

4-26-2021

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Recommended Citation

Tulaeva, Kh.U. (2021) "AN ONTOLOGY CONCEPT: DATABASE FOR GASTRONOMIC TOURISM, BUILDING XML SCHEMA DEFINITION AND EXTENSIBLE MARKUP LANGUAGE," *Economics and Innovative Technologies*: Vol. 2021 : No. 2 , Article 10.

Available at: <https://uzjournals.edu.uz/iqtisodiyot/vol2021/iss2/10>

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AN ONTOLOGY CONCEPT: DATABASE FOR GASTRONOMIC TOURISM, BUILDING XML SCHEMA DEFINITION AND EXTENSIBLE MARKUP LANGUAGE

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Abstract: *Tourism is a strategy for country to increase its income. Digital technologies are currently used to help improve tourism, for example with information about tourist areas through the website or Mobile Apps. Database is required as the basic infrastructure for implementing system when to support tourism. In this research, we discussed about the database model that can stored tourism data. Tourism databases such as warehouses are rich in information about tourism. Tourism information can be in the structured or unstructured form. Database development is an important part of enhancing development supported by digital technology. In this research, ontology is applied for database development and it produces the ontologies that could be utilized for gastronomic tourism.*

Keywords: *gastronomic tourism, data, database, ontology, XML Schema Definition, Extensible Markup Language*

Introduction

To reach the rapidly changing technology speed in 21st century is a big issue of today in any country's government system. Tourism is a sector where millions of people exchange their money to get high quality service and the number of tourists depends on how the service will be delivered. The tourism sector is one sector that provides income for the country. According to Popescu et.al. (2015) many countries make the tourism sector to be their main income [1].

Tourism is what involves every human being in the world. Tourists need detailed information about each place that they want to visit. Today we can see hundreds of digital resources which provide huge range of data in order to inform people about the place, the way, the service and the prices of a place where they will visit and spend their money.

Tourists who will travel to a tourist attraction, will seek information about the object before going on a tour. This means that management is needed regarding data/ information on tourist attractions. Management of data/ information on tourist attractions is done by using a database. A database is a place for storing data on a computer, by using certain methods, stored data can be

processed and produce information for users. Large databases are referred to as data warehouse.

The global importance of tourism is steadily rising, creating new job opportunities in many countries. Today's information management solutions for the complex tasks of tourism intermediaries are still at an early stage from a semantic point of view. The tourism product has an intangible nature in that a prospective traveler cannot touch the product before the trip. This is one major reason why information about tourism and travel services (e.g. destination, hotel, restaurants, events, transportation etc.) must be accurate and credible, one that fosters users' confidence.[2] One way to achieve this level of credibility is to engage knowledge representation formalisms that can sufficiently capture all relevant facts about tourism objects in a domain on which approaches to rendering tourism information services can be based. An ideal approach to achieve this is the use of ontologies which provide the platform on which recommendation formalisms that exploit deep knowledge of the user, tourism objects, and other relevant contextual information that closely model reality can be built. [2]

Gastronomy tourism is one of the emerging concepts in the tourism arena and it is an area which has been rarely researched. [3] Gastronomy tourism has been evolved through local food and beverages and major component of the tourist's budget is allocated for food and beverages when travelling. Since there are many unaddressed opportunities which are associated with gastronomy which can be utilized to enhance the country's or region's economic development, it is necessary to identify the sub components which are associated with gastronomy tourism, how it is associated with destination branding and the challenges associated with gastronomy.

[3]

The aim of this research is to build database based on ontology for gastronomic tourism in Uzbekistan, especially in Bukhara region.

The research objectives are:

- Develop ontology for database of gastronomic tourism
- Create XML Schema Definition (XSD)
- Create Extensible Markup Language (XML)

Literature review

Gastronomy is one of the sectors most valued by tourists. When we travel we like to discover the local cuisine of the destination, to explore its restaurants, to taste the typical products, the traditions, and to be able to live surprising, unique

and special experiences. The data show that, according to the World Tourism Organization (UNWTO), more than a third of a tourist's spending is dedicated to food. Gastronomy has become one of the main reasons to travel. In many destinations, gastronomy has become a strategic sector that contributes to the

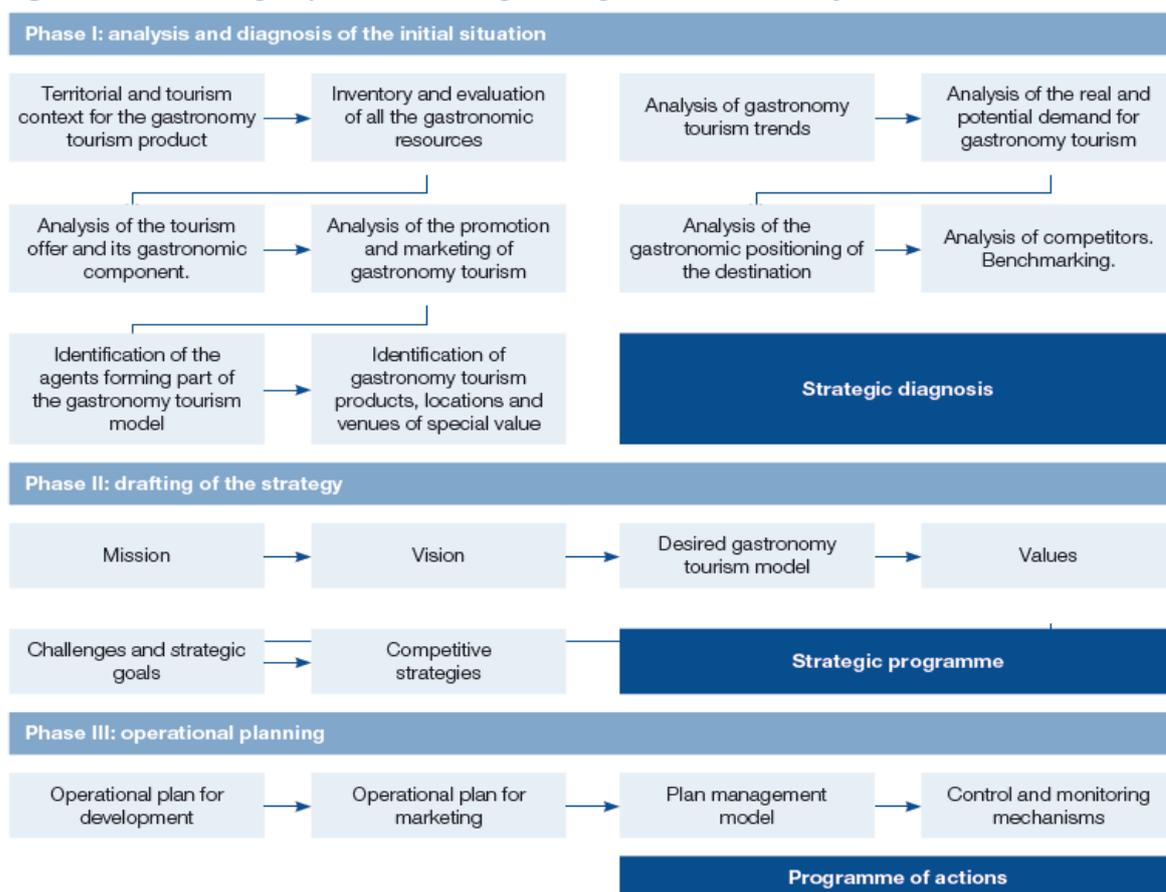


Figure1: Methodological process for drafting a Strategic Plan for Gastronomy Tourism

generation of wealth and employment, creating value for the entire value chain from the production of quality food, its transformation, to the hotel or tourism companies and the promotion of the country brand.

As Figure 1 shows, when the tourism policy of a destination places priority on working to promote the attractions of the gastronomic culture, it is essential to draw up a Strategic Plan for Gastronomy Tourism. But the problem is how to manage the strategy by confident and complete information about the tourism product.

With a view to the publication of the Global Report on Food Tourism, a survey was conducted among the UNWTO AFFILIATE Members in order to know their opinion about current situation of Food Tourism. Responses form Affiliate

Members, working in diverse sectors around the world, were received in this regard.

According to the results this survey, 88.2% of respondents consider that gastronomy is a strategic element in defining the brand and image of their destination. Only 11.8% were of the opinion that gastronomy plays a minor role. Located at the intersection of the caravan roads of the Great Silk Road, Uzbekistan for many centuries absorbed the most interesting and unusual recipes of dishes from different countries. Gastronomic tours to Uzbekistan provide a unique opportunity not only to taste famous Uzbek dishes every day, but also to become a true connoisseur and connoisseur of Uzbek cuisine.

Research methodology

This research discusses the concept to build database based on ontology for data of gastronomic in Uzbekistan. Gastronomic is part of tourism in country, because from food, people want to visit. The research methodology contains 5 steps as shown in Figure2:

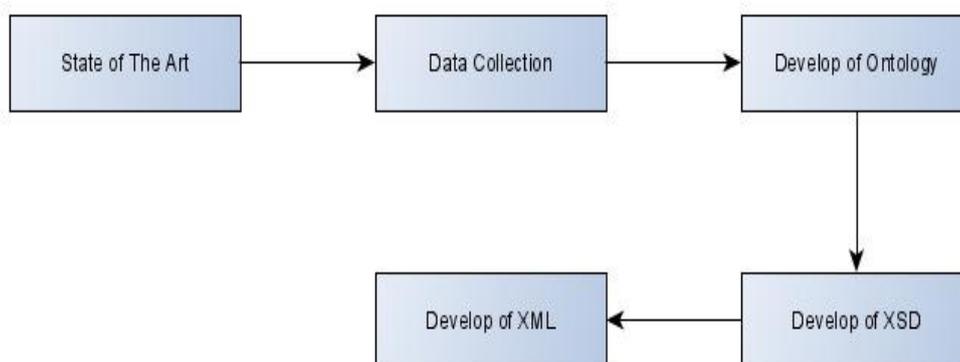


Figure 2. Research Methodology

Analysis and results

Management data of tourism can be done by developed database and using ontology concept. The use of ontology is able to integrate heterogeneous schemes in various domains. A number of frameworks designed using an ontology-based integration approach have developed in recent years and provide many benefits.

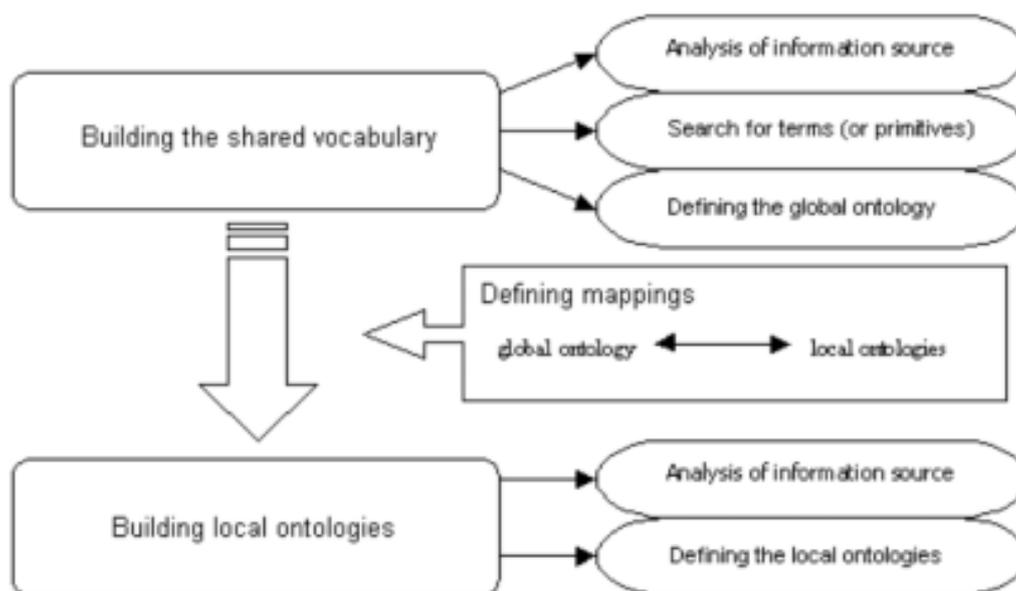


Figure 3. Ontology Construction Method [4]

In tourism domain, there already exist different in-house taxonomies and catalogues which are designed and used internally by tourism agents to help them to manage heterogeneous tourism data. Efforts are made to generate global standards to facilitate inter and intra tourism data exchange (e.g., by the World Tourism Organization). [5]

State of The Art

In this thesis, the first step taken is to conduct a literature study on tourism, especially in Uzbekistan. Gastronomy is the most important part of a country's tourism, because each place has its own characteristics for food, which can make tourists visit to taste the food in that place.

Literature study is done through:

1. Study of literature related to tourism and gastronomy
2. Literature study on databases, ontology
3. Literature study on XSD and XML development

Data Collection

In order to build the ontology in this research we collected the data from the website from Google browser and official telegram page of the restaurants, which included to the tables. The steps are:

1. Define how many tables we need.
2. Identify the fields and columns we need and clarify the names and data in this columns. After the headers of the data table are clear, we started entering the data just below the respective column headings. In this database terminology, we

called the rows **Records**, and columns called **Fields**. When entering records we took into consideration these regulations:

- Do not leave any blank rows in the table. This includes not leaving a blank row between the column headings and the first row of data.
- A record must contain data about only one specific item.
- A record must also contain all the data in the database about that item. There cannot be information about an item in more than one row.

3. While rows in an Excel database are referred to as records, the columns are known as fields. Each column needs a heading to identify the data it contains.

These headings are called field names. We used field names to ensure that the data for each record was entered in the same sequence. We entered the data in a column using the same format.

Data collection done by collect data from website about gastronomic in Uzbekistan. Data collection contains:

- How many tables related with gastronomic
- Data for each tables

In this research, gastronomic have 4 (four) tables, are:

1. Table of Country
2. Table of City
3. Table of Restaurant
4. Table of Menu

Developing the Ontology

In this research, gastronomic data is stored in a database by developing an ontology method. The development of ontology is carried out in 3 steps, are: determine class, determine relation, and determine attribute.

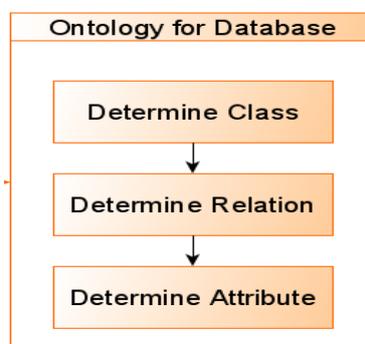


Figure 4. Steps of Develop Ontology

Steps for develop ontology are:

1. Determine class, The development of ontology for gastronomic data begins with determining the class of ontology, which is the superclass and subclass.

2. Determine relation, After determining the class in ontology, the relation between the class is determined.

3. Determine attribute, Attributes for subclasses are determined by understanding things related to the subclasses

Ontology for gastronomic has a superclass, the name of superclass is "Gastronomic". Based on data collection, we define subclasses are:

- Country
- City
- Restaurant
- Menu

Each subclass has an attributes, are:

- Country: Country Code, Country Name
- City: City Code, City Name
- Restaurant: Restaurant Code, Restaurant Name, Address, Phone Number, Webpage, Opening Time, Closing Time
- Menu: Menu Code, Menu Name, Price

Figure 5 shows the ontology for gastronomic tourism.

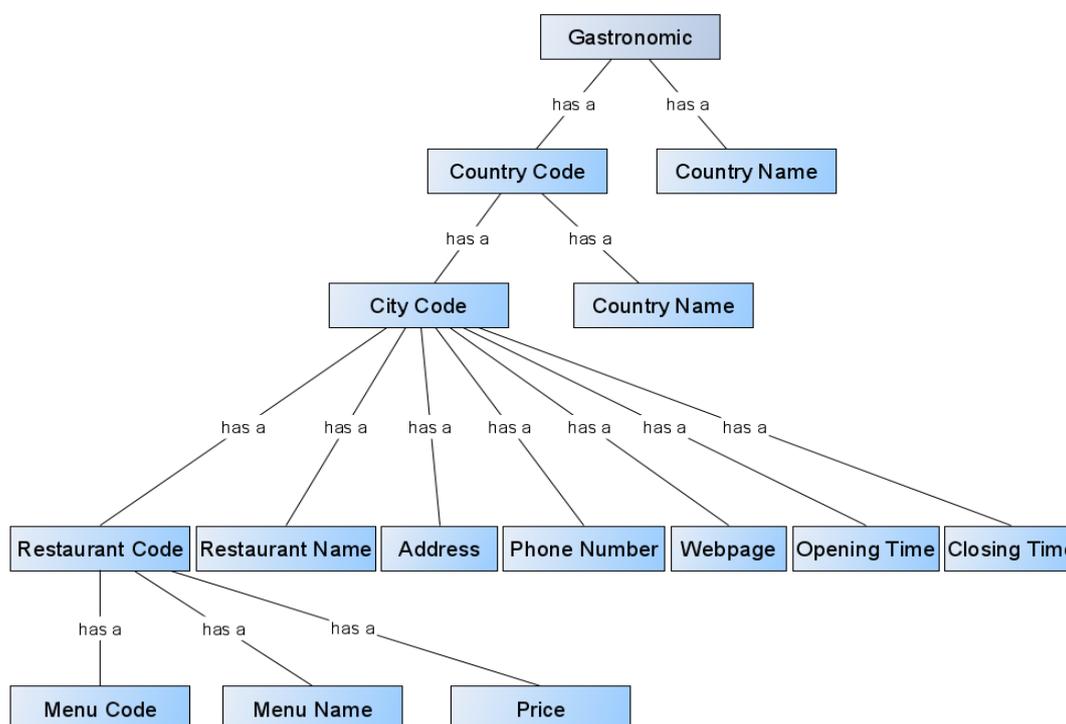


Figure 5. Ontology for Gastronomic tourism

Developing the XSD

XML Schema Definitions (XSD)

XML Schema Definition or commonly known as XSD is a scheme that describes the structure of the Extensible Markup Language (XML) document.

Definition of XML Schema Definitions (XSD)

XSD is a recommendation of the World Wide Web Consortium (W3C) which specifies the format of the material in the Extensible Markup Language (XML) document. XSD can be used by programmers to verify each part of the item's content in the document, whether it matches the description of the place it is placed. XSD 1.1 is the W3C standard approved in April 2012 [Rouse, 2015]. In general, a scheme is an abstract representation of the characteristics of an object and its relationship with other objects. XSD represents the relationship between attributes and elements of XML objects (for example, documents or parts of documents). The process of making schemes for documents involves analyzing their structure and defining each structural element that exists. As in XML, elements are defined in a set of tags.

XSD for Gastronomic tourism Ontology is as shown in Figure 6.

```
<?xml version="1.0" encoding="UTF-8" ?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema">

  <xs:element name="Gastronomic">
    <xs:complexType>
      <xs:sequence>
        <xs:element name="country_code" type="xs:string"/>
        <xs:element name="country_name" type="xs:string"/>
        <xs:element name="city_code" type="xs:string"/>
        <xs:element name="city_name" type="xs:string"/>
        <xs:element name="restaurant_">
          <xs:complexType>
            <xs:sequence>
              <xs:element name="restaurant_code" type="xs:string"/>
              <xs:element name="menu_">
                <xs:complexType>
                  <xs:sequence>
                    <xs:element name="menu_code" type="xs:string"/>
                    <xs:element name="menu_name" type="xs:string"/>
                    <xs:element name="price" type="xs:string"/>
                  </xs:sequence>
                </xs:complexType>
              </xs:element>
              <xs:element name="restaurant_name" type="xs:string"/>
              <xs:element name="address_" type="xs:string"/>
              <xs:element name="phone_number" type="xs:string"/>
              <xs:element name="web_page" type="xs:string"/>
              <xs:element name="opening_time" type="xs:string"/>
              <xs:element name="closing_time" type="xs:string"/>
            </xs:sequence>
          </xs:complexType>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
  </xs:element>
</xs:schema>
```

Figure 6. XSD for Gastronomic Ontology

Figure xx is an XSD script for gastronomic ontology. There are several elements that consist of parent elements and child elements. The `<xs: element name = "Gastronomic">` element is the root element or parent element. After that, there are other elements that define the contents of the "Gastronomic" element, such as `<xs: element name = "country_code">`, `<xs: element name =`

“country_name”>, <xs: element name = “city_code”>, and <xs: element name = “city_name”> which has a string data type.

The <xs: element name = “restaurant_”> element is a derived element from the “Gastronomic” element. Derivative elements occur because the amount of data that has the same object in the “Gastronomic” element is more than one, so we need derived elements so that all data on these elements can be read completely. Other elements in the “restaurant_” element are <xs:element name = “restaurant_code”>, <xs:element name = “restaurant_name”>, <xs:element name = “address_”>, <xs:element name = “phone_number”>, <xs:element name = “web_page”>, <xs:element name = “opening_time”>, and <xs:element name = “closing_time”> which also have string data types.

In the “restaurant_” element there are also derived elements, namely <xs:element name = “menu_”>. This element must exist because in a restaurant there are usually various types of menu choices. So it is necessary to create derived elements so that all data on these elements can be read completely. Other elements in the “menu_” element are <xs:element name = “menu_code”>, <xs:element name = “menu_name”>, and <xs:element name = “price”> with the string data type.

The <xs:complexType> element that comes after the parent and child elements defines that the element is a complex element that can contain other elements and/or text. Meanwhile, the <xs:sequence> element defines that the elements in a complex element are sequential elements.

This XSD scheme has been validated through the web page <http://www.utilities-online.info/>, with the result of its validity being “XSD Document is Well Formed and Valid”.

XML for Gastronomic tourism Ontology can be seen in Figure 7.

```
<?xml version="1.0" encoding="utf-8"?>
<Gastronomic>
  <country_code>country_code</country_code>
  <country_name>country_name</country_name>
  <city_code>city_code</city_code>
  <city_name>city_name</city_name>
  <restaurant_>
    <restaurant_code>restaurant_code</restaurant_code>
    <menu_>
      <menu_code>menu_code</menu_code>
      <menu_name>menu_name</menu_name>
      <price>price</price>
    </menu_>
    <restaurant_name>restaurant_name</restaurant_name>
    <address_>address</address_>
    <phone_number>phone_number</phone_number>
    <web_page>web_page</web_page>
    <opening_time>opening_time</opening_time>
    <closing_time>closing_time</closing_time>
  </restaurant_>
</Gastronomic>
```

Figure 7. XML for Gastronomic tourism Ontology

Figure xx is the XML program code for gastronomic ontology. XML creation must be based on a pre-built XSD framework or schema. The framework here means the arrangement of each program block in XML must match that made in XSD.

The XML structure for declaring the XML version used is contained in the first line of code, which is `<? Xml version = "1.0" encoding = "utf-8">`. The elements that contain the tag to describe the object consist of opening, body, and closing tags, such as `<county_code> country_code </country_code>`, `<city_name> city_name </city_nama>`, `<restaurant_code> restaurant_code <restaurant_code>`, `<web_page > web_page </web_page>`, `<opening_time> opening_time </opening_time>`. The contents between the opening tag and the closing tag are filled in according to the data held and the program block code is repeated until all existing data have been entered.

It is clear that the XML program block for the gastronomic ontology follows the preconceived framework or schema in the XSD, with the same indent for each element. This XML schema has been validated through the web page <http://www.utilities-online.info/>, with the result of its validity being "XML Document is Well Formed".

Conclusions and suggestions

This study aims to answer the objectives of the research that has been carried out, after several series of analysis were carried out, three conclusions were obtained based on the method used, as follows:

1. The formation of a corpus scheme is done by creating XML Schema Definition (XSD) which produces an XSD documents. The resulting XML Schema Definitions (XSD) document was declared valid after testing the XSD scheme has been validated through the web page <http://www.utilities-online.info/>, with the result of its validity being “XSD Document is Well Formed and Valid”.

2. Then, making Extensible Markup Language (XML) is done with the help of programs written using the Python programming language to produce XML documents. The Extensible Markup Language (XML) document produced has been declared valid after testing the validity of the document schema has been validated through the web page <http://www.utilities-online.info/>, with the result of its validity being “XML Document is Well Formed”.

- The database for gastronomic tourism contains four tables, including:
- Table of Country
- Table of City
- Table of Restaurant
- Table of Menu

3. Ontology for gastronomic tourism database has a superclass, the name of superclass is “Gastronomic”. Based on data collection, defined subclasses are:

- Country
- City
- Restaurant
- Menu

And the attributes, are: Country: Country Code, Country Name, City: City Code, City Name, Restaurant: Restaurant Code, Restaurant Name, Address, Phone Number, Webpage, Opening Time, Closing Time, Menu: Menu Code, Menu Name, Price.

The discussion in this research is about developing a database by designing ontology in tourism data. In this research, we developed an ontology by conducting further analysis of the gastronomic tourism sector in Bukhara, and enriching the data collected. Detailed analysis of tourism in Uzbekistan will improve the problem statement, so that the ontology that is built for the database on tourism data can be built completely.

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