Journal of Association of Arab Universities for Tourism and Hospitality (JAAUTH)
Vol. 23 No. 1, (December 2022).
journal homepage: http://jaauth.journals.ekb.eg

Knowledge-Based Prototype for Assessing the Appropriateness of Tourism and Hospitality Services for Accessible Tourism

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ARTICLE INFO

Keywords:
Accessible Tourism; Disability; Tourists with disabilities; Accessible Hospitality; Artificial Intelligence; Expert Systems, Knowledge-Based Systems.

(JAAUTH)
Vol. 22, No. 3, (June 2022),

ABSTRACT

Although there is an expanded interest towards the accessible tourism, besides the continuous support offered by the decision-makers in the tourism and hospitality sector which aims at rehabilitating the tourism and hospitality services to be appropriate to receive this type of tourism, there is not a mechanism to evaluate services and facilities presented by the tourism and hospitality sector for the accessible tourism. Therefore, it is difficult to ensure their commitments towards the application of the UNWTO regulations and guidelines in this regard. Furthermore, no research has sought to discuss this important issue. Hence, this article underscores how the tourism and hospitality industry could better use emerging technologies like Artificial Intelligence (AI) to specify to what extent tourism and hospitality sectors provide acceptable and adequate accessible products and services to all tourists, regardless of their physical limitations, disabilities, or age**.** In this context, a knowledge-based prototype was proposed to play this role. Moreover, The propsed prototype can assist decision-makers in rating various services and facilities offered by the tourism and hospitality sectors to tourists with disablities. To ensure the quality of the proposed knowledge-based prototype and to assure about its ability to present accurate advice, three approaches were adopted for testing the proposed prototype. Smart PLS-3.0 was utilised to test the hypotheses. It is found that, the proposed knowledge-based prototype is valid to be used. Practicallly, it is believed that the knowledge-based prototype's outcomes will be valuable and beneficial for various stakeholders in the tourism and hospitality sector.

1. Introduction

Accessible tourism is an echoed concept in most global tourism industry platforms. It has been mainly born in the European Union, since 2003, with the approval of the

United Nations Convention on the Rights of Persons with Disabilities (UN CRPD, 2007), there has been an expanded spotlight on the tourism commitments to guarantee that people with disabilities can practice their right to enjoy leisure, sport, and tourism under the same conditions as other people. By now, after the United Nations World Tourism Organization UNWTO's declaration of 2009, when many stereotyping sectors of the global tourism market are weakening, accessible tourism has emerged as a promising tourism style providing the opportunity to serve a significant and expanding market, capture new customers and consequently increase operating revenues (World Tourism Organization, 2016).

World statistics has proved that tourists with disabilities are becoming an important part of the tourism market with a high economic value**.** The World Health Organization's statistics indicated that, there are approximately 1 billion persons with disabilities in the world. This equates to approximately 15% of the world population having a physical, mental or sensory disability (United Nations, 2006). In addition to this data, the rapid ageing of the population is underway. In 2009, there were more than 730 million people over 60 years of age, equivalent to 10% of the population, an increase of more than 20% since 2000. By 2050, the number of persons over 60 will increase to account for 20% of the world population, with one fifth of this group being over 80 years old (World Tourism Organization, 2013).

In view of the aforementioned, tourism and hospitality industry around the world has begun preparing all facilities and services to be accessible for all. Several studies have put some indicators that lead to improving the quality of service and ensure a good experience on the part of the tourist regarding the area of accessibility. These indicators are related to all aspects of the trip that guarantee to avoid the creation of what is called accessibility islands. In other words, the indicators enable the tourism sector to create a comprehensive supply of tourism for all products and services of the supply chain (reservation systems, accommodation, transportation, advertising, etc.) are easily accessed.

Although there is an expanded interest in accessible tourism, besides the continuous support offered by decision makers in the tourism and hospitality sector which aims to rehabilitate the tourism sector to be appropriate to receive this type of tourism, there is no mechanism to evaluate services and facilities presented by the tourism sector for accessible tourism. Therefore, it is difficult to ensure their commitments towards the application of the UNWTO regulations and guidelines in this regard. Therefore, there is an inevitable need to adopt new technology like Artificial Intelligence to pave the way for tourism and hospitality businesses to be appropriate to receive disabled tourists. In this paper, we proposed a knowledge-based prototype that can play this role. Furthermore, it can assist decision-makers in rating various services and facilities offered by the tourism and hospitality businesses to maximize the destination share of the international accessible tourism market. The proposed prototype was tested to be assured that it is valid to use and beneficial.

The paper is structured as follows; Section 2 highlights the background. Section 3 reviews the related works. The design and development of the proposed knowledge-

based prototype are explained in Section 4. Section 5 presents the testing methodology. Section 6 discusses the paper. Finally, section 7 concludes the paper.

2. Background

Section two commences by clarifying key concepts which have been cited in this paper: Disability, Tourists with Disabilities, Accessible Tourism, Accessibility, in Hospitality, and Knowledge-Based Systems.

2.1. Disability

It has been considered a medical or biological condition attributed to a particular person, which is needed to be fixed by treatment or rehabilitation. Today, the social aspects of disability are taken into account. It is unfair to create obstacles for persons with disabilities and prevent them to live and enjoy their life side beside with those without disabilities. In this context, UNWTO has shown that the UN Convention on the Rights of People with Disabilities recognizes disability as a human rights issue and identifies it as a social construct rather than a personal issue (World Tourism Organization, 2016). This means that disability results from the interaction between people with impairments and attitudinal and environmental barriers that hinder their full and effective participation in society on an equal basis with others (United Nations, 2006).

2.2. Tourists with Disabilities

According to UNWTO “Disabled Person” means any person whose full and effective participation in society on an equal basis with others in travel, accommodation and other tourism services is hindered by the environmental and attitudinal barriers (World Tourism Organization, 2013). According to Akinci (2013), there are different categories of tourists with disabilities, group of them include those who have long-term physical, mental, intellectual, or sensory impairments. Others who have disabilities for a temporary period, like the elderly, people carrying luggage, small children, pregnant or people who are big or small or stature. Disabled tourists with their different types of disability face real problems in accessing tourism and hospitality products and services.

2.3. Accessible Tourism

Accessible tourism concept is also known and used under different terms such as "Universal Tourism", "Disabled Tourism" "Barrier-free Tourism" and "Everyone and Everything Including Tourism" (Darcy and Dickson, 2009). As for this concept definition, UNWTO has defined accessible tourism as "the adaptation of environments and of tourism products and services to enable access, use and enjoyment by all users, under the principles of universal design" (World Tourism Organization, 2016). Tourism experiences can be enjoyed by all people if they can participate. Tourism is, therefore, an ongoing effort to ensure that all tourists, regardless of their physical limitations, disabilities, or age, can enjoy the best possible experience (Matt, 2021). Therefore, the world tourism organization has recognized the right of disabled people to experience tourist and hospitality products and services at any time and whatever they want without any restrictions independently and with equity and dignity through the delivery of universally designed tourist products, services, and environments. This

means that all people including the person on wheelchair, walking stick, people with visual and hearing impairments, seniors, pregnant women, families with a pram, and travelers with heavy luggage are the prospective stakeholders served by accessible tourism (World Tourism Organization, 2013).

2.4. Accessibility in the hospitality industry

The extant literature reveals that, the rehabilitation of the physical environment of buildings, spaces, equipment, and amenities throughout the hotel became the standard. Therefore, ensuring accessibility for tourists with disabilities in the hospitality industry is no longer a problem. The scope of accessibility has been expanded to encompass the digital services relevant to the tourists' experiences. In this context, hotels, restaurants, catering, travel agencies, and airlines are called to ensure that their services are accessible to all (Rabinowitz, 2021). A recent survey of global travel and hospitality executives revealed that digitizing hospitality services has become a business priority for the majority of hospitality companies. In this regard, digital access has become imperative to meet the needs and desires of tourists with disabilities in the hospitality industry. Consequently, hospitality enterprises have already responded to the issue of accessibility through investing in digital accessibility services. Digital Accessibility refers to individuals with disabilities' ability to use any technology efficiently. This frequently refers to web sites and applications, mobile apps, and terminals that have been built to be accessible to all guests with disabilities in the hospitality industry (Springer, 2021). According to Akinci et al. (2021) accommodation enterprises that provide accessible services to guests with disabilities are called "Disabled-Friendly Accommodation Companies". However, even though many accommodation companies claim to be disabled-friendly in their marketing efforts, it is noticed that the services provided in this regard are inadequate and do not meet acceptable standards.

2.5. Knowledge-Based Systems

Knowledge-Based systems (KBS) are one of the prominent research domains of Artificial Intelligence (AI). It is also known as Expert System. KBSs now play a large role in many industries and fields as diverse as hospital and medical facilities, petroleum engineering, financial services, telecommunications, information management, help desk management, employee performance evaluation, loan analysis, customer service, transportation, video games, manufacturing, aviation, and tourism (Leondes, 2002). KBS is defined as an interactive and reliable computer-based decision-making system that uses both facts and heuristics to solve complex decision-making problems (Nikolopoulos, 1997), It is also defined as a computer program that uses artificial-intelligence methods to solve problems within a specialized domain that ordinarily requires human expertise (Arvind, and Srinivas, 2010). It is considered at the highest level of human intelligence and expertise. The purpose of an expert system is to solve the most complex issues in a specific domain (Motos and Wilson, 2006). According to Razieh and Zahra (2013) and Peter and Lucas (2000), the benefits of KBSs are as follows.

- Easily available due to mass production of software.
- Improving the decision quality.

- Saving the expense of consulting experts for problem-solving.
- Providing fast and efficient solutions to problems in a particular domain.
- Helping to get fast and accurate answers
- The error rate is low as compared to human errors.

In view of the above-mentioned, it is obvious that the KBS is one of the artificial intelligence applications. It can resolve many issues which generally would require a human expert. It is based on knowledge acquired from an expert. It supports the decision-making process by using both facts and heuristics. The success of any KBS is majorly dependent upon the collection of highly accurate and precise knowledge. It has many benefits at different sectors which are among them the tourism sector.

3. Related Works

Many KBSs in the tourism and hospitality industry were developed a decade back. Related works in this field highlight the benefits of using KBSs in tourism**.** Many KBSs were developed for supporting this area. For example**,** a KBS for tourist information management was developed to recommend a suitable travel schedule that satisfies user input constraints such as time, budget, and preferences. The system can provide tourists with information on the route and the distance between any two towns in the region (Chauhan, 2010)**.** While in another article, a KBS for rural tourism in Maramures, Romania, was designed to evaluate the rural hotels and to rank them. Moreover, the user can evaluate the benefits of tourist destinations from several points of view and obtain information useful for decision making (Diana-Aderina *et al*., 2011). In the same context, Dogan and Kut (2010) developed a KBS to support the tourism sector in Turkey, where tourists are able to select the most suitable holiday places for them. Shankar (2012) presented the development of a KBS for tourism in Kolkata. The expert tour advisory system acts as a guide for tourists, provides them with detailed and up-to-date information, asks them for their purpose of visit, takes their preferences as input, and generates detailed tour schedules according to their need using its expert knowledge-based inference engine. Another paper discussed the importance of using KBSs in the tourism sector. The paper pointed out that knowledge-based decision support systems are a special kind of expert systems that can solve complex decision problems. The paper also illustrated that KBSs can act as counselor for each tourist, tour operator, and travel agent (Low *et al.*, 2000). KBS for was presented by Nada and Musbah (2015), and was developed to recommend a suitable travel schedule that satisfies the tourist's interest. The system is useful for tourists, and tourism agencies to select the best package based on the appropriate time, budget, and preferences of required tourist places. Hasiym (2009) developed a KBS for events guide. The system covers every event held at every location. The system is capable to find the nearest event, date of events, location of nearest food available, and more. This system has a good function to search about tourism information for events and special occasions. Subramanian, and Krishnankutty (2008) developed a KBS that would help the visitors, tour operators and administrators in rating various eco-destinations in one's area of interest. The system not only provides solutions, but also gives suggestions to the user for the query posed to them.

It is concluded that, KBSs have been successfully used in the tourism and hospitality sector in many countries to present some benefits to tourists, hotels, tour operators, and travel agents. All proposed KBSs help to customize a tourist program, choose the best destination, or rate some aspects of ecotourism. There are not enough studies of using KBSs in accessible tourism.

In this paper, we propose a knowledge-based prototype for rating the appropriateness of the tourism and hospitality sector for accessible tourism. This proposed prototype presents a mechanism to evaluate services and facilities offered by the tourism and hospitality sector to the accessible tourism. Thus, it helps decision makers to determine to what extent hospitality and tourism bodies are committed to applying the UNWTO indicators and guidelines in this regard.

4. The Design and Development of the Proposed Knowledge-Based Prototype

4.1. Prototype Architecture

The suggested knowledge-based prototype is a rule-based expert system. As shown in (Figure1), the architecture enables the reviewer to assess the appropriateness of a tourism service provider individually or assess the appropriateness of the tourism governorate to receive accessible tourism. By using a checklist value, the prototype based on the knowledge stored in the knowledge base can give scores to the checked tourism service provider. Based on these scores, the model through the inference engine gives the rates to the checked tourism service provider. These rates are appropriate, inappropriate, or somewhat appropriate. On the other hand, the rates of the reviewer, based on the tourism service providers, can assess the appropriateness of the tourism governorate to receive accessible tourism. The inference engine applies the rules to each tourism service provider rate and gives a rate to the tourism governorate. The given rate to the tourism governorate either is appropriate, not appropriate, or somewhat appropriate.

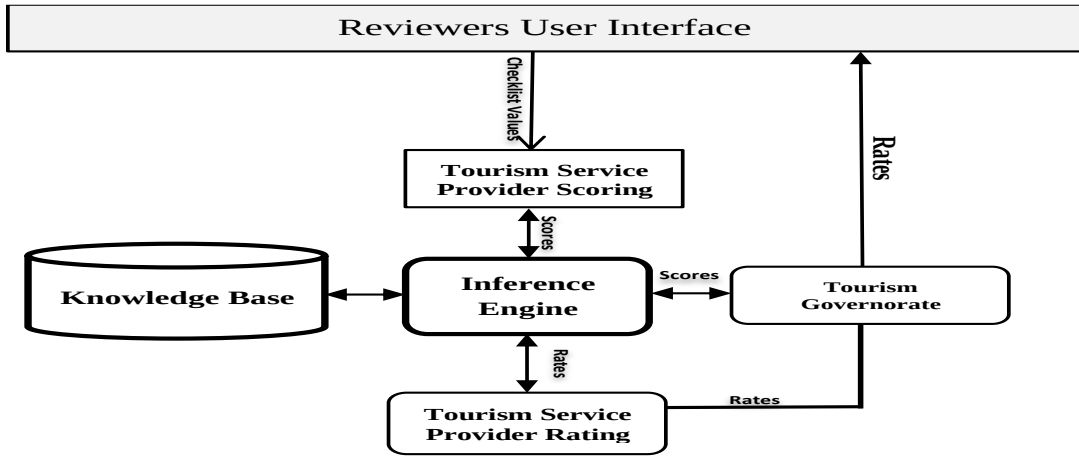

Fig.1. Prototype Architecture

As shown in the prototype architecture, the reviewer user interface presents a checklist that contains some questions; the reviewer has the option to answer in “Yes”, or “No”. The checklist was prepared according to the criteria to assess the appropriateness of each tourist service provider in the tourism governorate to receive accessible tourism.

According to the answers given by the reviewer, the search in the knowledge base is for possible pattern matches. If there is a rule in the knowledge base that matches the given facts by the reviewer, the prototype shows the appropriate rate in this interface.

The inference engine assigns a variable, for example 'X', for each question, and a numerical value for each option, i.e., Yes and No. That is, if a reviewer selects 'Yes' from the Option Box, then "X" is assigned with a value of 10, the same if he selects "No" then "X" is assigned with a value of 5.

Once all questions get their values through the input of the reviewer, the inference engine adds the numerical values to find the composite score and the inference engine calculates a percentage value, which in turn rates the tourist service provider as "Appropriate" if the percentage value of the composite score is between 75% and100%, "Somewhat Appropriate" if the percentage value of the composite score is between 60% and 74%, or "Not appropriate" if the percentage value of the composite score is less than 60 %.

4.2. Personalization Knowledge Conceptual View

Figure 2 shows a conceptual view for the domain ontology of the proposed knowledge-based prototype. The ontology contains twelve concepts, which can be grouped into two categories. Firstly, the tourism governorate rating category contains a super concept called the *Tourism Governorate* with four attributes (Name, Location, Score, and Rate), and three concepts: *Transportation Facility* concept with three attributes (location, score, and Rate), the *Tourism Services Provider* concept with four attributes (name, location, score, and Rate), and the *Urban Environment* concept with three attributes (Location, Score, and rate). Secondly, the tourism service provider rating category contains a super concept called the *Tourism Service Provider* with four attributes (Name, Location, Score, and Rate) and eight concepts for the different tourism service provider types considered in this paper. These eight concepts inherit the super concept in his four attributes (Name, Location, Score, and Rate), and each concept of them has one or more sub-concepts which includes the items of evaluation. The eight concepts are as follows: (1) *Tourism Information* with four sub concepts (Reservation System, List of Disabled Tourists' Services, Promotional Material and Tourists Complaints), (2) *Urban environments* with four sub-concepts (Signage, Main Corridor, Elevator, and Parking Area). (3) *Hotel* with three sub concepts (Hotel Room, Conference Hall, and Restaurant), plus an attribute (Category). (4) *Transportation Company* with one sub-concept (modality of transport). (5) *Conference Hall* with one sub-concept (Conference Hall Facility). (6) *Restaurant* with one sub-concept (restaurant equipment). (7) *Theatre, Cinema, & Museum* and with one sub-concept (Entertainment Facility), and (8) *Travel agency.*

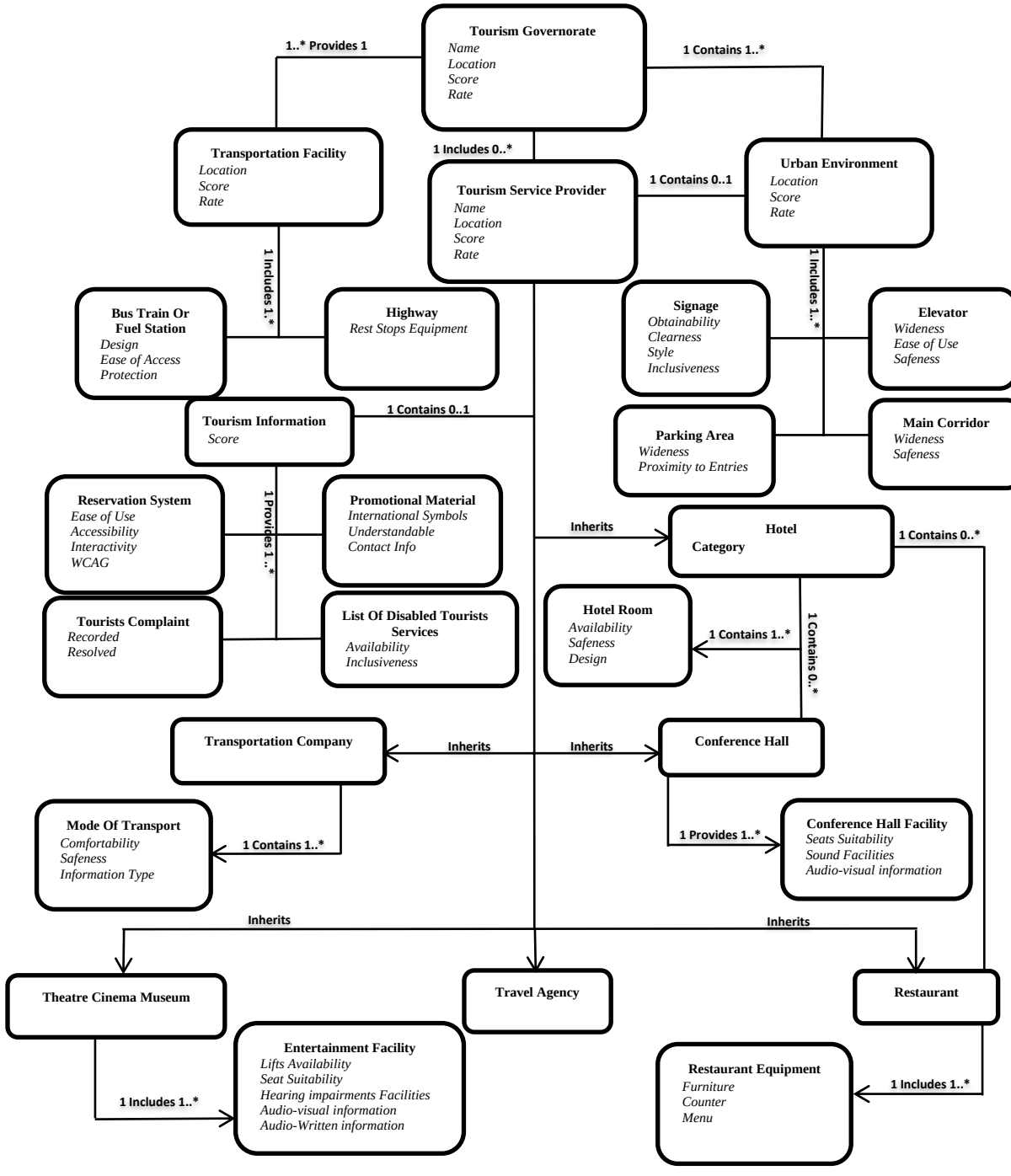

Fig. 2. Conceptual View of Personalization Domain Ontology.

The rating process can be performed through three levels: the first is rating the appropriateness of one of the tourism services providers, such as Travel Agency, Hotel, Transportation Company, Theater, Cinema & Museum, Restaurant, or Conference Hall to receive accessible tourism. Figures 3, 4, and 5 give different examples of how to give scores and rates for a travel agency, a hotel, and a transportation company. As shown in figure 3, the Inference Engine executes two

Inference steps. Firstly, the Travel Agency Score Inference Step, which accepts the four attributes of the different Tourism Info components and determines the scores of each Tourism Info component (i.e., How far does reservation system easy to use by the disabled tourists? To what extent does promotional material use the international symbols?). Finally, the Travel Agency Rate Inference Step accepts the scores of the different Tourism Info components and derives the rate of to what extent the Tourism Information in a Tourist Agency is appropriate to receive the accessible tourism.

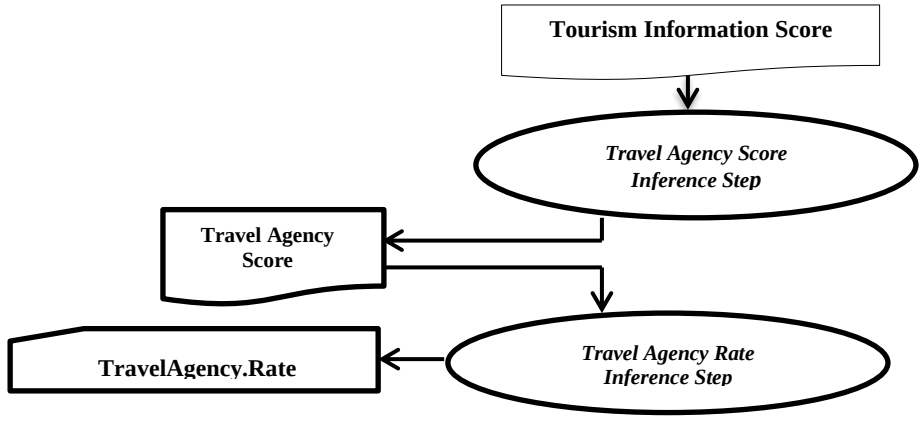

Fig.3. Conceptual View of Travel Agency Personalization Inference Steps, (Level One: Rating a certain Type of Tourist Services Providers)

As for the hotel rating, figure 4 illustrates the conceptual view of hotel personalization inference steps. The Hotel Inference Engine executes two inference steps. First, the Hotel Score Inference Step, accepts the attributes of each of the five components of the hotel and determines the scores of each hotel component. As shown in 3, each hotel may contain some or all of the following five components: (1) *Urban Environment*, (elevators, parking areas, signage and corridors), (2) *Tourism Information*, (Reservation Systems, Promotional Materials, Tourist Complaints and List of disabled Tourists Services), (3) *Hotel Room*, (4) *Conference Hall*, and (5) *Restaurant*. To calculate the scores of the *Urban Environment*, for example, in a hotel, the Hotel Score Inference Engine accepts the attributes of the *Urban Environment* (i.e., Are the elevators wide enough for a person using a wheelchair to enter and move easily? Are the elevators equipped with emergency systems accessible to the hearing impaired? Are the parking areas near as possible to the entry and exit points of buildings or tourist attractions? and do the parking areas have spaces with proper identification for vehicles of persons with reduced mobility). Finally, the Hotel Rate Inference Step accepts the scores of the different Hotel components and derives the rate of to what extent the hotel is appropriate to receive accessible tourism.

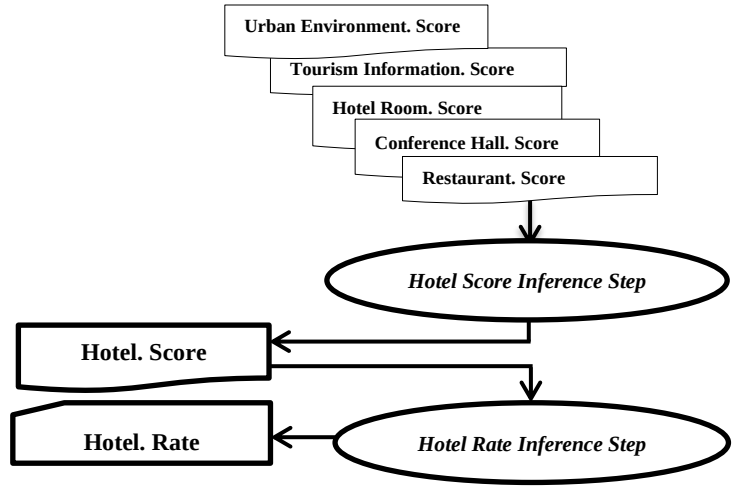

Fig.4. Conceptual View of Hotel Personalization Inference Steps, (Level One: Rating a certain Type of Tourist Services Providers)

Regarding Transportation Company rating, figure 5 illustrates the conceptual view of transportation company personalization inference steps. The Transportation Company Inference Engine executes two inference steps. First, the Transportation Company Score Inference Step, which accepts the attributes of each of the two components of the Transportation Company and determines the scores of each Transportation Company component. As shown in Figure 3, each transportation company may contain one or all of the following two components: (1) *Tourism Information,* and (2) *Mode of Transport*. To calculate the scores of the *Mode of Transport,* for example, in a transportation company, the Transportation Company Score Inference Engine accepts the attributes of the *Mode of Transport* (i.e., are modes of transport safe and comfortable for people with disabilities or reduced mobility? Does mode of transport provide information to passengers before or during the journey in visual and acoustic formats? Finally, the Transportation Company Rate Inference Step accepts the scores of the two components of the Transportation Company and derives the rate of to what extent the Transportation Company is appropriate to receive accessible tourism.

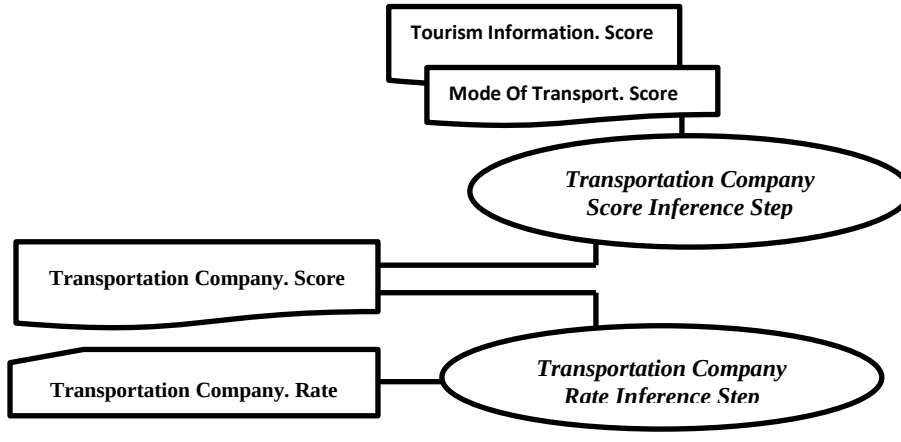

Fig.5. Conceptual View of Transportation Company Personalization Inference Steps, (Level One: Rating a certain Type of Tourist Services Providers)

The second level is rating the appropriateness of all tourism services providers in a certain tourism governorate to receive accessible tourism. As shown in Figure 6, the Inference Engine executes an Inference step. The Tourism Service Provider Rate Inference Step accepts the rates of the different Tourism services providers (i.e., Tourism Information Rate, Hotel Rate, Conference Hall Rate, and so on) and derives the Rate of to what extent the tourism services providers in a certain tourism Governorate are appropriate to receive the accessible tourism.

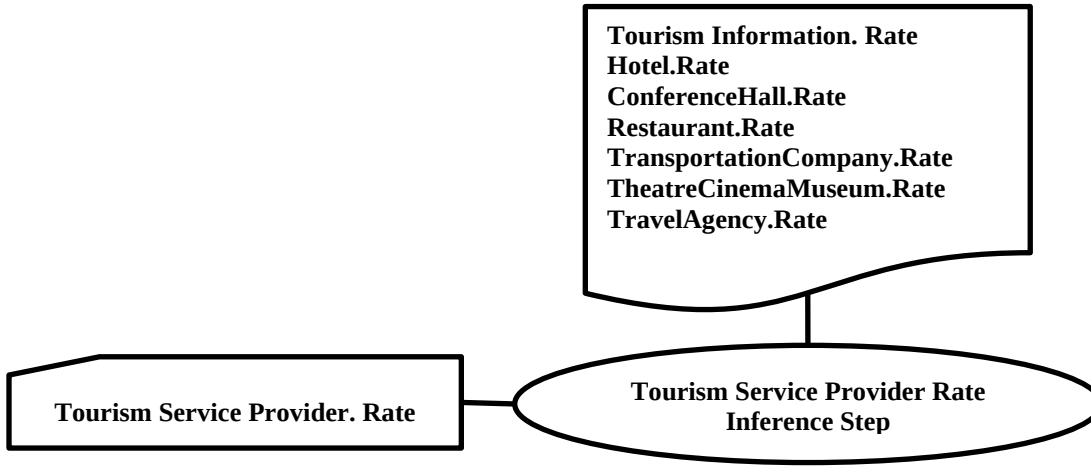

Fig.6. Conceptual View of Tourism Service Provider Personalization Inference Steps, (Level Two: Rating all the Tourism Services Providers in a certain Governorate**)**

The third level is rating the appropriateness of a certain tourism governorate to receive accessible tourism. As shown in figure 7, the Inference Engine executes an inference step. The Tourism Governorate Rate Inference Step accepts the rates of the transportation facilities, the tourism services providers, and the urban environment and derives the rate of to what extent the tourism governorate is appropriate to receive accessible tourism.

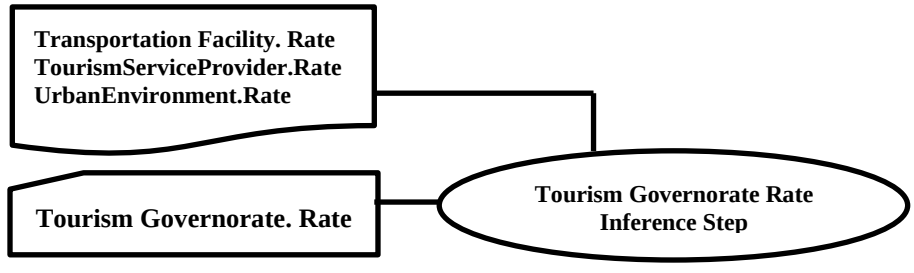

Fig.7. Conceptual View of a Tourism Governorate Personalization Inference Steps (Level Three: Rating a Tourism Governorate)

4.3. Personalization Knowledge Base Design

The personalization knowledge base consists of two main components: the personalization domain ontology and the personalization heuristic rule. The personalization domain ontology defines the twelve concepts presented in figure 2. The personalization heuristic rules are classified into three relations that are invoked by the three inference steps shown in Figures 3, 4, and 5. These relations are: 1. a

certain type of the tourism services providers and its appropriateness to receive accessible tourism.; 2. all the tourism services providers in a certain tourism governorate and their appropriateness to receive the accessible tourism, and 3. a certain tourism governorate and its appropriateness to receive the accessible tourism

4.3.1. The Personalization Domain Ontology

The personalization domain ontology has two categories of concepts: the evaluation aspects category, and the tourism accessibility criteria category. Each concept attribute is specified using five facts: attribute name, description, source of value (user or derived), data type (string, number, etc.), and legal values (set of values). Table 1 shows the ontology specifications of the Evaluation Aspects Category, which consists of the Tourism Governorate Concept, the Tourism Service Provider concept, the Transportation Facility Concept, and the Urban Environment Concept.

Table 1

The Ontology of Evaluation Aspects Category

Tourism Governorate Concept	
Name	**Tourist Governorate Name**
Description	The Tourist Governorate Name
Source of Value	User
Type	String
Name	**Location**
Description	The Geographical region in which the tourist governorate is located in
Source of Value	User
Type	String
Legal Value	"Cairo", "Giza", "Alex", "Matrouh", "Fayoum", "New Valley", "North Sinai", "South Sinai", "Suez", "Port Said", "Ismailia", "Red Sea", "Minya", Luxor", and "Aswan"
Name	**Score**
Description	The marks given to each evaluated governorate
Source of Value	Derived
Type	Number
Legal Value	0 to 4
Name	**Rate**
Description	The given rate to each scored governorate
Source of Value	Derived
Type	String
Legal Value	"Appropriate", "Somewhat Appropriate", Not Appropriate"
Tourism Service Provider	
Name	**Tourism Service Provider Name**
Description	The Tourist Service Provider Name
Source of Value	User
Type	String
Legal Value	" Travel Agency", "Hotel", "Transportation Company", "Theatre", "Cinema, & Museum, Restaurant", and "Conference

Continued

	Hall”
Name	**Location**
Description	The Geographical region in which the Tourism Service Provider is located in
Source of Value	User
Type	String
Legal Value	"Cairo", "Giza", "Alex", "Matrouh", "Fayoum", "New Valley", "North Sinai", "South Sinai", "Suez", "Port Said", "Ismailia", "Red Sea", "Minya","Luxor", and "Aswan"
Name	**Score**
Description	The points given to each evaluated tourism service provider
Source of Value	Derived
Type	Number
Legal Value	0 to 4
Name	**Rate**
Description	The given rate to each scored tourism service provider
Source of Value	Derived
Type	String
Legal Value	“Appropriate”, “Somewhat Appropriate”, Not Appropriate”
Transportation Facility Concept	
Name	**Location**
Description	The Geographical region in which the highway or the station are located in
Source of Value	User
Type	String
Legal Value	"Cairo", "Giza", "Alex", "Matrouh", "Fayoum", "New Valley", "North Sinai", "South Sinai", "Suez", "Port Said", "Ismailia", "Red Sea", "Minya","Luxor", and "Aswan"
Name	**Score**
Description	The marks given to each evaluated transportation facility
Source of Value	Derived
Type	Number
Legal Value	0 to 4
Name	**Rate**
Description	The given rate to each scored transportation facility
Source of Value	Derived
Type	String
Legal Value	“Appropriate”, “Somewhat Appropriate”, Not Appropriate”
Urban Environment Concept	
Name	**Location**
Description	The name of the building in which the urban environment is existed
Source of Value	User
Type	String

Continued

Legal Value	"Airport", "Seaport", "Land port", "Mall", "Museum", "Restaurant", "Hotel", "Conference Hall", "Theatre", "Cinema", "Travel Agency", "Transportation Company", "Hospital", "Bank", and "Governmental Body.
Name	**Score**
Description	The given marks to each evaluated tourism building
Source of Value	Derived
Type	Number
Legal Value	0 to 4
Name	**Rate**
Description	The given rate to each scored transportation facility
Source of Value	Derived
Type	String
Legal Value	"Appropriate", "Somewhat Appropriate", Not Appropriate"

Table 2 shows the ontology specifications of the category of tourism accessibility criteria, which has the following.

Tourism Accessibility Criteria concept. This concept defines the tourism accessibility criteria which in its light, the reviewer can rate to what extent the tourist governorate, or the tourist services provider is appropriate to receive the disabled tourists.

Table 2

The Ontology of Tourism Accessibility Criteria Category

Tourism Accessibility Criteria Concept	
Name	**Rate**
Description	The Tourism Accessibility Criteria Rate
Source of Value	Derived
Type	String
Legal Value	"Appropriate", "Not Appropriate", and "Somewhat Appropriate"

Tourism Information is an example of the tourism accessibility criteria, which contains four sub-concepts representing the different components of the tourism information criterion: Reservation Systems, Promotional Materials, List of Disabled Tourist Services, and Tourists' Complaints.

Table 3 shows the ontology specifications of the Tourism Information concept and its four sub-concepts, as an example of the different tourism accessibility criteria.

Table 3

The Ontology of Tourism Information Concept, and its four Sub-Concepts

Tourism Information Concept	
Name	**Rate**
Description	The Tourism Information Criterion Rate
Source of Value	Derived
Type	String
Legal Value	"Appropriate", "Not Appropriate", and "Somewhat Appropriate"

Continued

Reservation Systems Sub-Concept	
Name	**Ease of Use**
Description	Do the reservation systems facilitate the appropriate booking procedures for tourists with disabilities?
Source of Value	User
Type	String
Legal Value	"Yes", "No"
Name	**Accessibility**
Description	Do the reservation systems have clear information on the level of accessibility of facilities and services?
Source of Value	User
Type	String
Legal Value	"Yes", "No"
Name	**Interactivity**
Description	User
Source of Value	String
Type	"Yes", "No"
Legal Value	User
Name	**WCAG**
Description	Are the reservation systems following the Web Content Accessibility Guidelines (WCAG)?
Source of Value	User
Type	String
Legal Value	"Yes", "No"
Promotional Materials Sub-Concept	
Name	**International Symbols**
Description	Do the promotional materials use the international symbols?
Source of Value	User
Type	String
Legal Value	"Yes", "No"
Name	**Understandable**
Description	Are promotional materials easily understood
Source of Value	User
Type	String
Legal Value	"Yes", "No"
Name	**Contact Info**
Description	Do the promotional materials state how to contact the establishment through accessible media (text telephone, fax, or email)?
Source of Value	User
Type	String
Legal Value	"Yes", "No"
List of Disabled Tourists' Services Sub-Concept	
Name	**Availability**
Description	Is the list of disabled tourists' services Availability?
Source of Value	User

Continued

Type	String
Legal Value	"Yes", "No"
Name	**Inclusiveness**
Description	Does the list of disabled tourists' services contain the following guides: a guide for prostheses, a guide for veterinary clinics for dogs, and a guide for suppliers and distributors of specialized medical care?
Source of Value	User
Type	String
Legal Value	"Yes", "No"
Tourists' complaints Sub-concept	
Name	**Recorded**
Description	Are tourists' complaints recorded?
Source of Value	User
Type	String
Legal Value	"Yes", "No"
Name	**Resolved**
Description	Are tourists' complaints resolved through a suitable procedure?
Source of Value	User
Type	String
Legal Value	"Yes", "No"

4.3.2. The Personalization Heuristic Rules

The personalization heuristic rules are classified into two relations. Each relation consists of a set of heuristic rules. These relations are as follows; (1): The relation between the Tourism Service Provider and the Tourism Accessibility Criteria (2): the relation between The Tourism Governorate and the Tourism Accessibility Criteria. As for the first relation, the inference step of this relation indicates that if the tourism service provider (i.e., A Museum) is "Appropriate", "Somewhat Appropriate" or "Not Appropriate", to receive the disabled tourists. Table 4 presents the heuristic rules of the Tourism Service Provider (i.e., A Museum) and the Tourism Accessibility Criteria (i.e., Tourism Info). As shown in this table, the heuristic rules of this relation are divided into several categories. Each category includes four sub-concepts, Reservation Facilities, Promotional Materials, List of Disabled Tourists' Services, and Tourists' Complaints. Each sub-concept contains several attributes which are used in rating the appropriateness of the tourism information in a museum to deal with disabled tourists. The first Category includes rules from number 1 to rule number 4. This category represents the case of applying all the criteria of accessible tourism in what regards tourism information in a museum as an example of a tourism service provider. The second category includes rules from number 5 to rule number 8. This category represents the case of applying some of the accessible tourism criteria and not applying the others in what concerning the tourism information in a museum. The third category includes rules from number 9 to rule number 12. This category

represents the case of not applying all the criteria of accessible tourism in what concerns tourism information in a museum.

Table 4

The Tourist Service Provider and the Tourism Accessibility Criteria.

Category 1: the case of applying all the criteria of accessible tourism in what concerning tourism information in a museum as an example		
Rule 1:		
If	Reservation Facilities. Ease of Use = "Yes"	And
	Reservation Facilities. Accessibility = "Yes"	And
	Reservation Facilities. Interactivity = "Yes"	And
	Reservation Facilities. (WCAG) = "Yes"	
Then	Reservation Facilities. Rate= "Appropriate".	
Rule 2:		
If	Promotional materials. International Symbols = "Yes"	And
	Promotional materials. Understandable= "Yes"	And
	Promotional materials. Contact Info = "Yes"	
Then	Promotional materials. Rate= "Appropriate".	
Rule 3:		
If	List of Disabled Tourists' Services. Availability = "Yes"	And
	List of Disabled Tourists' Services. Inclusiveness= "Yes"	And
Then	List of Disabled Tourists' Services. Rate= "Appropriate".	
Rule 4:		
If	Tourists Complaints. Recorded = "Yes"	And
	Tourist complaints. Resolved = "Yes"	
Then	Tourists Complaints. Rate= "Appropriate"	
Category 2 the case of applying some of the accessible tourism criteria and not applying the others in what concerning the tourism information in a museum, as an example.		
Rule 5:		
If	Reservation Facilities. Ease of Use = "Yes"	And
	Reservation Facilities. Accessibility = "Yes"	And
	Reservation Facilities. Interactivity = "Yes"	And
	Reservation Facilities. (WCAG) = "Yes"	
Then	Reservation Facilities. Rate= "Appropriate".	
Rule 6:		
If	Promotional materials. International Symbols = "Yes"	And
	Promotional materials. Understandable= "Yes"	And
	Promotional materials. Contact Info = "No"	
Then	Promotional materials. Rate= "Somewhat Appropriate".	
Rule 7:		
If	List of Disabled Tourists' Services. Availability = "Yes"	And
	List of Disabled Tourists' Services. Inclusiveness= "Yes"	And
Then	List of Disabled Tourists' Services. Rate= "Appropriate".	

Continued

Rule 8:		
If	Tourist complaints. Recorded = "No"	And
	Tourists Complaints. Resolved = "No"	
Then	Tourist complaints. Rate= "Somewhat Appropriate"	
Category 3: the case of not applying all the criteria of accessible tourism in what concerning the tourism information in a museum, as an example		
Rule 9:		
If	Reservation Facilities. Ease of Use = "No"	And
	Reservation Facilities. Accessibility = "No"	And
	Reservation Facilities. Interactivity = "No"	And
	Reservation Facilities. (WCAG) = "No"	
Then	Reservation Facilities. Rate= "Not Appropriate".	
Rule 10:		
If	Promotional materials. International Symbols = "No"	And
	Promotional materials. Understandable= "No"	And
	Promotional materials. Contact Info = "No"	
Then	Promotional materials. Rate= "Not Appropriate".	
Rule 11:		
If	List of Disabled Tourists' Services. Availability = "No"	And
	List of Disabled Tourists' Services. Inclusiveness= "No"	And
Then	List of Disabled Tourists' Services. Rate= "Not Appropriate".	
Rule 12:		
If	Tourists Complaints. Recorded = "No"	And
	Tourist complaints. Resolved = "No"	
Then	Tourists Complaints. Rate= "Not Appropriate"	

Regarding the second relation, which is between the Tourism Governorate and the Tourism Accessibility Criteria, the inference step of this relation indicates if the Tourism Governorate (i.e. South Sinai) is "Appropriate", "Somewhat Appropriate", or "Not Appropriate", to receive the disabled tourists. Table 5 presents the heuristic rules of The Tourism Governorate and the Tourism Accessibility Criteria. As shown in this table, the heuristic rules of this relation are divided into several categories. Each category includes three concepts: *Transportation Facility, Tourism Service Provider*, and *Urban Environment.* Each concept contains sub-concepts and several attributes which are used in rating the appropriateness of the tourism governorate to receive the disabled tourists. The first category includes rule number 13. This category represents the accessibility tourism case of applying all the criteria by the evaluated governorate, that is, the South Sinai Governorate. The second category includes rules number 15. This category represents the case of applying some of the accessible tourism criteria and not applying the others by South Sinai. The third category includes rule number 14. This category represents the case of not applying all the criteria for accessible tourism by South Sinai region.

Table 5
The Tourism Governorate and the Tourism Accessibility Criteria.

Category 1: the accessibility tourism case of applying all the criteria by a tourism governorate (i.e., South Sinai)		
Rule 13:		
If	Transportation facility. Rate = "Appropriate"	And
	Tourism service provider. Rate = "Appropriate"	And
	Urban Environment. Rate = "Appropriate"	
Then	The Tourism Governorate. Rate= "Appropriate".	
Category 2: the case of applying some of the accessible tourism criteria and not applying the others in a tourism governorate (i.e. South Sinai)		
Rule 15:		
If	Transportation facility. Rate = "Appropriate"	And
	Tourism service provider. Rate = "Some Appropriate"	And
	Urban Environment. Rate = " Appropriate"	
Then	The Tourism Governorate. Rate = "Somewhat Appropriate".	
Category 3: the case of not applying all the criteria of accessible tourism in a tourism governorate (i.e. South Sinai)		
Rule 14:		
If	Transportation facility. Rate = "Not Appropriate"	And
	Tourism service provider. Rate = "Not Appropriate"	And
	The Tourism Governorate. Rate = "Not Appropriate"	
Then	The Tourism Governorate. Rate= "Not Appropriate".	

5. Testing Methodology of the Proposed Knowledge Based Prototype

To ensure the quality of the proposed knowledge-based prototype and to ensure that it will give its users accurate advice, we adopted three approaches to test the proposed prototype. The first method is to test its verification and validation. According to El-Korany, et al. (2000), verification testing means assuring that the knowledge-based prototype is structurally correct. They added that validation testing means that demonstrating the ability of the knowledge-based prototype to reach correct conclusions. Vermesan (1998) defined the items listed under the verification and validation variables as follows, competency, consistency, and completeness. The first method of testing was done by reviewing the prototype proposed by Artificial Intelligent professors and specialists. The second approach is to test the performance. Munaiseche and Liando (2016) stated that testing the performance of knowledge-based prototype means assuring its usability by users and its usefulness for them. This was achieved by holding meetings with some managers at the official and unofficial tourism bodies in Egypt. The third approach is to test its effect on guest intention to visit. This was reached by surveying the opinions of some disabled tourists about the effect of the proposed prototype on their intention to treat with hotels and tourism services providers who use this proposed prototype. Figure (8) shows the testing methodology of the proposed knowledge-based prototype

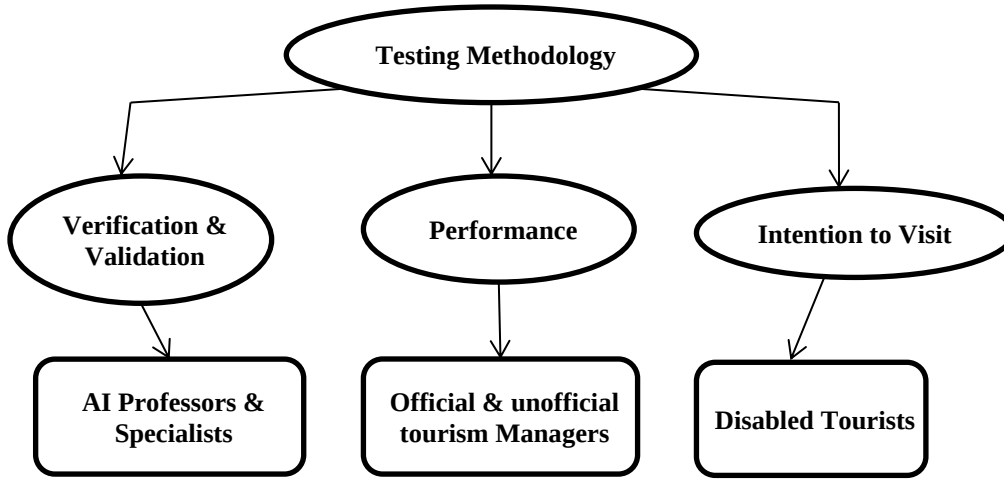

Fig.8. Testing methodology of the proposed knowledge-based prototype

5.1. The Sample and Design

To carry out the prototype evaluation process, some predetermined questions, organized in two checklists were asked through several interviews to a number of 70 Artificial Intelligent professors and specialists at different faculties of Artificial Intelligent in Egypt and through holding meetings with a number of 94 experts at the Ministry of Tourism, the Ministry of Culture, Cairo Airport Authority, The National Museum of Egyptian Civilization Authority, Chamber of Travel and Tourism Companies and Agencies, The Egyptian General Company for Tourism & Hotels (EGOTH), Hotel Establishments Chamber, and Chamber of Establishments and Tourism Restaurants. The first checklist is made up of three sections to assess the verification and validation of the proposed prototype. The second checklist consists of two sections to check its performance from the point of view of the official & unofficial tourism managers. Finally, to assess the impact of the proposed knowledge-based prototype on the intention of disabled tourists to visit the hotels and tourism establishments that use this proposed prototype, a total of 155 questionnaires were distributed to a convenient sample of disabled tourists in hotels, restaurants, cinemas, museums, and airports in three tourism governorates: Cairo, Alexandria, and South Sinai. of those 155 participants, (55%) of them were female and (45%) of them were male. More than (57%) of respondents were between the age of (19:60) years old. Majority of disabled participants were ambulatory disability (43%), and Self-care disability (24%).

5.2. Measures

Eleven elements were used to measure the verification and validation variable of the knowledge-based prototype proposed by (Vermesan, 1998). The study adopted the eight-item scale from (Munaiseche, and Liando, 2016) to measure the performance variable of the proposed knowledge-based prototype. The Tourists' intention to visit variable was rated by some disabled tourists using a three items scale from (Blasco-Lopez et al., 2019). All elements are measured on a five-point Likert scale ranging from disagree (1) to agree (5). The sentences were encoded as follows: (Table 6).

5.2.1 Intelligent Professors checklist

Table 6 shows the descriptive statistics of the verification and validation variable. This variable consists of three elements: competence, consistency, and completeness.

Table 6

Descriptive Statistics for Verification and Validation Variable of the Proposed Prototype

Verification and Validation Variable			
Competency		**M**	**SD**
	The model is deemed competent	4.01	0.232
	The model achieves the required tasks	4.01	0.232
	The model improves the quality of assessment outputs	3.95	0.340
	The model reduces the risks of errors	3.93	0.336
Consistency			
	Each question in the checklist is clear.	4.05	0.269
	Each value in the knowledgebase is valid.	4.04	0.250
	Each rule in the knowledgebase is logic	4.01	0.311
	Each transaction executes successfully	4.04	0.250
	The transaction doesn't break the rules defined by the knowledgebase.	4.02	0.293
Completeness			
	The model covers all aspects of evaluating the suitability of the tourism service provider to receive the accessible tourism	4.04	0.290
	The model makes all evaluation questions are required to be answered.	3.94	0.383

It is important to explore the significance of the means values, which are as follows: values between 0.0 and 1.790 means (completely disagree). Values are between 1.790 and 2.590 means (disagree). Values are between 2.590 and 3.390 means neutral. Values are between 3.390 and 4.190 means (agree). The values are between 4.190 and 5 means (completely agree).

According to table 6, the mean of verification and validation variable rang from (M= 4.5, SD= 0.296) to (M= 3.93, SD= 0.336). This result confirms that the proposed knowledge-based prototype is competent, consistent, and complete. This indicates that experts confirm that the proposed prototype is correctly structured and can give accurate advice. They also added that the proposed prototype contains the three elements that any successful application must have. Thus, it is verified and valid to be used. This result agrees with (Vermesan, 1998).

5.2.2 Managers checklist

Table 7 shows descriptive statistics of performance variable of the proposed prototype from the viewpoint of the managers at different official and unofficial bodies in Egypt.

Table 7
Descriptive statistics for performance variable of the proposed prototype

Performance Variable			
Perceived Usability		**M**	**SD**
	I can show proficiency using the model (APP).	3.94	0.322
	I can quickly perform the rating tasks	3.94	0.286
	I can easily remember how to use the model after a period of not using it,	3.89	0.343
	I can easily recover from the errors	3.94	0.322
	I am satisfied with the model design	3.91	0.317
Perceived Usefulness			
	Using the form (APP) will increase my ability to rate services	3.85	0.387
	Using the model (APP) will improve the efficiency of my services rating.	3.85	0.387
	I find that the model (APP) is useful for me	3.86	0.347

According to table 7, the mean of usability and usefulness variable rang from (M= 3.94, SD= 0.322) to (M= 3.85, SD= 0.387). This result confirms that the proposed knowledge-based prototype has a good performance because it is usable and useful. This indicates that managers in different official and unofficial bodies in Egypt who are supposed to use this proposed prototype confirm that it is easy to use and is useful for achieving the evaluation process of the appropriateness of the tourist and hotel establishments to receive accessible tourism. This result agrees with (Munaiseche, and Liando, 2016).

5.2.3. Guest questionnaire

According to the suggested model, there are two hypotheses to examine, as follows:

H_1. Perceived usability variable has a Positive effect on guest intention to visit.
H_2. Perceived usefulness variable has a positive effect on guest intention to visit.

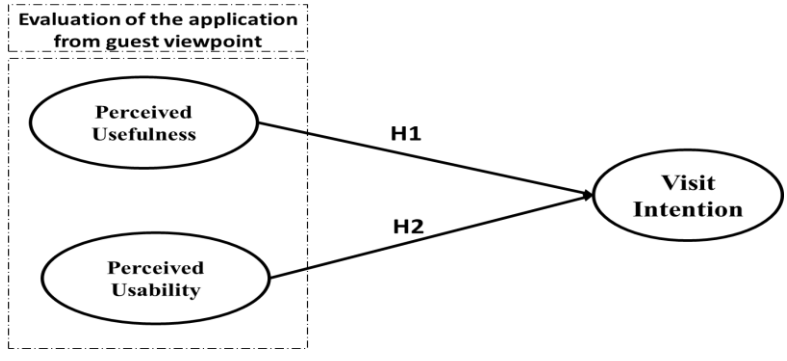

Fig.9. The proposed conceptual framework

5.2.3.1. Results

The "Partial least squares PLS" technique was used to test the hypotheses with SmartPLS-3.0. According to Leguina (2015), the proposed model should examine by PLS using a two-step, As follows.

5.2.3.2. Assessment of the outer measurement model

To evaluate the reliability and validity, internal consistency reliability, the reliability of the indicators, the convergence validity, and the discriminant validity were tested. First, as showed in **Table 8**, the structures' internal consistency reliability was tested with Cronbach's alpha (α) changing from 0.906 to 0.920, and the composite reliability (C.R) ranging from 0.929 to 0.950. Second, the reliability was acceptable since all loading values of the structure indicators were greater than 0.70. Third, convergent validity was evaluated by the average variance extracted (AVE) values exceeding the satisfactory value of 0.50 (Henseler et al., 2009).

Table 8

Assessment of the Formative Measurement Model

The model items	Outer Loading	α	C.R	AVE
Perceived Usefulness		0.920	0.950	0.862
Usefulness_1	0.946			
Usefulness_2	0.922			
Usefulness_3	0.919			
Perceived Usability		0.906	0.929	0.725
Usability_1	0.807			
Usability_2	0.825			
Usability_3	0.839			
Usability_4	0.909			
Usability_5	0.874			
Visit intention		0.913	0.945	0.852
VI_1	0.908			
VI_2	0.943			
VI_3	0.918			

Finally, three criteria were implemented to assess the discriminant validity of the constructs. They were cross-loading, Fornell-Larcker criterion, and heterotrait-monotrait ratio (HTMT) (Leguina, 2015). As indicated in Table (9), the outer load for each latent variable - underlined- was higher than the cross load with other measurements.

Table 9

Cross-Loading Results

Variable / Code	Perceived Usefulness	Perceived Usability	Visit Intention
Usefulness_1	**0.946**	0.706	0.745
Usefulness_2	**0.922**	0.742	0.742
Usefulness_3	**0.919**	0.795	0.749
Usability_1	0.576	**0.807**	0.581
Usability_2	0.599	**0.825**	0.495
Usability_3	0.662	**0.839**	0.559
Usability_4	0.725	**0.909**	0.707

Continued

Usability_5	0.814	**0.874**	0.797
VI_1	0.749	0.715	**0.908**
VI_2	0.704	0.678	**0.943**
VI_3	0.766	0.698	**0.918**

As shown in Table 10, the bold values of the AVEs in the diagonals are higher than the correlation between variables. According to Gold et al. (2001), HTMT values need to be less than 0.90. The HTMT values of HTMT were lower than this (Table 3). According to the results, the model structure has adequate discriminant validity. Consequently, the outcomes of the outer measurement model were deemed strong enough to continue to evaluate the structural model.

Table 10

Inter-construct correlations, the square root of AVE, and HTMT results

	AVEs values			HTMT results		
	Perceived Usefulness	**Perceived Usability**	**Visit Intention**	**Perceived Usefulness**	**Perceived Usability**	**Visit Intention**
Perceived Usefulness	**0.929**					
Perceived Usability	0.805	**0.851**		0.867		
Visit Intention	0.803	0.756	**0.923**	0.875	0.809	

5.2.3.3. Assessment of the structural model

The hypotheses were then tested by structural equation analysis (SQM). In particular, the model's predictive capacity and the explanatory power were analyzed (Hair Jr et al., 2019). With the VIF values of the manifest indicators changing from 2.89 to 4.251below 5, the multicollinearity of the structural model has been verified as inexistent. Next, (Chin, 1998) indicated that the lower limit for the R^2 values is 0.10. Therefore, the R^2 values for visit intention variables (R^2= 0.679) is acceptable (**Table 11**). Furthermore, the Stone-Geisser Q2 test indicates values of visit intention variables greater than zero (**Table 11**), indicating adequate predictive validity of the model (Henseler et al., 2009). Consequently, enough predictive validity for the structural model was also confirmed.

Table 11

Coefficient of determination (R2) and (Q2) of the model

Endogenous latent construct	(R2)	(Q2)
Visit intention	0.679	0.536

Lastly, the path coefficient and t-value of the hypothesized association were analyzed using a bootstrapping technique. **Table 12 and Figure 10** below display the hypothesis test results, given the path coefficient values and the relevant significance. The perceived usefulness variable was found to have a positive and significant correlation with the visit intention variable at $\beta = 0.551, p < 0.000$, so **H_1** was supported. The results also confirm that the perceived usability variable has a positive effect on visit intention variable at $\beta = 0.312$, $p < 0.012$, supporting **H_2**.

Table 12
Path coefficients

	Beta (β)	t-values	P Values	Results
Perceived Usefulness -> Visit Intention	0.551	4.054	0.000	Accepted
Perceived Usability -> Visit Intention	0.312	2.515	0.012	Accepted

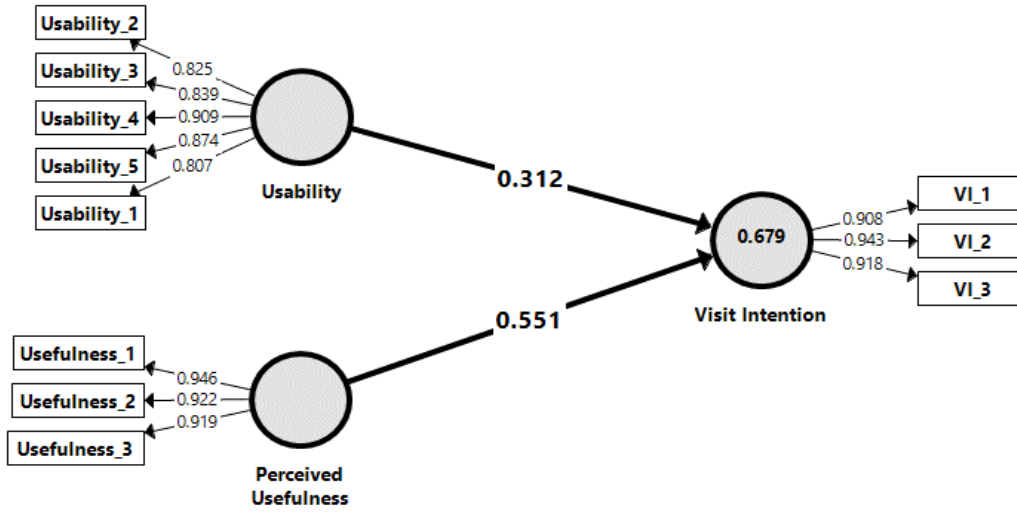

Fig.10. The Structural and Measurement Model

6. Discussion

The results of the interview with the artificial intelligent professors and specialists revealed that the proposed knowledge-based prototype is verified and valid. This result confirms that the proposed prototype is competent, consistent, and complete. It indicates that experts confirm that the proposed prototype is correctly structured and can give correct advice. They also added that the proposed prototype contains the three elements that any successful application must have. Thus, it is verified and valid to be used. This result agrees with (Vermesan, 1998). Regarding the results of meetings held with managers at different official and unofficial bodies in Egypt, this result confirms that the proposed knowledge-based prototype performs well because it is usable and useful. This indicates that managers in different official and unofficial bodies in Egypt are supposed to use this proposed prototype assure that it is easy to use and is useful for achieving the evaluation process of the appropriateness of the tourist and hotel establishments to receive accessible tourism. This result agrees with (Munaiseche, and Liando, 2016). Regarding the results of the questionnaire, the respondents were assured that they could easily use the proposed prototype. They can assess each aspect of the offered services by hotels and tourist establishments. Surveyed disabled tourists emphasized that the proposed prototype is very useful for them, and it is considered a main motivation to encourage them to treat with the hotel or tourism establishments that allow its customers to evaluate their services by such as this proposed prototype.

7. Conclusion

There are currently no benchmarks in place to evaluate the accessible services and products offered to disabled guests by tourism and hospitality companies. As a result, the purpose of this article is to formulate an assessment model by using Artificial Intelligence (AI) applications, to assess the degree of satisfactory about accessible products and services provided to guests with disabilities**.** this article believed that the proposed knowledge-based prototype is beneficial to several stakeholders. It can enable employees in the official and unofficial hotel and tourism bodies to easily assess to what extent the hotel and tourism establishment are appropriate to receive accessible tourism. Based on this proposed prototype, those employees can provide reports to decision makers at each tourism service provider, Ministry of Tourism, Ministry of Culture, Governor of any tourist governorate, or Prime Ministers about the appropriateness of accessible services offered to tourists with disabilities. On the other hand, the proposed prototype has a positive impact on the intention of disabled tourists to treat with the hotel and tourism services providers that use this prototype because it will allow them to evaluate the offered services and determine to what extent these services are appropriate for them. Not to mention that the opinions of artificial intelligent professors and specialists who emphasized that the proposed prototype is valid to be used.

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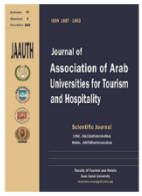

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(JAAUTH)
المجلد 23، العدد 1، (ديسمبر 2022).
الموقع الإلكتروني: http://jaauth.journals.ekb.eg

نموذج أولي قائم على المعرفة لتقييم مدى ملاءمة خدمات قطاع السياحة والضيافة للسياحة الميسرة

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معلومات المقالة

الكلمات المفتاحية

السياحة الميسرة؛ الإعاقة؛ السائحين ذوي القدرات الخاصة؛ الضيافة الميسرة؛ الذكاء الاصطناعي؛ النظم الخبيرة؛ النظم القائمة على المعرفة

(JAAUTH)
المجلد 23، العدد1، (ديسمبر 2022)،

الملخص

على الرغم من الاهتمام المتزايد بالسياحة الميسرة، والدعم المستمر الذي يقدمه متخذي القرار في قطاع السياحة والضيافة والذي يهدف إلى إعادة تأهيل القطاع ليكون مناسبًا لاستقبال السائحين ذوي القدرات الخاصة، لا توجد آلية لتقييم الخدمات والمرافق التي يقدمها قطاع السياحة والضيافة للسياحة الميسرة. وبالتالي فإنه من الصعب التيقن من التزاماتهم تجاه تطبيق إرشادات منظمة السياحة العالمية ومبادئها التوجيهية في هذا الشأن. في هذه الورقة البحثية تم تصميم نموذجًا قائمًا على المعرفة باستخدام تقنيات الذكاء الاصطناعي لتقييم مدى ملاءمة المنشآت السياحية والفندقية لاستقبال السياحة الميسرة. من الناحية العملية، يعتقد أن نتائج النموذج الأولي القائم على المعرفة ستكون قيمة ومفيدة لجميع العاملين والمستفيدين بقطاع السياحة والضيافة. ولضمان جودة النموذج القائم على المعرفة، وللتأكد من أنه سيقدم لمستخدميه نصائح دقيقة، قمنا باعتماد ثلاث طرق لاختبار هذا النموذج المقترح. تم استخدام Smart PLS-3.0 لاختبار الفرضيات. وقد وجد أن النموذج المقترح، صالحاً للاستخدام.