Internet Benefits and Digital Transformation Applying in Boosting Tourism Sector and Forecasting Tourism Management Revenue

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Abstract

In recent years, esp. during covid 19 pandemic, there is increasing need of working at home model with computer skills, and in the scope of this study we will mention roles of computer skills and digital transformation which apply to forecast of tourism revenue.  
Among economic sectors, tourism is a very important industry that contributes greatly to GDP growth of the country in the current context. Forecasting tourism revenue is very important to have reasonable policies or decisions at the macro level. In fact, in this period, with new concepts of smart cities and smart communities, we experienced IoTs (internet of things) roles in developing and promoting our local and community tourism services very much.  
In the current context, digital transformation is an inevitable development trend. Currently, businesses that do not follow this trend will not be able to access new achievements and advancements and will find it difficult to participate in the new value chain that digital transformation brings. The article uses the method of analyzing and forecasting tourism industry revenue.  
This paper proposes a solution to apply an analysis and forecasting method through linear regression to forecast tourism revenue. To implement this method, the article collects and analyzes data, thereby proposing solutions to promote socio-economic development and tourism industry.  
The research results will play an important role, helping policymakers to be proactive in making necessary plans and decisions for business, investment, and promotion processes of travel to increase revenue, etc.
Keywords

Analysis and Forecast, Computer Skills, Regression, Tourism Revenue, Digital Transformation of the Tourism Industry.

**JEL:** M30, M37, Q26, M38.

Introduction

The industry 4.0 has affected much on all sectors, as well as in tourism sector. Esp. We would like to mention the impacts of internet on tourism services and connect everything together, so-called Internet of things (IoTs) concept.

According to Ordonez et al (2010), Disruptive technologies, including IoT play a crucial role in the way of understanding and managing this industry and especially in how the offer and demand are linked. The great diversity of IoT applications in the tourism industry defines the competitiveness not only of the private companies involved but also of the destinations which are being transformed into Smart Destinations as a natural evolution from Smart Cities, which are influenced by the tourism sector. Smart Cities are characterised by smartly managing different areas. Smart Destinations require this smart management as well as the integration of the stakeholders’ value-chain throughout the entire process. In this process, IoT has a crucial role in enhancing the experiences of tourists, to more efficiently manage the destination, and to offer a channel of information exchange.

In reality, IoTs has much impacts on tourism revenues. Whereas people can consider other computer applications and skills to forecast tourism revenues. This is 2nd impacts of computer we mention in this paper.

Facing the requirements of economic development, especially in the current process of international economic integration, in order to survive and develop firmly, the tourism industry must have solutions to adapt to the pandemic context. It is necessary for tourism businesses to apply solutions to analyze, evaluate and forecast revenue in order to propose future development plans and towards digital transformation.

Vietnam is located in Southeast Asia, where vibrant economic activities in general and tourism in particular are taking place. Vietnam has many favorable conditions to develop the tourism industry. The diversity of resources both in nature (beach, cave, island, mineral water, vegetation cover, rare fauna, many unique natural landscapes) and humanities (historical monuments) history, art architecture, customs and habits, traditional
craft villages, diversity of ethnic identities, etc.). This is the condition for the development of many types of tourism. Each tourist territory has its own nuances, creating cross-country tourist routes, not repeating between one region and another, often not boring tourists. On the other hand, tourism resources are distributed near major cities and important international border gates, which should facilitate the travel and visit of tourists. Many tourism territories of Vietnam, if properly planned and invested, will become major tourist centers that can compete with countries in the region and the world. Forecasting is the science and art of predicting what will happen in the future, on the basis of scientific analysis of collected data. When conducting forecasting, we base on collecting and processing data in the past and present to determine the movement trend of future phenomena thanks to a number of mathematical models. A forecast can be a subjective prediction or intuition about the future. But in order to make the forecast more accurate, one tries to exclude the subjectivity of the forecaster. The problem of analysis and prediction has been widely applied in many fields of social life, especially important economic sectors such as industry, tourism, post and telecommunications, finance-banking, insurance. insurance, education, health care, etc., thereby supporting the forecast of GDP, inflation, unemployment, etc. However, in reality, the application of analytical and forecasting methods is still not much, we have not seen and exploited all the strengths of this problem. In order to promote the development of Vietnam's economy, ensure social security, and earn more workers, it is very important to propose solutions and informatics tools to support the revenue forecasting and analysis. This paper proposes a solution to apply a "linear regression" analysis and forecasting method to tourism revenue forecast. From there, it will support managers and policy makers to make the right decisions and increase revenue for the tourism industry.

Research Method

The article uses regression method. The first task of correlation regression analysis is to build a regression model and determine the nature and form of the relationship.

Predictive model according to the regression equation: \[ \hat{y} = a + bt \]

Inside:

t: Value of the influencing criterion (cause) (independent variable).
\( \hat{y} \): Adjusted value of the affected criterion (result) (dependent variable) in relation to t.
a: The coefficient of freedom (intercept coefficient), which is the starting point of the theoretical regression line, shows the influence of other factors (other cause criteria) besides t on the fluctuation of y.
b: Regression coefficient (slope, slope), reflecting the direct influence of the cause criterion t on the outcome criterion y. Every time t increases by 1 unit, y changes on average by b units.
b indicates the direction of the relationship: \( b > 0 \): The relationship is positive; \( b < 0 \): Inverse relationship.

How to define parameters: \( a, b \) must be determined so that the theoretical regression line best describes the actual relationship. The distance from the actual point to the point on the smallest theoretical regression line will be the best.

From the above equation by the method of least squares or by placing the chronological order \( (t) \) in the series of numbers to calculate the parameters \( a, b \).

If we put the time order \( t \) so that \( \sum t \neq 0 \) we have the following parameter calculation formula:

\[
a = \frac{\bar{y}t - \bar{y}t^2}{\sum t^2 - \bar{t}^2} \quad b = \bar{y} - a\bar{t}
\]

If we put the chronological order \( t \) such that \( \sum t = 0 \) we have:

\[
a = \frac{\sum y}{n} = \bar{y} \quad b = \frac{\sum yt}{\sum t^2}
\]

Error of forecast:
Forecast error is the difference between the actual level and the calculated level according to the forecast model.

Forecast error depends on 03 factors: the variability of the criterion in the previous period, the length of the time of the previous period and the length of the prediction period.

The most important problem in forecasting by extrapolating the trend function is choosing the trend function, determining the prediction error and the prediction interval:

Formula for standard error (\( \delta_y \))

\[
\delta_y = \sqrt{\frac{\sum(y - \hat{y})^2}{n - p}}
\]

Inside:
- \( \delta_y \): Standard error
- \( \hat{y} \): Value calculated according to the trend function

\( N \): Number of levels in the series
\( P \): Number of parameters to look for in the trend model

Then determine the prediction interval according to the following formula: 

\[
y_{n+1} \pm t_{\alpha} S_p
\]

\( t_{\alpha} \) is the tabular value of the t-Student criterion with (n-2) degrees of freedom and a confidence probability (t-\( \alpha \)).

+ Correlation coefficient: The correlation coefficient is an indicator to evaluate the closeness of a simple linear correlation relationship.

+ Coefficient of determination: The coefficient of determination (\( r^2 \)) is used to evaluate the fit of the model, it indicates the percentage change in \( y \) explained by the model.

Result The study collects revenue from Vietnam's tourism industry over the years 2010-2020.
Results and Discussion

1) Roles of Internet of Things (IoTs) in Developing and Promoting Tourism Services

With new concepts of smart cities and communities, we would like to emphasize roles of internet of things (IoTs) in delivering ecology and community tourism services for tourists, at least for local people and for global tourists after covid 19 in future.

Nitti et al (2017) said that tourism needs also to be integrated in the future vision for tourism, especially in the context of Smart Cities, environments fully benefiting from the recent technological advances. Within the combined framework of Smart Cities and Accessible Tourism, the Internet-of-Things (IoTs) concept is the key technological point for the development of smart urban environments. IoT and big data are both technology-driven developments, leading to scenarios such as the Smart Cities one that has the potential to make citizen live smarter, more sustainable and more accessible. This chapter analyses the key requirements for IoTs applications in a Smart City context, the state-of-the-art for the use of IoTs for Accessible Tourism applications and proposes an architecture together with its practical implementation, tailored for the use-case of accessible tourism for physically impaired persons.

In the below section we aim to analyze SWOT of IoTs applying in tourism services:

Strengths

- IoTs help us to deliver travel experience to tourists and community.
  During a trip to the city, travelers will be able to locate and find information about everything they need from their smartphones with ease. There will be sensors everywhere in the city, from the roofs of buses to parks, gardens and parking lots, which will collect data on tourists’ habits and their reactions to attractions. different perspectives, identify patterns, and optimize the tourist experience.
- IoTs help agents and services to connect together to serve better needs of tourists.
  IoTs is streamlining the end-to-end operations of hotels, airlines, and travel agencies by connecting intelligent devices, systems and processes. By adopting IoTs technology, the travel industry can improve operational efficiency and create a more personalized guest experience.
- IoTs also help tourism services to provide facilities via mobiles or tablets for clients such as: easily adjusting room temperature.
- Adopting IoTs will enable hotels and tourism agents to increase automation level.
Hotels can more effectively track the supply chain through sensors in the shipment, helping them to be ready for any future contingencies and avoid service disruptions to guests. Hotels and airlines can even deploy security mechanisms in offices and buildings with ease, with centralized management of IoT-enabled cameras and sensors from smartphones.

**Weaknesses**

- It might cost time for clients and tourists to learn IoTs and AI applications and machine learning (ML).
- It cost money for investment in IoTs and AI applications.

**Opportunities**

- Trends of developing smart cities and smart communities will help to create more and more opportunities for applying IoTs in tourism services in future.
- Robots and robotic in tourism is also new trend.
- Easy and smart services and facilities during tours for tourists also can be developed such as: intelligence clocks and security individualized in rooms.
- Smart libraries will offer tourists reading time and reading books with convenient mechanisms.
- At airports or on vehicles, Even bags will be able to locate passengers and send them a signal by sensing the conveyor belt they are closest to. By attaching an RFID tag to the luggage, passengers will be able to find their real-time location. Bag-mounted sensors will benefit travelers who have lost their luggage, allowing airlines to locate and deliver lost luggage quickly.
- Last but not least, Together with IoTs, AI - Artificial intelligence can also be used and applied in tourism in smart cities and communities.

**Threats**

- Cybersecurity risk and cyber attacks will go together with Digital transformation and IoTs applications.
  Last but not least, we can see IoTs roles in boosting revenues of tourism sector, in the below figure, tourists can feel about better life in better places via images from computers and internet:
2) Using Computer Models and Skills for Forecasting Tourism Revenues

The study collects revenue from Vietnam's tourism industry over the years 2010-2020.

Step 1. Collect and organize data Based on the data quoted from the Ministry of Culture, Sports and Tourism, the Vietnam National Administration of Tourism has collected the tourism revenue from 2010 to 2020 with the following specific data:

<table>
<thead>
<tr>
<th>Year</th>
<th>Tourism revenue (billion VND)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>51,0</td>
</tr>
<tr>
<td>2011</td>
<td>56,1</td>
</tr>
<tr>
<td>2012</td>
<td>60,2</td>
</tr>
<tr>
<td>2013</td>
<td>68,1</td>
</tr>
<tr>
<td>2014</td>
<td>96,2</td>
</tr>
<tr>
<td>2015</td>
<td>129,8</td>
</tr>
<tr>
<td>2016</td>
<td>160,0</td>
</tr>
<tr>
<td>2017</td>
<td>200,1</td>
</tr>
<tr>
<td>2018</td>
<td>230,1</td>
</tr>
<tr>
<td>2019</td>
<td>338,0</td>
</tr>
<tr>
<td>2020</td>
<td>399,8</td>
</tr>
</tbody>
</table>

Source: author construction
Step 2. Implement the regression

Based on the value of tourism revenue over the years from 2010 to 2020, the author uses the regression method to give a forecast value of revenue for the following years. + Select Tools \ Data Analysis \ Regression, OK. The following dialog boxes appear in turn:

![Data Analysis Dialog](image1.png)

**Figure 1 Data Analysis Dialog**

![Regression dialog box](image2.png)

**Figure 2 Regression dialog box and Enter parameters for forecasting model**
Table 2 Parameters of the regression model

<table>
<thead>
<tr>
<th>Regression Statistics</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple R</td>
<td>0.2804405615</td>
</tr>
<tr>
<td>R Square</td>
<td>0.082569669</td>
</tr>
<tr>
<td>Adjusted R Square</td>
<td>0.000480321</td>
</tr>
<tr>
<td>Standard Error</td>
<td>47.01831252</td>
</tr>
<tr>
<td>Observations</td>
<td>10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>r</th>
<th>significance r</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>122349.7061</td>
<td>122349.7061</td>
<td>0.77177642</td>
<td>0.999238</td>
</tr>
<tr>
<td>9</td>
<td>16955.17959</td>
<td>1883.977778</td>
<td>0.99999999</td>
<td>1.000000</td>
</tr>
<tr>
<td>10</td>
<td>141396.8401</td>
<td></td>
<td>0.99999999</td>
<td>1.000000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Coefficients</th>
<th>Standard Error</th>
<th>t Stat</th>
<th>P-value</th>
<th>Lower 95%</th>
<th>Upper 95%</th>
<th>Lower 95%</th>
<th>Upper 95%</th>
<th>Lower 95%</th>
<th>Upper 95%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-67668.7747</td>
<td>8148.359255</td>
<td>-8.20356823</td>
<td>0.80356823</td>
<td>-66327.9637</td>
<td>-68709.957</td>
<td>-65254.838</td>
<td>-69236.721</td>
<td></td>
</tr>
<tr>
<td>Variable 1</td>
<td>33.73018181</td>
<td>3.80156936</td>
<td>8.80156936</td>
<td>0.00000000</td>
<td>32.95899486</td>
<td>34.5013564</td>
<td>32.5013564</td>
<td>34.5013564</td>
<td></td>
</tr>
</tbody>
</table>

Step 3. Analyze forecast results

Table 3 Forecast results

<table>
<thead>
<tr>
<th>Year</th>
<th>Tourism revenue (billion VND)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2021</td>
<td>365.00</td>
</tr>
<tr>
<td>2022</td>
<td>399.01</td>
</tr>
<tr>
<td>2023</td>
<td>432.00</td>
</tr>
<tr>
<td>2024</td>
<td>466.00</td>
</tr>
</tbody>
</table>

Based on the above table, we have the regression equation: \( Y = 33.73018181818 \times X - 67668.7747272727 \) Inside: \( Y \) is revenue \( X \) is the number of years to forecast So when \( X = 2021 \), the predicted value of \( Y \) is calculated as:

\[
Y_{2021} = 33.73018181818 \times 2021 - 67668.7747272727 = 365.00
\]

\[
Y_{2022} = 33.73018181818 \times 2018 - 67668.7747272727 = 399.01
\]

\[
Y_{2023} = 33.73018181818 \times 2019 - 67668.7747272727 = 432.00
\]

\[
Y_{2024} = 33.73018181818 \times 2020 - 67668.7747272727 = 466.00
\]

That is, revenue in 2021 will reach 365 trillion VND.
Step 4. Verification of forecast results
We have the parameter table of the regression model:

- Multiple R: Multiple correlation coefficient (0 ≤ R ≤ 1) = 0.939: Shows the closeness of the correlation relationship between the time variable and the revenue of the tourism industry over the years.
- R Square: Factor of determination = 0.882. Of the 100% variation in sales, 88% of the variation is due to time variables, the remaining 12% is due to random error. From the parameter table of the regression model, the coefficient of determination $R^2 = 0.88$ shows the fit of the selected model.

Conclusions

First, Internet of things (IoTs) together with AI will create more opportunities for developing tourism services for clients and tourists to have new experiences, such as controlling all equipment and home applications such as tivis, air conditioners, washing machines, smart locks, LED lights, etc. Even using mobile phones we can unlock the hotel rooms easily with digital technology, or other face or hand gestures or sensors.

Verma and Shukla (2019) said that The Tourism industry is widespread and includes several stakeholders in overall channel of tourist circuit. The industry is full of diversities and experiences in diversities. The trending technology may act as a thread to sew all in one comprising the experience and solve the issues of accurate data collection in tourism industry. The paper is divided into three sections of introduction, discussion on influence of Internet of Things technology in different fragments of tourism industry and impacts of IoT concluded with a proposed model.

Second, Analyzing and forecasting tourism revenue is an important problem in order to provide solutions for future development that are suitable to the actual context.

This paper has applied regression analysis and forecasting methods to forecast tourism revenue on the basis of data collection, analysis and testing. From there, giving solutions as well as optimal decisions to promote economic and social development of the tourism industry in particular and economic development in general. Like other businesses, the tourism industry is strongly impacted by digital transformation. The fact that customers can quickly share their opinions via social networks will help businesses better understand
what customers want. From there, it is possible to satisfy and satisfy the best customers. Among the growing technology solutions, tourism businesses can use ratings and reviews, virtual reality. These applications are suitable for a traveler's characteristic of being far away from the product, and consuming the product during travel. Smartphone apps allow you to exploit information, perform transactions, and integrate many utilities. finding information about places to visit, choosing a guide, no need for direct human interaction. Customers can search for information and experience tourist destinations on their internet, before and during the trip. Many tourist sites or companies have built virtual tours to simulate tourist destinations through images and videos. In the context of digital transformation of the tourism industry, businesses need to be proactive, creative, approach new technologies, transform the way they operate, thereby taking advantage of every opportunity to develop quickly and sustainably.

Limitation of Research

We can make further analysis of effects of AI and IoTs in tourism sector in various markets in the world.

References


Do, A.T. (2019). Research on building linkage models in community based tourism development to increase income for households in the western districts of Ha Giang province, The project coded DTXH.HG0218, Department of Science and Technology of Ha Giang province.


