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# MODERN HOTEL BUSINESS MANAGEMENT TOOLS

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## ABSTRACT

*High-tech innovations are largely dictated by the requirements of the modern hospitality industry. Innovative technologies in the hotel are advanced multifunctional services that can perform many tasks that are characteristic of this particular type of business as a hotel. Using advanced automation tools within a few months of use will prove its effectiveness, positively affecting the number of room orders and eliminating human errors in the formation of the most critical reports. The world experience of using modern tools of hotel business management is studied. The article discusses such advanced hotel management tools as PMS, Channel Manager, Booking module, Internet Acquiring, Website, Chatbots. Particular attention is paid to the consideration of the Revenue Management system. Modern Revenue Management Systems for hotels use advanced algorithms and proven hotel profitability*

*methodologies. They analyze hotel data, find growth opportunities and predict what price changes need to be made to earn more money. Several basic models for demand forecasting are considered that allow the revenue management system to maximize hotel profits.*

**Key words:** Booking module, Business, Channel manager, Chatbots, Internet Acquiring, Hotel, Management, PMS, Tools, Website

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## 1. INTRODUCTION

Today, innovative technologies and modern management tools in the hotel business are not just a “fashion upgrade”, but a real need, which determines the further development of the hotel, and in some cases even the very survival and retention of market share [1-4].

Many hoteliers who understand the real level of competition in the hospitality market are trying to improve the hotel, even resorting to such non-standard methods as studying the water and soil around the hotel [5-7]. Innovations in hotels, especially modern automation, remain an unambiguous solution to this issue [8-9]. The use of technological capabilities in the hotel's work, in improving the sales of its rooms and in promoting the brand on the Internet is not an innovation, but a necessary condition for the survival and promotion of the business. Therefore, for the development and improvement of the hotel, it is essential to introduce modern management and automation tools [10].

Combining new technologies for the production of services in the hotel business and marketing communication tools with the target audience and brand promotion, modern hotel management systems can maximize the attendance and sales of its rooms, including direct sales from the hotel site, in a matter of months.

## 2. MODERN HOTEL MANAGEMENT TOOLS

Modern Internet technologies in the hospitality industry are practically removing all limits, making the number of rooms and hotel services available for booking for every tourist who has access to the World Wide Web, regardless of his current location.

Such tools also help in organizing the various processes of the hotel business, providing instant communication between its departments and providing the entire global Internet network as a source of searching for the necessary information. Automation of such processes, which is provided by new technologies in the hotel business, will save staff and management from unnecessary loads and eliminate the possibility of errors in assessing the situation or accounting.

The following automation and digitalization tools for the hotel business can be distinguished:

- PMS
- Channel manager
- Booking module
- Internet Acquiring
- Website

- Chatbots
- Revenue Management

**Table 1** Functions and advantages of modern hotel business management tools

<b>Tool</b>	<b>Features and Benefits</b>
<i>PMS Automation Function</i>	<ul style="list-style-type: none"> <li>• receptionist;</li> <li>• reporting;</li> <li>• storage of guest history;</li> <li>• tariff management;</li> <li>• room fund management.</li> </ul>
<i>Channel manager Automation of online sales</i>	<ul style="list-style-type: none"> <li>• increases sales;</li> <li>• automates the updating of prices;</li> <li>• all available rooms are always on sale;</li> <li>• does not allow overbooking;</li> <li>• provides synchronization with sales channels.</li> </ul>
<i>Widget booking module for web site and social networks</i>	<ul style="list-style-type: none"> <li>• increases direct sales from the hotel website;</li> <li>• suitable for any site, FB;</li> <li>• interacts with booking sites;</li> <li>• allows you to accept payment by credit card;</li> <li>• works without commission.</li> </ul>
<i>Online Acquiring Service Benefits</i>	<ul style="list-style-type: none"> <li>• increases income;</li> <li>• the most attractive rates;</li> <li>• integration with the site and social networks – for free;</li> <li>• refund to guest without commission;</li> <li>• payment is immediately displayed in the system.</li> </ul>
<i>Website Features</i>	<ul style="list-style-type: none"> <li>• sale of rooms;</li> <li>• information and media content;</li> <li>• interactive online booking system;</li> <li>• customer feedback.</li> </ul>
<i>Chatbots</i>	<ul style="list-style-type: none"> <li>• increase customer satisfaction</li> <li>• increase income;</li> <li>• improve customer engagement and brand loyalty;</li> <li>• lower prices by automation;</li> <li>• simplification of the booking process;</li> <li>• ensuring consistent booking in chat rooms;</li> <li>• prompt receipt of feedback from guests;</li> <li>• monitoring chats with the presence of a human factor;</li> <li>• managing guest expectations using the quick messaging service are waiting for a speedy solution to their needs through chatbots.</li> </ul>
<i>Revenue Management</i>	The primary function that Revenue Management performs is to sell the product you need to the right customer at the right time at the right price.

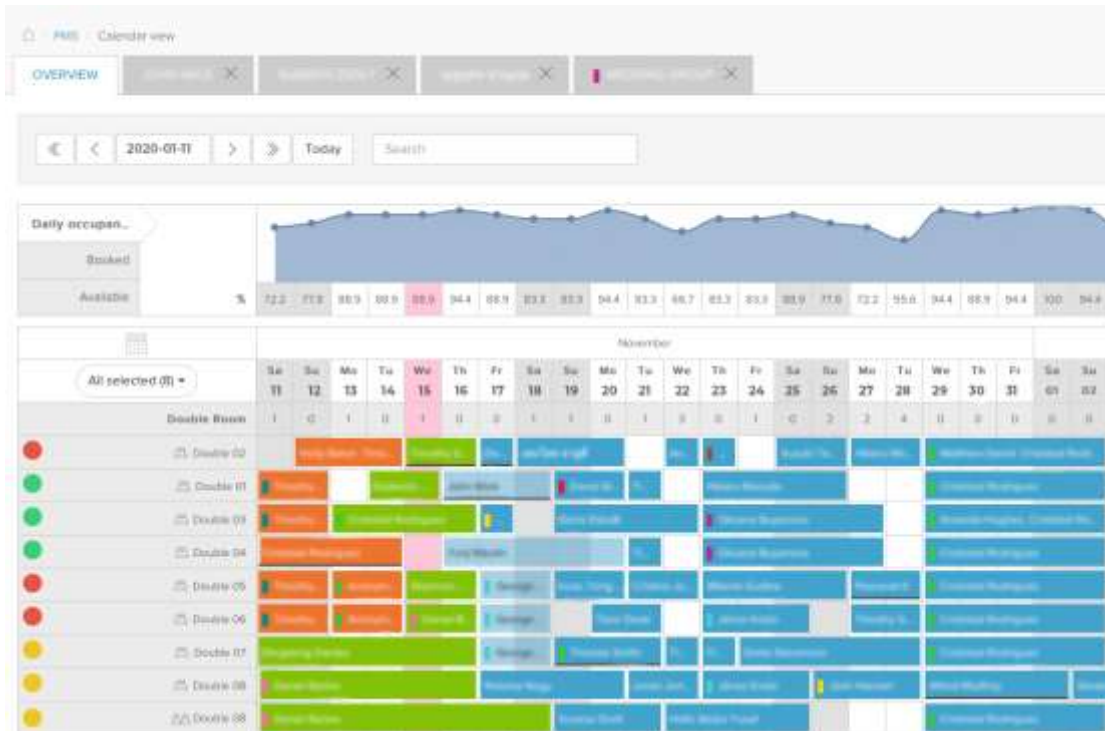
Consider hotel management tools in more detail.

## 2.1. PMS

The professional property management system allows you to automate many hotel business processes:

- simplifies the process of guest registration and room selection, taking into account his preferences and history of residence
- control and planning of hotel loading
- pricing
- allows you to conduct analytics and analysis of work results
- receiving statistical reports.

PMS also allows for timely management of the number of rooms, load control, and reservation of places (including direct client and online bookings) (Fig. 1).



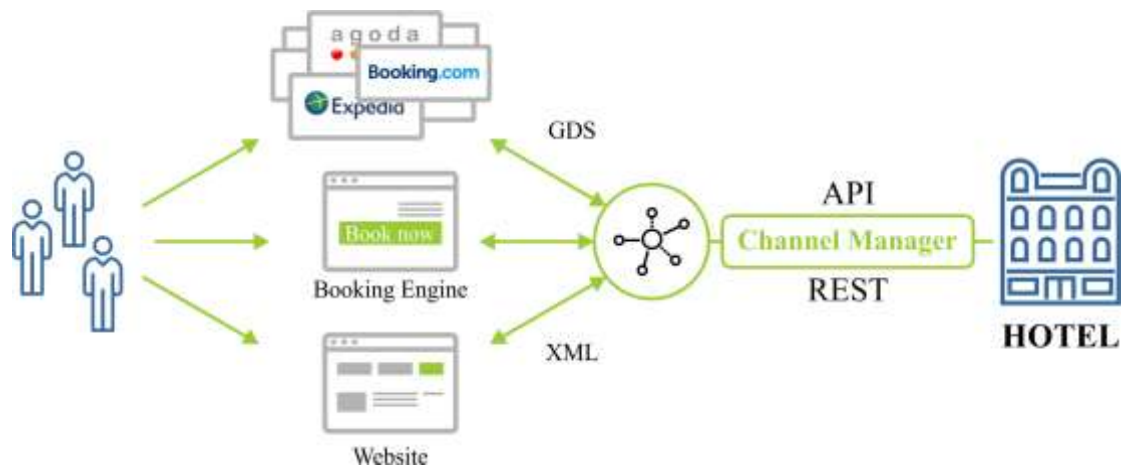
**Figure 1** A fragment of the Property Management System in a cloud system

Modern PMS are automatically able to process all online orders, and visually display a report on the available numbers in the form of a list, calendar and chart mode.

## 2.2. Channel Manager

Organization of hotel services sales and manual interaction with several booking channels requires a lot of effort, including putting up for salerooms, timely withdrawal from the deal in case of booking, tracking price changes, monitoring special offers and special conditions. And if there are more than one, then managing sales channels in the hotel industry becomes a daunting task.

The hotel manages sales in a single system, and the channel manager synchronizes the relevance of prices and available rooms with all online sales channels (website, booking.com, Tripadvisor, Expedia, etc.) (Fig. 2).



**Figure 2** Synchronizing with online sales channels

Channel Manager is a vital management tool for hotels with more than 20 rooms to save time and avoid the risks of overbooking.

### 2.3. Web Site

Even though there are a large number of services that make it easier to get reservation requests, the hotel needs to have its website. On the one hand, getting a client from some online booking service can be cheaper and more accessible, but the hotel's website is the face of the company and a platform where you can find additional information about rooms, services, services, payment methods and contact information. Its presence increases the trust of users and the status of the hotel in their eyes. The individual website of the hotel is also a tool for obtaining customers from social networks and other sites.

A good hotel or hotel site increases site traffic and leads new regular customers, increases sales and makes a profit.

### 2.4. Booking Module for the Site

A site for a hotel these days is an exceptional necessity. And for it to be not just a platform for placing information and tariffs, but also an online sales tool, you need to use the booking module.

The online booking module allows customers to select the desired rooms and services in a matter of seconds and receive a booking confirmation in a form convenient for them.

ROOM'S BOOKING  
Guaranteed check-in  
Online Booking System

Check-in date: 19.06.2020

Check-out date: 22.06.2020

Guests: 1 adult, 0 childrens

Book Now

**Figure 3** Room selection form on the hotel website

The module displays the latest information about available rooms, rates, promotions and special offers. Instantly informs the client about the cost of rooms and services. In the absence of free rooms for a given period, the module can automatically generate offers for the coming dates.

## 2.5. Internet Acquiring

Internet acquiring allows accepting payment by credit card from the hotel website or through social networks. In modern business, more and more customers pay for services, including accommodation, online. Therefore, Internet acquiring is profitable not only because it brings additional income, but it also increases customer loyalty.

Hotel guests can make an advance payment for accommodation without visiting the bank, and the hotel receives a guaranteed reservation confirmed by payment, which will significantly reduce losses when guests do not arrive.

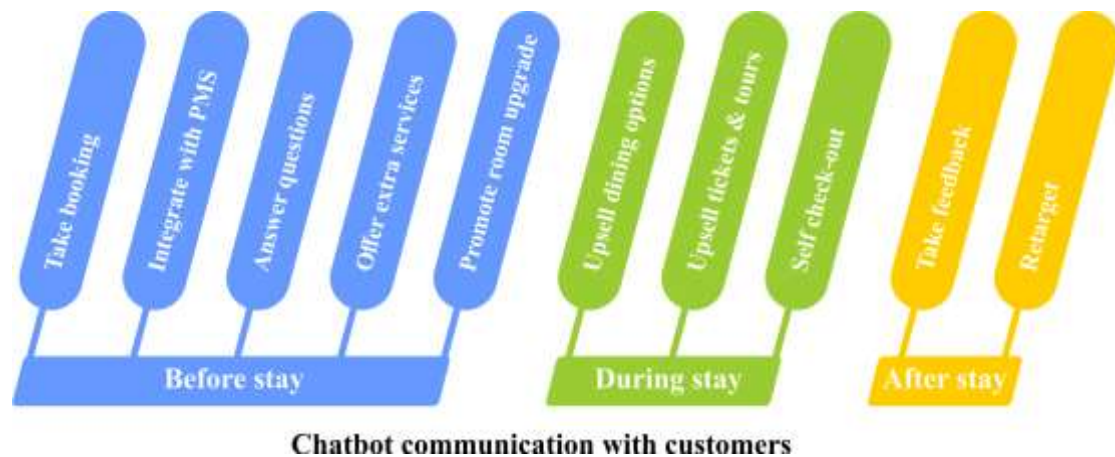
The integration of Internet acquiring with a website or social networks is usually straightforward and will not take much time.

## 2.6. Chatbots

Chatbots are gaining popularity in the hotel industry and the tourism industry. They begin to offer options with advanced features at a low price and have advantages in performing many vital functions:

- increase customer satisfaction rate;
- increase income;
- improve customer engagement and brand loyalty;
- simplify the booking process;
- prompt feedback from guests;
- lower prices by automation.

The chatbot can provide a solution for the requests of guests in several scenarios in several languages without the participation of staff; via chat, you can also order services outside the hotel: taxi, food delivery, tours, book tables in the restaurant. A chatbot allows to record a request and track the status of the application for both visitors and hotel staff. Fixed claims gradually form statistics and will enable us to improve service and sales.



**Figure 4** Ability chatbot to communicate with customers

Most of the guests' requests are typical and repeated, so the chatbot will be able to relieve the staff of the role of the link between the guest and the various departments of the hotel using automatic communication. This will redirect the resources of employees to solving problems of a higher order.

Another essential advantage of the chatbot is getting guest reviews. Guests generally ignore requests to leave feedback via email. But practice shows that customers are much more likely to respond to instant messengers, which improves the number of positive reviews.

## **2.7. Revenue Management**

Revenue Management is a profit maximization tool. This method is also known as real-time pricing and is an optimization model based on forecasting the demand for hotel services.

The essence of income management in hotels can be reduced to the following general definitions and explanations:

- the process of analyzing information to make the most effective decisions on managing tariffs and loading to maximize hotel income;
- continuous analysis, study and understanding of the business;
- demand analysis;
- constantly identifying new opportunities to increase revenue, providing daily recommendations and sales instructions to the reception and accommodation services, the reservation department and the sales department to optimize tariffs;
- making decisions based on knowledge, analysis and calculations, and not on assumptions or feelings.

The most classic definition of revenue management intersects with the basic concept of marketing and reads as follows: Selling the Right Room to the Right Client at the Right Moment at the Right Price.

In other words, revenue management is a technique aimed at determining the best sales policy to maximize revenue at each moment based on determining demand behaviour.

## **3. DEMAND MODELING FOR PROFIT OPTIMIZATION USING REVENUE MANAGEMENT**

Modern Revenue Management Systems for hotels use advanced algorithms and proven hotel profitability methodologies. They analyze hotel data, find growth opportunities and predict what price changes need to be made to earn more money. Each proposal can be rejected, reviewed or accepted by those who know the big picture of the whole business. The actions taken are automatically applied to the PMS, and over time, the adoption of price recommendations can be put on autopilot.

Revenue Management takes the work of not only the sales or booking department, but the entire hotel to a higher level and helps to anticipate and predict changes in demand, excluding tactical decisions under the influence of circumstances.

To forecast demand, hotels use various methods of quantitative analysis, based primarily on specific data.

So, time series models predict, assuming that the future is a function of the past. Associative models use similar historical data and then include other external variables such as budget, current room rate, prices of competing hotels, and much more.

Hotels often take into account such individual factors as future events in the city, annual groups booking a certain number of rooms for a given period, and so on. There are several basic models for forecasting demand:

- Historical model;
- Model of exponential smoothing;

- Pre-booking model;
- Regression models;
- Combined model.

Regardless of the method chosen, demand forecasting consists of the following steps:

- Definition of the purpose and period of the forecast (what exactly we want to predict and in what time perspective - from several hours to several years).
- Choosing a forecasting model (which model is the best for this forecast).
- Collection of data for input (collection means the selection of the data required in the hotel system).
- Building a forecast (performed graphically by the hotel system).
- Data analysis and application (the study of the data obtained and the adoption of necessary measures to optimize or adjust the situation).

Forecasting demand is one of the cornerstones of revenue management. It is imperative that the rhabarb managers have the complete picture of the upcoming need to project the hotel load, revenues and operating resources as accurately as possible. Critical demand forecasting shows how many rooms will be booked for a given day if there are no restrictions. This is the so-called unconditional demand, which gives an idea of the market opportunities available at the hotel at any time.

An unlimited forecast is based on the number of rooms already booked and then takes into account the pace of the reservation to determine how many rooms will be sold at the current rate on any given day if an unlimited number of rooms were available. For example, if the number of rooms consists of 300 rooms, and the forecast for the first day – for 210 numbers, then the next day it will move to book 230 rooms, in each case exceeding the demand over the offer.

The data used for forecasting demand is based on information on current reservations, statistics on bookings for the same period last year, as well as data on rooms sold in competing hotels. In the hospitality industry, it is customary to separate income forecasting methods into three types:

- *Historic booking models* that only consider the final number of rooms or arrivals on a particular night of stay. These are traditional forecasting methods, such as exponential smoothing in various forms, moving averages (simple and weighted), and linear regression. Despite the high accuracy of forecasting, in modern business realities, historical models are becoming more limited and need to be supplemented or combined with other methods.
- *Pre-booking models* can be divided into additive and multiplicative. Additive models assume that the number of reservations on a given day before arrival does not depend on the final number of rooms sold. In contrast, multiplicative models assume that the number of bookings is still ahead, depends on the current amount of reservation.
- *Combined models* use either regression or the weighted average of the historical forecast and the preliminary reservation forecast or full information model.

*Historical Model.* Assumes that demand, future demand is similar to the past, when the same date is used in the previous year, given the order of the days of the week. For example, demand on Monday, in the first week of January 2020 should be the same as in the first week of January 2019. This is one of the simplest forecasting methods, but highly dependent on past events (holidays, large-scale events, and other events that affect demand).



The main advantage of the historical approach is the ability to forecast demand for the year ahead. Also, the historical method can be expanded by using values from several previous years.



**Figure 5** Demand forecasting using a historical model

When demand is highly variable, this model does not provide an accurate forecast. The graph shows that the percentage error is unacceptably high and does not correspond to the real situation. In practice, such a forecast can lead to significant losses in the planning of demand and related purchases.

**Preliminary Analysis Models.** Applicable to data series that show seasonal variations and consist of a predicted equation and three smoothing equations.

The first equation for the  $A_t$  level, which can be described as the average value of the data, although it cannot be considered as a statistical average.

The second equation calculates the trend  $T_t$ , which is the predicted change in data values over time. The third equation computes the seasonal component  $C_b$ . Besides, all three equations have their corresponding parameter (a, b, c), which indicates the frequency of seasonality. For example, quarterly forecast and seasonality – by a quarter,  $N = 4$ . The forecast for the period is as follows:

Additive Model:

$$\begin{aligned}
 X_{t+k} &= Y_t + kT_t + S_{t+k=N}, \text{ where} \\
 Y_t &= a(X_t - S_{t-1}) + (1 - a)(X_{t-1} + T_{t-1}) \\
 T_t &= b(Y_t - Y_{t-1}) + (1 - b)T_{t-1} \\
 S_t &= c(X_t - Y_t) + (1 - c)S_{t-N}
 \end{aligned} \tag{1}$$

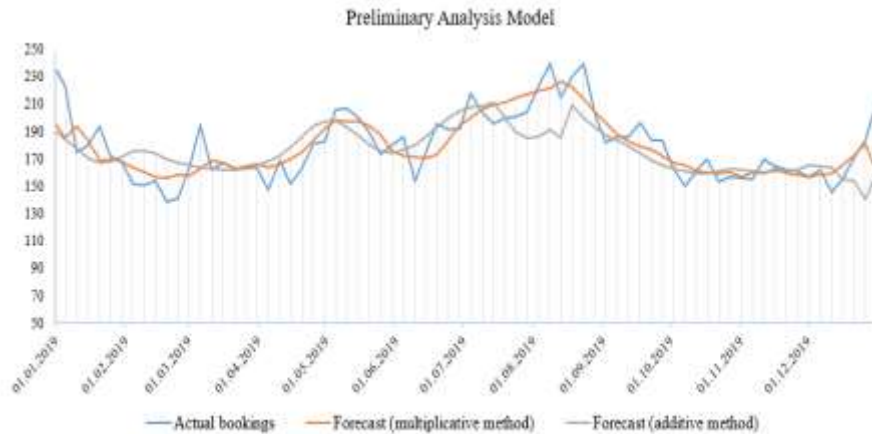
Multiplicative Model:

$$\begin{aligned}
 X_{t+k} &= (Y_t + kT_t) * S_{t+k=N}, \text{ where} \\
 Y_t &= a(z_t * S_{t-n}) + (1 - a)(Y_{t-1} + T_{t-1}) \\
 T_t &= b(Y_t - Y_{t-1}) + (1 - b)T_{t-1}
 \end{aligned} \tag{2}$$

$$S_t = c(Z_t * Y_{t-1} + T_{t-1}) + (1 - c)S_{t-N}$$

The difference between the two methods is the nature of the seasonal component. The additive method is optimal when the variation of the seasonal component is almost constant and is expressed in absolute terms and the sum to zero.

The multiplicative model is used when seasonal fluctuations change in proportion to the level of the series. It is expressed in relative terms and sums up to approximately  $N$ . Double exponential smoothing is a simplified version of the additive model.



**Figure 6** Forecasting demand using preliminary analysis

This method is valid, but only subject to stable demand, taking into account additional information about the trend and seasonal factors in the equation.

In this case, we got an error of 7.41% (multiplicative model) and 5.8% (additive model).

*Regression Models.* One of the most popular models is linear regression. The regression model consists of the dependent variable  $Y_t$ , which predicts the number of rooms booked for a period  $t$  and the independent variable  $Y_{t-n}$ , which reflects the number of rooms booked a few days before arrival. The following equation describes regression:

$$Y_t = b_0 + b_1 * Y_{t-n} \tag{3}$$

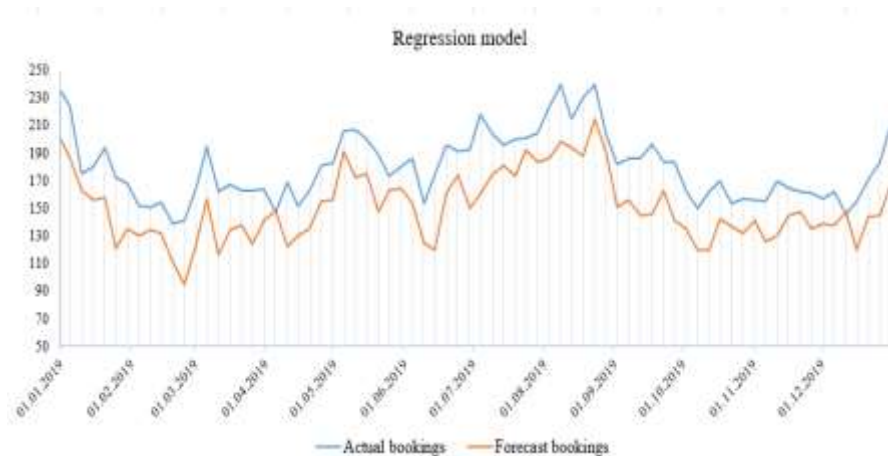
where  $b_0$  and  $b_1$  are the regression parameters.

Another type of regression analysis is the least-squares estimation method used to estimate unknown quantities from measurements containing random errors and to approximate the representation of a given function by others. Then the equation takes the form:

$$Y_t = b_0 + b_1 * Y_{t-n} + \dots + b_p * Y_{t-n-k} \tag{4}$$

where  $Y_{t-n} + \dots + Y_{t-n-k}$  – the number of reservations  $n$  days before the arrival date.

This method is effectively useful in such an essential component of management rhubarb as the processing of observations and analytical data.



**Figure 7** Demand Forecasting with Regression

Regression analysis is highly effective due to the ability to predict unstable data (which the hotel operates daily). Compared with the methods described above, where the error reaches 42%, regression methods reduce this indicator to 10%.

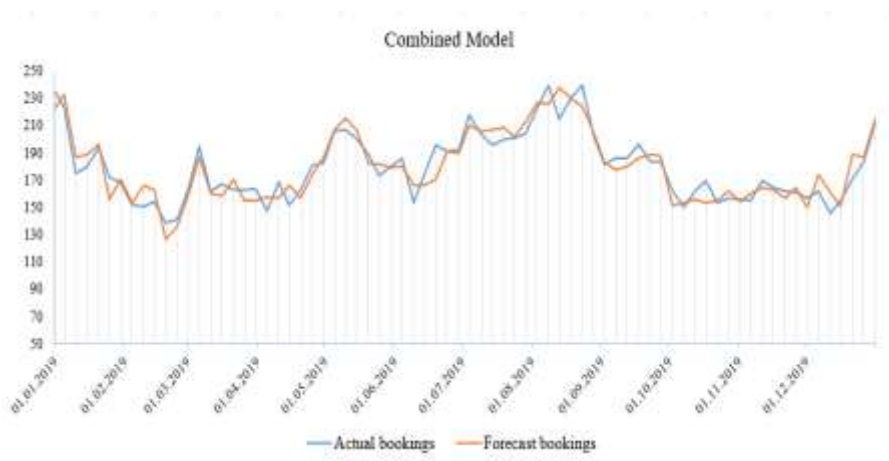
*Combined Models.* The models described above are the basis of financial forecasting [9]; however, they are still not so often used by Russian hotels in practice. In most cases, a combined model is used that combines the techniques and algorithms of several basic methods. This approach makes it possible to compensate for the shortcomings of some models with the help of others, and is aimed at improving the accuracy of forecasting, as one of the main criteria for the effectiveness of the model, which can be written as follows:

$$\alpha = \frac{MSE2 - \rho\sqrt{MSE1}\sqrt{MSE2}}{MSE1 - MSE2 - 2 - \rho\sqrt{MSE1}\sqrt{MSE2}} \quad (5)$$

where  $MSE$  is the Mean Square Error, and  $\rho$  is the correlation coefficient between errors in the forecasts of the two models. The coefficient  $\rho$  is calculated as:

$$\rho = \frac{\sum(xi - x)(yi - y)}{\sqrt{\sum(xi - x)^2}\sqrt{\sum(yi - y)^2}} \quad (6)$$

The graph of the analysis based on the combined model demonstrates the high accuracy of the forecast, in comparison with other models used:



**Figure 8** Demand forecasting using a combined model

Combined modelling, synthesizing several methods, allows joining their advantages. As a result of the analysis of the above models, we can conclude that the combined model is the most advanced, demonstrating high accuracy.

#### 4. CONCLUSIONS

The hotel business is considered the most conservative in terms of dynamic development. At the same time, the hospitality industry is an area that comes into contact with the most significant number of related business areas: logistics, marketing, digital technology, construction, global tourist flows. That is why it is essential to navigate and apply modern management tools and trends in areas that directly or indirectly relate to the field of hospitality.

First of all, it concerns business automation tools, such as PMS, Channel Manager, Booking module, Chatbots, Revenue Management.

Hotel owners are interested in using modern tools and technologies that will help them organize an explicit internal control of the hotel, hotel complex, restaurant or fast food establishment, and thus avoid high additional costs.

A well-thought-out integrated automation system becomes an indispensable reliable assistant for a hotelier who is interested in efficient and economical business management. It provides management accounting so that the owner at any time and any distance from his property can see the real picture of the effectiveness of his business, the movement of funds, inventory, estimate the load of the hotel, restaurant, analyze the situation in dynamics and make forecasts for the future that will help him make the right managerial decisions.

The use of modern management tools and an automation system contributes to the development of the hotel business, as well as increasing prestige and creating a positive image.

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