

## Data driven pricing strategies for hotels during the COVID-19 pandemic

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**Abstract:** Pandemics such as COVID-19 can challenge many of the very well-established strategies of revenue management. The purpose of this paper is to subject the four widely used strategies of revenue management in the hotel industry into an empirical analysis for their suitability at the time of crisis. The data driven approach to modelling has been adopted in this research based on the real-life data obtained from the property management system of nine of the 5-star hotels in Qatar. The results indicate that four of these hypotheses are supported. This revelation has been the basis for drawing implications to the finance and marketing managers of hotels to enhance customer satisfaction and maximise hotel revenue during the COVID-19 or any such pandemic. The results are based on real-life data and have the foundation of well-established pricing strategies in use at the hotels.

**Keywords:** revenue management; pricing strategies; five-star hotels; COVID-19.

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## 1 Introduction

COVID-19 is a pandemic that has revolutionised the business world, and unfortunately, it did not provide the flexibility of time to business world to cope up. This resulted in the abrupt changes in the functionalities of business which had its repercussions on social, economic and environmental dimensions of the business world. Many of the very

well-established theories in the business world were challenged by the pandemic and revenue management was no exception to this. Fundamentally, one of the objectives of revenue management is to fix the price to maximise the revenue growth (Strauss et al., 2018). Some of common strategies adopted for revenue growth are: promoting online booking, building revenue management culture, selling products of other branded hotels, leveraging events and attraction, and specifically under the revenue management culture, the prominent choices in pricing are – value-added pricing, discount pricing, price per segment, length of stay, positional pricing, penetration pricing, and skimming. Even though there is a very well-established procedure for implementing each of these strategies and tactics, it is very important to identify which one of the pricing strategies would be effective in a given unforeseen circumstance. So, there is a need to study the effectiveness of these strategies under the pandemic situation based on the real-life data.

Strategic pricing strategies are critical at demanding times such as the pandemics. Bertini et al. (2020) have provided evidence from one experiment and then developed a model to understand the cost of the bias under different market conditions and emphasise the importance of appropriate strategy in marketing. Kirca et al. (2020) have examined the extent to which product and brand portfolio characteristics interact to affect brand performance and emphasise upon the breadth, depth and innovativeness of the product portfolio. Bhattacharya et al. (2019) have found that decisions regarding strategic orientation should be examined in light of both likely risks and returns in order to make appropriate resource allocation decisions which has an influence on the business performance. Among the pricing strategies to maximise the revenue growth as well as meet customer satisfaction (CST), four strategies, namely – dynamic pricing (DNP), gross operating profit (GOP) per available rooms, differential pricing (DFP), and positioning-based pricing (PBP) stand out from the rest (Ling et al., 2012; Wangui et al., 2018). DNP is demand driven pricing based on the demand for the product or service (Abrate et al., 2012). GOP per available rooms is basically a performance indicator in a hotel and is given by gross revenue minus the gross expenditure and it is a good performance indicator for the hotel and it can form the basis for pricing (Kapiki et al., 2014). DFP as a concept is selling the same product or service at different price for different customers based on customer type, time of purchase, location, etc., (Xu et al., 2014). PBP is to place the product or service at a certain position relative to that of the competitors' product or service with an intention to reach the targeted customers (Smerichevskiy et al., 2019). So, the primary objective of this research is to explore how these price strategies would relate to the hotel revenue (HTR) and CST during the COVID-19 situation.

There are many research studies which have established relationships between revenue management and pricing strategies. Chiang et al. (2007) have identified that pricing strategies are the critical aspects of revenue management which need to be closely monitored for the success of the industries. Maglaras and Meissner (2006) have found that natural static and DNP heuristics can be very effective in alleviating many issues related to revenue management. Wirtz et al. (2003) have recommended various techniques of pricing strategies to tackle problems associated with revenue management. They have identified those high published rates, physical and non-physical rate fences, bundling of services need to be refined for better revenue management. According to Wirtz et al. (2003) justifying the price difference could be of importance in multi-tier price structure and they recommend increasing the rack or full-fare rate and then expressing all other price points as discounts to this rack rate.

This research adopts a method of building a hypothesis based on the available knowledge in business performance and testing it using the practical situations to specifically study the interrelationships of DNP, CST and HTR so that the critical pricing strategies can be identified as applicable to COVID-19 situation or similar pandemic in the future.

## **2 Literature review**

Pricing strategies play a dominant role in gaining the competitive advantage in the market, as it not only contributes to the revenue, but also enhances CST, and hence, it is a very active area of research in hotel industry today. For instance, Collins and Parsa (2006) have undertaken a qualitative research in the US with ten major cities as the source of database and found that on an average there was a potential to gain 251 million USD annually through the hotel industries in the US. In another study undertaken in 313 hotels in Italy it was found that pricing strategy was the key determinant of revenue maximisation and CST (Pulina and Santoni, 2018). O'Connor (2002) performed an empirical analysis based on 50 internationally branded hotels using electronics B2B distribution channels and found that the pricing strategies through the electronic routes significantly contributed not only to the revenue growth of the hotels, but also enhanced CST to a considerable extent. In a study undertaken in Taiwan, two distinctly different effects were observed in DFP. At low price level of room, food and beverage, an increase in guest satisfaction as well as revenue was observed with DFP; however, at high price level exactly the opposite effect was observed (Chen et al., 2015).

There are several distinctly different pricing strategies adopted in hotel industry which are grounded well on certain theories. One of the most widely discussed theory is Hedonic price theory (HPT), according to which the attributes and their characteristics in hotels are unobservable (De Oliveira, 2016). So, the HPR-based pricing attempt to capture price heterogeneity. The criticism of this theory is that the customer's willingness to pay and the demand elasticity are unaccounted in HPT (Aguiló et al., 2001). Mark-up pricing theory (MPT) is another theory which basically recommends adding up of the product or service costs and add profit margin to it (Sammut-Bonnici and Channon, 2015). The criticism of MPT is that it is more applicable to the product-based industries as service is very difficult to measure quantitatively to perfection due to the intangible features of it. Another theory which is widely practices is target return theory (TRT) (Copeland and Jacobs, 1981) according to which in high investment business the target returns constitutes the basis for pricing. While TRT will be the obvious choice in high investment business, it lacks flexibility and it is not easy to decide on the return on investment period in many business situations. Another theory which is reasonably popular in hotel industry in particular is value-based pricing theory (VPT) (Aulia et al., 2016). The VPT provides a good combination of tangible and intangible factors in products and services and is based on the perceived value of the buyer. The major criticism to VPT is that it is profitable to apply this theory only in businesses where the perceived value of service by the buyer is greater than the actual cost to the supplier. Another associated theory here is competition-based pricing theory (CPT)

(De Toni et al., 2017), according to which the competitor's price becomes the reference. Again, it is difficult to apply CPT to products and services with high differentiation. Penetration pricing theory (PPT) (Pamudji et al., 2015) is also widely popular theory which recommends promotional pricing which is fundamentally a temporary price which is much below the market price just to encase on the demanding situation in the market. This has been very successful in the internet era as the prices can be easily displayed through the electronic media for any stipulated period and a large customer base can be attracted. The last in the list of the theories which are widely used is the skimming price theory (SPT) (Shavandi and Zare, 2013) according to which highest price possible will be floated to the service or product which is in tremendous demand in the market. All these strategies are fundamentally theoretical in nature and have specific application based on the prevailing market condition. So, the literature is rich with articles in which researchers have tested each of the strategies based on specific theories in various contexts of product and service offerings.

Santos and Flores (2017), based on their study of hotel performance in Brazil found that value-based pricing and cost-based pricing were both highly effective in gaining the competitive advantage. Further, they analysed 11 different pricing strategies: price by activity-based costs, price by ideal value, price by perceived value, marginal price, price by return on invested capital, distinct price, price by full costs or total, competitive price, price by production line, price by image, and price by auction for their effectiveness and identified that the first three in the list were most appropriate in the Brazilian market and the last three in the list were least effective in terms of business performance.

While these research studies provide both theoretical and practical perspectives on revenue management in general, the objective of this research has been specifically to investigate the impact of DNP, GOP per available rooms, DFP, and PBP as these specific strategies have been widely in use in the context of hotel industry, and further, the cardinal objective of this paper has been to identify the critical strategies which can help hotel industries in the time of adversities like COVID-19.

### **3 Research methodology**

#### *3.1 The hypothetical model*

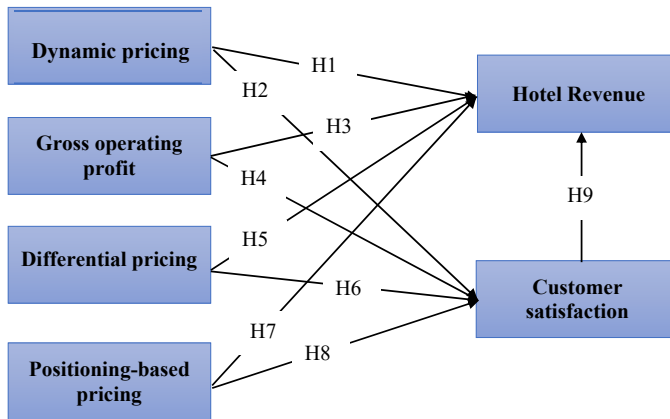
The hypothetical model (Figure 1) of this research is developed based on the earlier research studies. The research evidence has been gathered to relate the pricing strategies to HTR and CST and accordingly the hypothesis has been developed. The research linkages between the variables of study are discussed in the subsequent sections.

#### *3.2 Relationship between DNP and business performance*

Rohani and Nazari (2012) conducted a survey with a sample size of 120 guests in various hotels in Iran and found that DNP pricing had a positive impact on the hotel performance as well as CST. Chen et al. (2020) considered two-stage DNP strategy in the presence of reference price effect and provided a theoretical framework which proved that DNP has

the potential to gain higher revenues with more satisfied customers. Popescu and Wu (2007) established a mathematical relationship between DNP and the revenue generation. Tekin and Erol (2017) have considered the indirect effects of DNP and found that the reduction in wastage achieved through the DNP can contribute to the increase in the revenue and profitability and also nature-friendly attitudes among the customers. Bayoumi et al. (2013) have developed a model in which the price multipliers have been used effectively to enhance the HTR based on factors such as occupancy and the time of arrival of the guests in hotels and the model has been applied successfully in Plaza Hotel, Alexandria, Egypt.

**Figure 1** The hypothetical model (see online version for colours)



While most of the researchers have focussed on the combined approach of using forecasting and optimisation for effective management, Bandalouski et al. (2018) provided a disintegrated approach of dividing demand into multiple categories and further treating the forecast and demand separately for the DNP criterion and proved that DNP can be effective means to enhance the HTR. Aziz et al. (2011) provided three different approaches: the first, different scenarios of forecasted demand; the second, fix one scenario for the estimated demand and have the pricing on daily basis; and the third, partition the hotel capacity itself into several overlapping segments and for each segment obtain the different prices. It was proved that all the three scenarios were effective in improving the HTR. Faruqui and Palmer (2011) considered the case of DNP on electricity in the USA. As electricity cannot be stored and has to be consumed on production, the demand forecast has to be accurate and ‘peak’ time has to be identified and they run for 100 to 200 hours in the US per year. The best option suggested was to provide incentives for minimising electricity usage during the peak hours and in this context, Faruqui and Palmer (2011) applied the hour-ahead-pricing design (also called real-time-pricing) as a case of DNP and proved that the peak demand can be lowered by 4% to 20%, thus achieving the lowering of energy cost through DNP.

DNP also has an influence on *CST*. Way back in 90s, in a research undertaken in milk product industries it was found that DNP significantly influenced the *CST* (Friedman and Lewis, 1999). Gladilin and Saitov (2019) using the data driven approach in the context of retail business established the linkage between DNP and *CST*. The model also provided a means to calculate the increase in the bank interest rate to the retailers without sacrificing the customer loyalty attained through *CST*. Hinz et al. (2011) compared the fixed threshold price setting with an adaptive threshold price setting in the form of name-your-own-price (NYOP) and found that the latter increased profit over 20% with the same level of *CST* in the context of e-commerce-based business. Fu and Ji (2010) developed a mathematical model applicable to the remanufacturing business based on two-way auction transactions game theory and proved that when DNP was used the customers were satisfied to a higher level in comparison to the static pricing. Victor et al. (2018) have undertaken an exploratory study using a sample size of 178 based on purposive sampling and found that DNP in online purchase enhanced the *CST*. Fu and Ji (2010) using game analysis developed a mathematical model to relate DNP and *CST* and applied it in a manufacturing context and found that DNP would be appropriate to improve *CST*. Levin et al. (2007) found that in a limited capacity setting DNP was one of the best options to achieve *CST* and insisted that the internal pricing guarantee would be very effective in such a setting.

It is evident from the aforementioned research studies that *DNP* has impact both on *business revenue* and *CST* in the context of both service and product-based industries. For sustainability of the hotel business, which is the focus of this research, both *HTR* and *CST* are important. This is because, speaking in terms of long term business, revenue alone may not contribute to the sustainability, but *CST* has to be ensured. It is possible to boost revenue through several means of DNP but if the revenue gain is at the cost of *CST* sustainability of the business will be at stake. Further, the time factor plays a vital role in business performance, especially the pandemic situations such as COVID-19. The problem identified in this research is to study the impact of DNP on revenue and *CST* as applicable to the pandemic period so as to support future decisions in similar situations. Hence, the following hypotheses have been postulated.

- H1 There is a positive significant relationship between *DNP strategy* and *HTR*.
- H2 There is a positive significant relationship between *DNP strategy* and *CST*.

### 3.3 Relationship between *GOP* and business performance

Al Hayek (2018) studied the operating activities in Jordanian industrial joint stock companies and found that a focus on *GOP* resulted in the increase in the revenue of business. Jagelavicius (2013) developed a framework to link the *GOP* in terms of price, cost, volume and mix to business revenue based on the Boston Consulting Group Matrix and theorised that *GOP* strategy has the potential to enhance the revenue in the context of large assortment of products. The whole concept is that *GOP* would be the most appropriate measure particularly when it is difficult to arrive at the exact quantity of sales

when customer has a wide range of options to choose from (Jagelavicius, 2013). Based on the study undertaken in steel manufacturing industry in India it was proved that GOP was one of the key strategies for enhancing the net revenue (Tulsian, 2014). In the context of raw Asphalt distribution trade, it has been proved that the GOP strategy would be ideal to enhance profitability of business (Hafid, 2016).

There are also studies which have related the GOP to the CST. Yeung et al. (2002) using the data from American customer satisfaction index (ASSI) at the firm level performance and found that there existed a relationship between GOP strategy and CST, and also found the relationship to be nonlinear. Guo and Jiraporn (2005) used COMPUSTAT which is a financial and marketing database consisting of the data from across the globe and established a relationship between GOP and CST. Sun and Kim (2011) applied the ASSI in the context of hospitality and tourism industry in the USA and found that relationship between GOP strategy and CST held good on the short-term basis.

Even though these studies have established the relationships of GOP strategy with both revenue as well as CST there is no evidence for empirical studies in the context of Qatar despite the fact that its economy is based on hospitality industry to a considerable extent. Further, there is a need to identify the most preferred financial strategy in situation of pandemic such as COVID-19 and hence the following hypotheses have been formulated.

H3 There is a positive significant relationship between *GOP strategy* and *HTR*.

H4 There is a positive significant relationship between *GOP strategy* and *CST*.

### 3.4 Relationship between DFP and business performance

DFP strategy has been one of the sort after strategies in hotel industries for maximising the revenue and increasing CST since the past several years. Xu et al. (2014) have developed a mathematical model for the relationship between DFP strategy and HTR and established a positive relationship between these two variables. Abrate et al. (2012) conducted a survey in 1000 European hotels and based on the hotel booking data collected from three months to a single day found that DFP is an effective means to enhance the HTR. Beck et al. (2018) developed a differential price for the same day arrival of guests in a hotel which would maximise the revenue based on the analysis of 238 responses received from 3000 hotels in the USA.

DFP strategy has also proven to have considerable impact on CST. Zhu and Yu (2018) conducted a research in green electronic products under the three distinct categories of – new, remanufactured, and refurbished products and developed a simulated model based on real life data and established relationship between DFP and CST. Vivian (2017) conducted a research in large retail supermarkets in Kenya and through a sample size of 336 customers and 31 branch managers from eight regions and proved that DFP strategy not only enhances CST, but also builds customer loyalty. Kiptoo (2019) conducted a survey research in customers in Kenyan commercial banks using multi-stage sampling with 148 respondents and found that DFP had positive influence on CST, customer retention and customer loyalty. Cătoiu et al. (2010) have theorised that DFP

leads to value perception and buying intentions as it mainly enhances CST both in product and service goods. Yelkur and DaCosta (2002) conducted a survey in select five-star hotels and observed that DFP and communication through internet significantly improved CST; however, they recommend that unless customer loyalty is built CST may not be sustainable.

Thus, there is research evidence that DFP is related to revenue as well as CST in the contexts of both service and product-based commodities. However, not much of work has been undertaken in this direction in the context of hotel industry, particularly in Qatar, and hence, the following hypotheses have been formulated.

H5 There is a positive significant relationship between *DFP strategy* and *HTR*.

H6 There is a positive significant relationship between *DFP strategy* and *CST*.

### 3.5 Relationship between PBP and business performance

Porter (1990) strongly recommended PBP to gain competitive advantage in business leading to better revenue generation. According to Mayo and Brown (1999), PBP is the key to enhance business performance. Noone et al. (2013) based on their survey of 6,998 US-based hotels with a data of over an 11-year period found a strong correlation between PBP and HTR; however, the impact was significant for short-term revenue in comparison to the long-term revenue. Smerichevskyi et al. (2019) conducted a research in the Ukrainian market and developed an algorithm for PBP strategy for transnational organisation for revenue maximisation. Bitran and Caldentey (2003) have developed a stochastic model for PBP strategies to maximise revenue with specific reference to the goods which are highly sensitive to price. Abrate and Viglia (2016) analysed the PBP of five-star hotels from the Booking.com database with 21,596 data points and found that it had a significant influence on revenue generation. De Toni et al. (2017) surveyed 150 companies in the metal-mechanic sector in Brazil and found that PBP was positively associated with the revenue gaining.

It is also found that PBP strategy also has association with CST. Marinescu et al. (2010) conducted a study in the retail sector in general and found that PBP strategy significantly improved CST. On the other hand, Cao et al. (2003) conducted similar study in e-tailing (online retailing) and found that PBP strategy may not be effective on long term basis; however, it is suitable for short term CST enhancement. Yulisetiari and Prahasta (2019) conducted an empirical study based on purposive sampling of the users of Telkomsel Cellular Operators in East Java, Indonesia and found that PBP produced better CST. Razak et al. (2016) used a sample size of 110 respondents selected based on purposive sampling in a mall in Indonesia and proved that CST is a function of PBP of the product.

Even though there are many research studies in which researchers have associated PBP to both revenue and CST in the context of product and service industries not many of the research studies are in the context of hotel industry, particularly in Qatar where it contributes to the country's GDP substantially, and hence the following hypotheses are developed.



- H7 There is a positive significant relationship between *PBP* and *HTR*.  
H8 There is a positive significant relationship between *PBP* and *CST*.

### 3.6 *Relationship between HTR and CST*

The relationship between *revenue* and *CST* has been widely explored across the business sectors, yet the nature of relationship is inconclusive. For instance, Yeung and Ennew (2001) conducted a sectoral research to study the relationship between these two variables using the standard ASSI in companies from the proprietary financial database – Standard and Poor’s Compustat and the results indicated a mixed evidence for a positive relationship between the two variables based on the sector under consideration. Novak et al. (2015) used the car servicing network data from five European automobile brands in Slovenia and found that revenue gained had a positive impact on *CST*. Similar results were also obtained in hospital industry of Malaysia (Aziz et al., 2014). Pooser and Browne (2018) conducted a study in the insurance sector and found that revenue in insurance will increase with *CST* as there will be reduction in expenses to the organisation. Williams and Naumann (2011) conducted an empirical study in Fortune 100 firm based in USA with semi-autonomous business units serving B2B markets and found that *CST* is linked to revenue per account as well as the revenue growth per account. Karakas (2014) conducted a survey-based research with a sample size of 815 customers to the hotels in Hungary and found that both the service quality as well as *CST* contributed to the *HTR*. Amin (2015) conducted a survey using a sample size of 150 in Kashmir, India and empirically established that in the hotel industry *CST* was an important determinant of revenue. Noone et al. (2003) conducted a qualitative research on revenue management in hotels and established a linkage between customer relationship management, customer loyalty, *CST* and revenue. These research studies have been conducted in various product and service-based industries and relatively there are lesser number of studies in the context of hotel industry particularly in Qatar despite the fact that it is one of the major industries contributing to the economy of the country. Hence the following hypothesis has been postulated.

- H9 There is a positive significant relationship between *CST* and *HTR*.

### 3.7 *Sample design*

This is a cross-sectional research in terms of the time frame. The data has been collected from randomly selected nine of the five-star hotels in Doha, Qatar. All the hotels had free Wi-Fi facility, swimming pool, parking lot, family rooms, fitness centres, and all the general facilities of the five-star hotels and located at proximity of about 3 km from the center of the city. The property management system (PMS) of the hotel was the source of the data. The dataset had 36 variables describing 21,326 observations from the period of 1 March 2020 to 20 June 2020, as the first case of COVID-19 was found on 27 February 2020 (TPSQ, 2020). This included the bookings which had materialised as well as those cancelled. As the data is real all customer identification were deleted with an undertaking that it will be used only for research purpose. The data was directly from the PMS as

mentioned before, through the TSQL query on SQL server studio manager which is an integrated environment manager tool commonly used in management of Microsoft SQL databases. The query collected the ID of each to the variable of interest in the BO table. For the variables with values listed in related tables (e.g., market segment, market positioning, operating profit, etc.) the related values were also retrieved and the details of the extracted variable, its origin, and technical procedure is briefed in Table 1. A total of 736 data points were created based on the variance estimation which was used for the simulation using the structured equation modelling using the partial least square technique (PLST) using the SmartPLS Version 3 software. PLST has been specifically used because it uses the spectral data and the property or assay data together in an iterative fashion to build a model and provides better solution while testing the hypothesis (Ullman, 2006). The sample size to be adopted was based on the assumption of yield (Dell et al., 2002). Assuming an yield of 65% ( $p=0.65$ ;  $q=0.35$ ), if process yield to be accurate within 10% ( $a$ ) at 95% ( $\alpha = 0.05$ ) confidence level using the standard formula  $n = Z^2(pq/a)$  (Dell et al., 2002) the sample estimate is 91, and hence, the adopted sample size is adequate.

**Table 1** Variable descriptor

<i>Variable</i>	<i>Type</i>	<i>Description</i>	<i>Source/technical procedure</i>
DNP	Numeric	Dynamic pricing	BO/ Calculated by the cost per product plus the selling price.
GOP	Numeric	Gross operating profit per available rooms	BO/ subtracted operating expenditure from the gross revenue, then the hotel's GOP is divided by the total number of rooms.
DFP	Numeric	Differential pricing	BO/the differential cost is calculated by deducting the cost of current capacity from the cost of the proposed new capacity and the obtained amount is divided by the number of units of production which gives the minimum selling price.
PBP	Numeric		BO/Profit margin is added to the cost associated with producing and distributing and unit price is estimated by adding the unit cost to the product of rate of return and investment minus the quantity sold.
HTR	Numeric	Hotel revenue	BO/Revenue per available room (RevPAR) is calculated by the total revenue by the number of rooms available during the period of estimation.
CST	Integer	Customer satisfaction	BO/Estimated through the rating scale varying from 5 strongly agreed on satisfaction to 1 strongly disagreed to satisfaction.

## 4 Analysis and discussions

The analysis using structural equation modelling (SEM) essentially consists of two components, namely, *measurement model* and *structural model*. While the former provides proof for the reliability and validity of the data (descriptive statistics) the latter enables the testing of the hypothesis (inferential statistics) (Hair et al., 2013).

#### 4.1 *Measurement model*

SEM does not demand normality of data in principle; however, extreme skewness of data does affect the results (Hair et al., 2019). Hence, normality test has been undertaken based on Skewness and Kurtosis measures. The values of Skewness are within the limit of  $-1$  to  $+1$  and Kurtosis are within the range from  $-3$  to  $+3$  for the sample size of 736 in this research (Table 2) which ensures the normality of the data. In SEM at least three indicators need to account for the latent variable (Ullman, 2006), SEM is of particular use in situations as in this paper because it is a multivariate statistical analysis technique that is used to analyse structural relationships and it has the ability of combining factor analysis and multiple regression analysis, simultaneously and test the hypothesis. Accordingly, in this research three indicators have been chosen for each latent variable. The reliability and validity of measurement has been given in Table 3. It can be observed that Cronbach's Alpha values range from 0.7 to 0.9 indicating moderate to high reliability (cut off = 0.6; Hair et al., 2013). Composite reliability is also a measure of reliability of measurement and the values range from 0.8 to 0.9 again indicating moderate to high reliability ((cut off = 0.6; Hair et al., 2013). Dillon-Goldstein's rho\_A is considered to be a better indicator than Cronbach's alpha and values higher than 0.70 suggest unidimensionality of the variable under study (Ravand and Baghaei, 2016), and as the values for the variables of study range from 0.7 to 0.9 it can be concluded that all the factors are unidimensional and reliable. Average Variance Extracted (AVE) is a measure of convergent validity with a cut off value of 0.5 which indicates that at least 50% of the variance of the observed variable is explained by the construct under consideration (Ravand and Baghaei, 2016). In this research as the values are ranging from 0.6 to 0.8 (Table 3) it indicates that the variables have a high convergent validity. Further, factor loading is a measure of convergent validity which indicates that the factors associated to the research variable are representing the variables to the required extent and in the present case the factor loadings range from 0.7 to 0.9 except in one case (0.6, CST3 – Table 4 and Figure 2) which indicate a good convergent validity (cut off 0.7; Ravand and Baghaei, 2016). Even though one value is 0.6 the rest of the two values are 0.84 and 0.85 and hence it can be considered acceptable. Finally, discriminant validity is also established through the condition that the square root of AVE of each item should be greater than its inter-item correlation with the rest of the variables. In this research this condition is fulfilled for all the variables of study (Table 5), and hence, the measurement has the required level of discriminant validity. All these measures endorse the point that the descriptive statistics measures demonstrate the required reliability and validity of the data and its measurement.



**Table 3** Reliability and validity of measurement

	<i>Cronbach's alpha</i>	<i>rho_A</i>	<i>Composite reliability</i>	<i>Average variance extracted (AVE)</i>
CST	0.66	0.72	0.81	0.59
DFP	0.84	0.84	0.90	0.76
DNP	0.82	0.85	0.89	0.73
GOP	0.85	0.86	0.91	0.77
HTR	0.65	0.68	0.81	0.58
PBP	0.68	0.68	0.82	0.61

**Table 4** Factor loadings

	<i>CST</i>	<i>DFP</i>	<i>DNP</i>	<i>GOP</i>	<i>HTR</i>	<i>PBP</i>
CST1	0.85					
CST2	0.84					
CST3	0.59					
DFP1		0.88				
DFP2		0.87				
DFP3		0.86				
DNP1			0.86			
DNP2			0.89			
DNP3			0.82			
GOP1				0.86		
GOP2				0.90		
GOP3				0.88		
HTR1					0.72	
HTR2					0.84	
HTR3					0.73	
PBP1						0.81
PBP2						0.79
PBP3						0.74

**Table 5** Inter-item correlations

	<i>CST</i>	<i>DFP</i>	<i>DNP</i>	<i>GOP</i>	<i>HTR</i>	<i>PBP</i>
CST	0.77					
DFP	0.37	0.87				
DNP	0.35	0.69	0.86			
GOP	0.33	0.77	0.67	0.88		
HTR	0.66	0.29	0.32	0.29	0.76	
PBP	0.58	0.31	0.32	0.25	0.59	0.78

### 4.2 Structural model

Structural model enables the testing of the hypothesis. Figure 2 depicts the path coefficients of the relationships. It can be observed that the path coefficient values range from 0.01 to 0.5 for the relationships established in this research. The  $R^2$  values (Figure 3) for the two endogenous variables are 0.4 and 0.5 which basically indicates the goodness of fit of the model. It can also be interpreted that that about 40% of the relationship of *HTR* and 50% of the relationship of *CST* has been explained by the variables selected in this research. The model fit is acceptable (cut off is 0.1; Ravand and Baghaei, 2016), as the  $R^2$  values for both the endogenous variables are adequately higher than the threshold value. It can be observed from the values in Table 6 and Figure 3 that following hypotheses are supported.

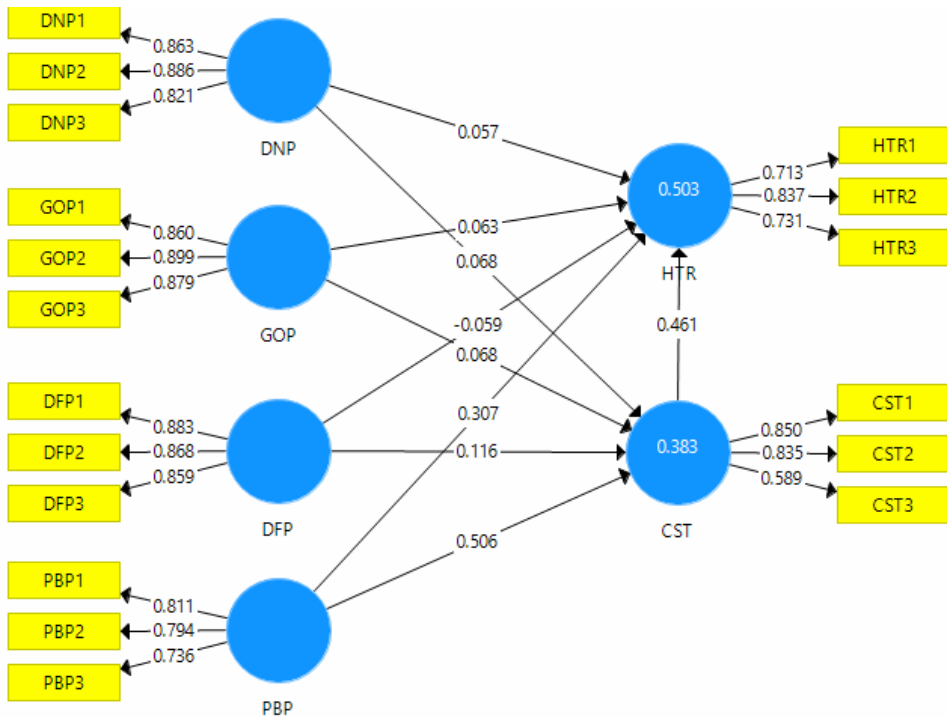
H10 There is a significant relationship between *DFP strategy* and *CST*.

H11 There is a significant relationship between *PBP* and *HTR*.

H12 There is a significant relationship between *PBP* and *CST*.

H13 There is a significant relationship between *CST* and *HTR*.

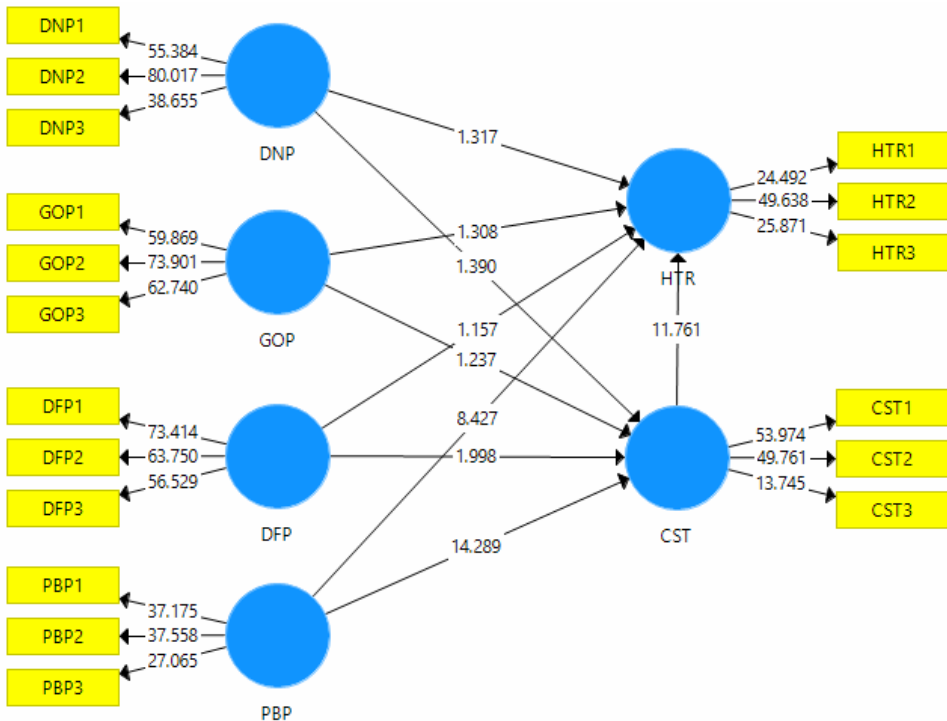
**Figure 2** Path model (see online version for colours)



**Table 6** t-statistics

	<i>Original sample (O)</i>	<i>Sample mean (M)</i>	<i>Standard deviation (STDEV)</i>	<i>T statistics (O/STDEV)</i>	<i>p values</i>	<i>Hypothesis</i>
CST → HTR	0.46	0.46	0.04	12.55	0.00	Supported
DFP → CST	0.12	0.12	0.06	2.02	0.04	Supported
DFP → HTR	-0.06	-0.06	0.05	1.15	0.25	Not supported
DNP → CST	0.07	0.07	0.05	1.51	0.13	Not supported
DNP → HTR	0.06	0.06	0.04	1.38	0.17	Not supported
GOP → CST	0.07	0.07	0.05	1.27	0.21	Not supported
GOP → HTR	0.06	0.06	0.05	1.26	0.21	Not supported
PBP → CST	0.51	0.51	0.04	14.04	0.00	Supported
PBP → HTR	0.31	0.31	0.04	7.59	0.00	Supported

**Figure 3** Structural model (see online version for colours)



### 5 Discussion and implications to managers

The implications of the study based on the discussion of the results are to both financial as well as marketing managers to enhance the HTR and CST during the period of

COVID-19, or similar pandemic during which some of the principles of finance and marketing will be facing a challenge.

First of all, the hypothesis testing has revealed the fact that *CST* has a positive significant relationship with *HTR*. This is already a very well researched area not only in hotel industry but several other service and product-based organisations. The results are in alignment to the results obtained by several earlier research during the normal times without any pandemic (e.g., Aziz et al., 2014; Novak et al., 2015; Pooser and Browne, 2018; Yeung and Ennew, 2001; Williams and Naumann, 2011). So, the implications to the marketing managers are that they need to continue with their strategies to enhance *CST* to maximise the *HTR* even during the period of the pandemic. In fact, during the COVID-19 situations the customer demands will be much higher than the normal period as there will be special needs of the customers to be met such as sanitisation of all the strategic locations, hot water available for drinking, medical assistance as and when required, shorter response period for queries related to service, etc. *CST* may have to be considered more seriously during the period of the pandemic in comparison to the normal periods of operation due to these special needs. Moreover, issues such as lockdown, curfew and security checks would further panic the customers, particularly outstation customers who are new to the place, and may have to be provided higher level of assistance. While there are several strategies which have been successfully adopted by the hotel managers some of the strategies such as Critical Incident Approach (Hayes, 2008) and Structured Customer Relationship Management System (Dominici and Guzzo, 2010) may be worth a consideration along with regular *CST* through employing courteous staff, improved services, patient listening by the staff, customised, personalised and need-based services, efficient grievances and complaints handling of the customers, quality service delivery, regular updating of the attribute measurement scales, and regular training programmes to the staff.

Among the revenue management strategies, hypothesis testing has revealed that *DFP strategy* has a significant positive relationship with *CST*. This revelation is in agreement with the research findings of earlier researchers in both service and product-based organisations (Cătoiu et al., 2010; Kiptoo, 2019; Vivian, 2017; Yelkur and DaCosta, 2002; Zhu and Yu, 2018). The implications to the finance managers are to adopt the 3 principles of making *DFP* strategy more effective:

- 1 Increase the market power of the hotel so that there are no readily available and equally satisfactory goods and services in the market.
- 2 Adopt measures to prevent reselling of the goods and services in the hotels through intermediaries at a lower price from those guests from whom the hotel is seeking to get a higher price.
- 3 Proper mechanism to differentiate the guests of the hotel to different classes based on their affordability. The *first degree* price discrimination would be to classify the customers based on their ability and willingness to pay. The *second degree* price discrimination would be to classify the customers based on not knowing how much they are willing to pay, but elicit the information through their purchase decisions. Versioning and temporal price differential are the most common methods which can be adopted in the second degree price discrimination. The *third-degree* price discrimination can be in the form of student discounts, senior citizen discounts and discounts based on geographical locations.



It was also revealed through the hypothesis testing that *PBP* is significantly and positively related to both *CST* as well as *HTR* were. This indicates that *PBP* strategy is the most successful strategy that can be adopted by the hotel managers during the COVID-19 or any other pandemic situation. This result is in agreement with earlier research in other service and product industries (e.g., Abrate and Viglia, 2016; Bitran and Caldente, 2003; Cao et al., 2003; De Toni et al., 2017; Noone et al., 2013; Razak et al., 2016; Smerichevskyi et al., 2019; Yulisetiari and Prahasta, 2019). The implications to the financial managers of the hotel are that they must find means to make the *PBP* strategy work to the advantage of the hotels to the best possible extent. The hotel should find out the most suitable *PBP* strategy which is applicable to their current position. For instance, *economy strategy* if both the quality of their products and services in the hotel as well as price offering is low, *penetration strategy* if quality is high and price can be still maintained low, *skimming strategy* if quality is low and price is high and *premium strategy* if both quality and price are high. These four strategies are quite handy at the time of pandemic situations such as COVID-19.

## 6 Conclusions

This research was primarily to seek the most suitable revenue management strategy to be adopted by the hotel industry in Qatar during the pandemic situations such as COVID-19. As the tourism and hotel industry was the worst affected industry during the pandemic, there was a compelling necessity to suggest the appropriate strategy to the hotels in Qatar as hotel industry is one of the contributors to the economy of the country.

The data driven models are widely being used in seeking strategic solutions to the managerial problems in the past few years due to the rich computational capabilities of the computers and also the ease of use of the applications. Hence, this approach was attempted based on the real-life data available in the five-star hotels in Qatar and associations were tested between the *revenue management strategies* and *CST* as well as *HTR*. Among the nine hypotheses that were empirically tested four were supported.

The result of the empirical analysis has indicated that among the four well established revenue management strategies available, it is only the *PBP* that had positive significant relationship with both *CST* as well as *HTR*. Thus, it could be concluded that this strategy was the most obvious choice during the pandemic situations such as COVID-19 to make hotel business sustainable. Accordingly, managerial implications were drawn to both marketing and financial managers so that they can exploit the positioning-based strategy to the maximum extent for the benefit of the hotels. The only other strategy which had a positive significant relationship with *CST* was the *DFP strategy*, which could also be the choice of the *HTR* managers to achieve direct *CST* as well as contribute to the *HTR* indirectly, as the research also revealed that *CST* and *HTR* were also positively and significantly related to each other.

The major limitation of this research is that it is specifically oriented towards the four dominant revenue management strategies applicable to the hotel industry. So, it opens up scope for further research considering the remaining strategies. Another limitation of the research is that it is completely based on the data collected during the specified period of COVID-19 situation in Qatar which was chosen purely based on the business potential and is a World Bank high-income economy, and has a tremendous potential for growth (Qatar, 2020). There is an element of uncertainty regarding the exact period during which

this situation may remain, and hence, data collection could have been extended to further duration of time to obtain improved results. Finally, data driven models have their inherent limitations as reproducibility of the data is always questionable; however, the reliability and validity undertaken in this research compensate to a considerable extent as the indices are within the safe margins and cut-off values.

Seldom have the crisis situations liked the one created by COVID-19 come with a warning signal, and it completely changed the way of life of the human beings across the world and impacted the entire business world adversely. This kind of situations demand the business world to have a business strategy exclusively designed for such crisis situations. This research is thus timely and typically a contribution to the managers of the hotel industry with an empirically derived solution for effective revenue management. It has contributions both to the practitioners and academicians in the area of revenue management.

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## Abbreviations

Dynamic pricing	DNP
Gross operating profit per available rooms	GOP
Differential pricing	DFP
Positioning-based pricing	PBP
Hotel revenue	HTR
Customer satisfaction	CST