisis and an accident. In previous approaches, an organization's external and internal environments were considered relatively stable to handle predictable changes (not sudden or unexpected changes) [7]. As shown in the following table, COVID-19 disease is one of the most severe diseases affecting the tourism industry:

Table 1. Tourism-related diseases (Rosselló, Gallego. 2017 and World Tourism Organization).

Disease	Country of origin	Destructive effects on tourism and the economy
SARS	Singapore, China, Hong Kong, Vietnam	Tourism was impacted by this disease, resulting in the unemployment of over three million people, and hotel occupancy rates dropped drastically.
Hand, Foot and Mouth	England, Scotland	The tourism income in these regions decreased by more than 16 percent.
Zika, Malaria, Dengue	Tropical regions of Africa, Asia, India and South America	This disease is primarily transmitted by mosquitoes. In order to reduce the spread of the disease, prevention measures, and coherent planning will be essential.
Ebola	Africa (Guinea, Senegal, Nigeria, Congo, Mali)	It is transmitted from animals to humans, with a 50% risk of death due to infection. Its eradication would increase tourism by five million people.
Yellow Fever	Tropical regions of South America and Africa	Mosquito bites transmit this disease; there is a vaccine, and eradicating it will bring 8.1 million tourists.
COVID-19	More than 200 countries, since 2019	Acute respiratory syndrome, a widespread epidemic that has reduced inbound tourism by 83% in the first three months of 2021, has a vaccine available.

Robots in the tourism industry

Sepulka was the name of the first robot invented in the tourism industry that was used as a guide at the Polytechnic Museum of Russia. In contrast to service robots, industrial robots are commonly used in a safe environment, and employees are given training on how to do work and use the machines while they provide services [5]. Among the milestones in the history of robotics use in the tourism industry, we can mention Rhino or Rhinoceros. This tour guide robot was installed in the Bonn Museum in Germany in 1997 and received over two thousand visitors within six days. Nowadays, augmented reality technologies, along with faster obstacle detection and environmental recognition, have enabled museum robots to deliver better services [4]. By utilizing this mechanism, the human force is freed from mundane tasks and can devote more attention to the creative and strategic aspects of the organization. In large dimensions, it leads to a higher level of productivity and creativity in implementing services. As a result, the human force will need to be retrained to work in a different position or the description of his previous duties will change. Using new technology in residential policies during a crisis can negatively impact future job growth, even if done gradually or implicitly [6]. Human-robot interaction is the study of human behavior and his reaction to the appearance and communication characteristics of the robots designed to expand service robots form the turning point of the new phenomenon of the mutual relationship between a human and an automatic machine. The upcoming generation of robots that follow basic design principles while being efficient is acceptable to society. It fulfills their social and emotional needs while maintaining human values. Human-robot interaction studies are focused particularly on the dynamic and personal nature of service robots, such as their voice, movement capabilities, and anthropomorphic features [17]. A robot's level of awareness and its characteristics are influenced by the design and complexity of the requested task and the nature of the service environment. Cognitive computing enables robots to imitate how the human mind works and makes the process of language understanding, object recognition, and conversation possible [5]. According to Mori's Uncanny Valley theory, a degree of robot-human similarity creates a sense of closeness and facilitates human-robot interaction but a person's reaction when faced with a robot that looks similar to a human, changes from excitement to strangeness and fear [21]. In general, the human similarities of robots, to a certain extent, strengthen their social sense and make them lovable. This measurable variable in robot design aims to increase humans' desire to use services conveniently. Their similarity to mechanical tools will bring social and communication limitations [1]. In hotel management, a service encounter can be defined as a combination of people (employees, customers), a service delivery environment, and facilitating factors (technology) [27]. Primary and secondary activities can be performed using robots. It is possible to use robots to assist staff in various ways, including cleaning and cooking. However, in some cases, these processes may be visible to passengers and even be considered an exciting aspect of the service offered. Although Robots are subject to defects and errors, and maybe their services are less flexible, the ability to work continuously without fatigue, the absence of disease and human factors, and the indifference to mundane tasks are positive signs to consider when utilizing robot services [9].

Using this service creates a new experience for passengers. It has been incredibly effective for children. Children's entertainment with robots, regardless of their function or limitations, mediates their relationship with their parents, and the satisfaction resulting from this pleasant interaction can cover a certain amount of interruption or possible service failure [1]. In order to automate services, a long-term strategy is required, and it is a costly endeavor. The first fully automated hotel opened in Japan in 2015 is one of the pioneers of this project. Robots handled more than 70% of hotel duties and a limited number of human resources supervised executive departments. After some time, half of the hotel's robots were removed. This action was prompted by the robots' failure to function properly [32]. Smart and contactless hospitality is made possible through the use of the new generation of service robots which can reduce perceived health risks during a crisis. There are two aspects to the communication domain of service robots in hospitality: their design type (tasks, movement, and degree of independence) and the human domain (consumers, the workforce interacting with this intelligent system). Similarly, the service space in robot-oriented accommodation units is also recognized as human interaction in the two positions of the passenger (demand) and the labor force engaged in the accommodation unit (supply) [8]. The theory of Ivanof and Seyitoglu suggests that robotics is suitable for tasks in which a sense of

human superiority is evident.

A few of these tasks include issuing payment documents, cleaning well-known areas of the hotel, accepting orders for new towels and napkins, dry cleaning, gardening, washing dishes, and cleaning the dining room. Robots should take responsibility for the hotel's repetitive and dangerous tasks to assist human workers rather than replace them [12]. According to a prediction in the World Economic Forum's annual report, approximately 85 million jobs may disappear or merge with the emergence of the next generation of technology by 2020.

Despite being considered one of the most controversial issues in human productivity and a threat to jobs, smart hotels have changed the strategy of other hotels like Chase Walker [3]. Nowadays, the use of new technology (the fifth generation) in hotels is considered the leading cause of the loss of jobs and unemployment, as well as the loss of hospitality. But change is inevitable, and over time, this trend has been observed across many industries and businesses (Replacing the workforce with bank tellers or mobile card readers) [10]. Aside from economic efficiency, differentiation, and productivity of robots, the main factors that will eventually replace or assist the labor force in this sector are economic efficiency, differentiation and productivity of robots. In recent years, new technologies such as robotics and artificial intelligence have led to the deskilling of jobs, which can be defined as reducing the variety of jobs available to human resources. As a result, the tasks of the labor force are reduced, and non-specialized personnel can work at a lower cost [9]. Robots and artificial intelligence will undoubtedly help hotels manage disease spread. During the COVID-19 pandemic, these cutting-edge technology-based services played a significant role in identifying people without masks and calculating their body temperature using infrared rays [22]. The lower level of human contact due to the role of technology as the primary intermediary in hotel services during the crisis is a stimulus to reduce the health risk. Identifying high-risk areas where human interaction is high and providing measures to reduce human contact through technology is essential (Internet of Things to turn off and on, adjust room temperature, intelligent assistant, smart doorman). However, the greater the prominence of technology's mediating role, the lower the perceived health risk will be [18, 20]. In addition to providing travelers with an exciting experience, contactless hospitality services reduce human errors and provide the basis for customizing services to meet their needs. This change in demand and consumption patterns is expected to become more prevalent [18]. Before 2020, robots were not sufficiently motivated to provide hotel services rapidly. The price of the new generation of robots, and in some cases, the uncertainty of acceptance on the supply side due to its new and unknown nature, which causes consumer frustration, have been among the compelling reasons for accommodation units' reluctance to change their strategy before the COVID-19 health crisis. The emphasis on maintaining social distance and ensuring the environment's health provided the

impetus for a shift in design and the provision of crisis management measures [28] Applying this strategy from the first step of selecting a hotel (using mobile applications instead of booking conventionally) to leaving the hotel (online payment) alongside contactless service given to customers reduces their perceived health risk, and travelers are more likely to book the accommodation later. The forced closure of hotel centers in crisis conditions became an incentive to change business strategy to deal with similar crises in the future [2]. An important strategy in the crisis era is attracting innovative and risk-taking customers because the industry's future will tend towards providing contactless services and encouraging risk-taking travelers to experience these services and use their views to attract and normalize robot-based services [19].

3. Result

3.1. Analyzing Demographic Data Results

The highest percentage of Iranian respondents were between 25 and 35 years old (40.6%), followed by 35 to 44 years old (25%), 18 to 24 years old (15.6%), and 55 to 65 years old (11.7%). According to the sample size, the lowest percentage of respondents is between 45 and 54 years of age (7%).

There were 29.4% of German respondents between 35 and 44 years old, 24.4% were between 45 and 54 years old, and 16.8% were between 55 and 65 years old, respectively. The participation percentage of respondents between 25 and 34 years old and 18 to 24 years old was (15.1%) and (14.3%).

Table 2. Respondents' age group.

Iranian		Germans		
Percent	Frequency	Percent	Frequency	Valid
15.6	20	14.3	17	18-24
40.6	52	15.1	18	25-34
25	32	29.4	35	35-44
7	9	24.4	29	45-54
11.7	15	16.8	20	55-65

Table 3. Gender differences and academic background.

Iranian		German		
Percent	Frequency	Percent	Frequency	Education
14.4	18	24.4	29	Diploma
51.6	66	35.5	42	Bachelor
32	41	23.5	28	Master degree
2.3	3	16.8	20	PHD
Percent	Frequency	Percent	Frequency	Valid (Gender)
64.8	83	58.8	70	Women
35.2	45	41.2	49	Men

3.2. Descriptive Statistics

The table below shows an overview of the average answers to questions of both groups. This amount was measured using a Likert scale of 1 to 5. The average response to robotic services in the reception, hospitality, and restaurant sectors was more than 3. Following the results, parametric tests can be used for data distributions with skewness and

elongation (normality indices). For this reason, we used an independent and one-sample t-test to evaluate two groups of communities. Generally, non-normal distributions have skewness and kurtosis outside the range of +2 -2.

Table 4. *Descriptive statistics (the whole sample).*

Variable type	Mean	Std.Deviation	Minimum	Maximum	Skewness	Kurtosis
R-services in hotel reception	3.515	0.89645	1.00	5.00	-.505	-.166
R-services in hospitality	3.686	.83113	1.25	5.00	-.572	-.243
R-services in restaurant	3.618	1.06364	1.00	5.00	-.641	-501

Table 5. *Two independent groups' t-test results.*

Group	Robotic services	Number	Mean	S.D	P	Mean Difference	Tendency level
	Robotic services in hotel reception	119	3.115	.902	0.084	-0.049-0.279	Average
German	Robotic services in hospitality	119	3.254	.770	<0.001	0.115-0.394	High
	Robotic services in restaurants	119	2.930	.999	0.223	-0.251-0.111	Average
	Robotic services in hotel reception	128	3.888	.714	<0.001	0.763-1.013	High
Persian	Robotic services in hospitality	128	4.088	.671	<0.001	0.971-1.206	High
	Robotic services in restaurants	128	4.258	.639	<0.001	1.146-1.137	High

A one-sample t-test determines the significance of the difference between the mean of two variables. An average of more than three on the five-option Likert scale indicates that most respondents chose options 3, 4, and 5. The significance level of the T-test of German tourists indicates that they are very interested in robotic hospitality services, according to the results of the research (P<0/001). Additionally, they were moderately likely to use hotel robotic services in the reception area (P=0.084) and restaurant (P=0.223). While Iranian tourists highly regarded all three hotel robotic services in the reception, hospitality, and restaurant departments (P<0.001).

The next table compares Iranian and German tourists' willingness to use robotic services in the era of COVID-19 using an independent.

Table 6. *Independent T-test results.*

Service type	Group	Number	Mean	Std. Deviation
Robotic services in hotel reception	German	119	3.115	.902
	Persian	128	3.888	.714
Robotic services in hospitality	German	119	3.254	.770
	Persian	128	4.088	.671
Robotic services in restaurants	German	119	2.930	.999
	Persian	128	4.258	.639

P> 0.05=H0 There is a significant difference between the two groups (1)
P<0.05= H1 There is no significant difference between the two groups (2)

Table 7. *Leven's test and T-test for equality of variances and means.*

Robotic services	Leven test		T-test		
	F	Sig	T	Significance	Confidence level of the difference
Reception services	6644	0.011	-7.494	<0.001	-.569,-976
			-7.431	<0.001	-.568, -978
Hospitality services	3.798	0.052	- 9.091	<0.001	-653,-1.014
			-9.045	<0.001	-.652,-1.015
Restaurant services	28.607	<0.001	-12.534	<0.001	-1.119,-1.537
			-12.343	<0.001	-1.116,-1.540

4. Conclusion

By comparing the results of this research and considering the main source of the researcher's inspiration from Ivanov Webster's article in 2018 entitled: Consumers' Behavior in the Face of Service Robots in Accommodation Units and the survey conducted in TravelZoo in 2016 [25], nearly 80% of respondents expect robots to play a role in future trips by 2020 as COVID-19 spread at the end of this year, this became a reality. According to estimations, some nations are more cautious and sensitive about accepting robots than others. Germans and French showed the least interest, while Chinese and Brazilians were more comfortable. The first significant point is the absence of health threats in previous surveys and polls. The researcher investigated how the current health crisis (COVID-19) influenced travelers' attitudes toward robotic services in the future. The comparison of the behavior pattern of two groups of tourists showed that Iranian tourists' behavior in dealing with robots in all three departments of reception, restaurant, and hospitality is generally high in hospitality and the results are in line with previous research. However,

German tourists' average tendency and their high willingness to use robots and artificial intelligence-related services in the hospitality sector show a relative change in their attitude towards them.

Iranians are willing to use robotics and artificial intelligence in restaurants, receptions, and hospitality. Germans, on the other hand, are less receptive to receptions and restaurants but are also highly interested in robotic hospitality services. According to a study in Turkey [20] during the COVID-19 health crisis, the results showed the positive role of new technology in the hoteling sector. The risk reduction of hygiene risk was understood, and there was increased interest in reservations. In the article by Rahimzadeh and Irani in 2021, they concluded that robots and artificial intelligence played a significant role in helping the hotel industry overcome the crisis. While this research was not directly related to any particular group of tourists, it cites similar results from technology as a means of reducing health risks.

Providing services using new technology during COVID-19 will increase post-crisis adoption. Employees can assist passengers in understanding the robots' functions by interacting with them. It will reduce the possibility of frustration when encountering robots and working with them. With the ever-increasing variety of services provided by robots from a marketing perspective, this mechanism, in addition to its competitive advantage over other accommodation units, is likely to attract a specific group of travelers. The target market includes the elderly and people with limited mobility who can utilize the robot-based generation of services under normal conditions. In addition, it may appear challenging to estimate the economic costs of these services at first glance. In the long run, however, it will have significant benefits. Compared with on-the-job training of the new workforce, software updates and support of manufacturing companies in competitive conditions will result in economic savings; this can occur because of the lack of proper productivity of human resources at all hours and the risk of illness and dissatisfaction under crisis conditions. Also, the temporary use or renting of service robots will be a good way to measure the economic efficiency of using this equipment in the long term and minimize the possibility of failure of huge projects and future investments.

5. Further Suggestions

Artificial intelligence and its tools are an integral part of everyday life, and robots can be utilized in a broader scope depending on future needs. When weighing the practical use of artificial intelligence tools in times of crisis and the endangering of jobs or fading hospitality principles, it is evident that using this new generation of technology to revitalize jobs becomes more critical. Researchers consider the extent and persistence of the COVID-19 pandemic to be a turning point in the acceptance and indirect use of new hotel services. Business owners should pay attention to passengers' expectations and not exceed their average level of service. The majority of this information is obtained through marketing research. For example, according to the upcoming research, Iranians have shown a higher level of acceptance than German travelers in facing hospitality services that reduce human contact in crises. Furthermore, implementing robotic-based services requires appropriate human and financial resource management methods and legal procedures must be implemented. For example, in-service training of employees, in addition to being costly, requires reconsidering the necessary prerequisites (for example, mastery of the English language or relevant software) to enter these occupations. Another obstacle to the targeted launch of the automatic hospitality mechanism is the ethical and security principles related to travelers' data. Connecting to an integrated Internet network increases the risk of stealing and misusing personal information. Providing instructions and obligations is a requirement for accommodations to attract more and more tourists. Along with significant changes in consumer patterns caused by the COVID-19 crisis, consumers will also accept that contagious diseases such as COVID-19 will become more prevalent soon. Robotic services can significantly apply long-term policies for hotels after health crises since they remove the fear of disease.

Appendix

Questionnaire:

This research used two different language-made questionnaires (Persian and Dutch). The English version is placed here for clarification:

What hotel features would you find more desirable regarding hygiene protocols if you had to travel and book a hotel during a health crisis (for example, COVID-19)?

Part I: Demographic information

Gender: female,   male

Age: 18 to 24,   25-34,   34-44,   44-54,   55-65

Education: bachelor's degree,   master's degree,   doctorate

Part II: Please answer the following questions according to the degree of strongly agree, agree, have no opinion, disagree and, strongly disagree

Table 8. *Questionnaire.*

	Question	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
1	Are you satisfied with the room service provided by robots during the health crisis (towels and napkins)? (Hospitality)					
2	During a health crisis, do you prefer QR codes to manual menus? (Restaurant)					
3	Will technology to identify people without masks affect the hotel's choice?(Reception)					
4	Would you prefer an automated check-in and check-out system?(reception)					
5	Will the Internet of Things capabilities (regulating light and temperature, etc.) be effective in choosing a hotel? (Hospitality)					
6	Will measuring body temperature in reception be one of the options you want? (Reception)					
7	Would you consider electrostatic sprays (to disinfect) as a means of improving environmental health? (hospitality)					
8	Do you feel more secure about your health when drinks and food are prepared by robots (Restaurant)					
9	Does a facial recognition system (which reduces human contact) help with hotel selection (reception)?					
10	Do you prefer robot food delivery to human food during a health crisis? (Restaurant)					

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