



# Contribution of hotels' revenue management for supply chain sustainability

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## Abstract

Revenue management (RM) on chain hotels versus independent hotels intends to create value for the activity, manage revenue, and control costs for profit efficiency. The article presents a simplified analysis of its management that intends to benefit suppliers, hotels, and hotels' level of service and how it is being seen nowadays. There was drawn a research question in this study: to understand how it is perceived the impacts of RM on supply chain management (SCM)? This essay aims to bring a two-ways input (from and to), hotel managers, hotel professional revenue managers, and supply chain managers. Due to the pandemic, all data for forecasting and analysis have been reconsidered because they cannot be related to further implications caused by the market changes and guests' behaviors, making this research relevant at this period.

**Keywords** Predictive models · Tourism management · Guest experience · Revenue management · Supply chain management

## Introduction

### Relevance

Revenue management (RM) fulfills an essential instrument for hotels' management strategy (Heo and Lee 2009; Thompson 2010; Bujisic et al. 2014; Karaesmen and Van Ryzin 2004; Ivanov 2014), since it maximizes the entire potential of the hotels' businesses. In fact, without a proper hotel RM strategy, the outcome is to apply reactive actions to achieve the demand, such as relying on uninterrupted overbookings or, on the complete opposite, lack of bookings (Karaesmen and Van Ryzin 2004; v. Wangenheim and Bayón 2007). In Portugal, the development of RM is yet to start, as some data interpretations are being now questioned but there is still a lack of know-how about RM techniques, and what to do with the extracted data reviewed.

Several corporations in the tourism industry also apply this tool and technique to strive for success. Besides hotels, and airlines, also online travel agents (OTA's), car rentals, and others are building their RM frameworks (Elmaghraby

and Keskinocak 2003; Karaesmen and Van Ryzin 2004; v. Wangenheim and Bayón 2007). To the tourism industry is pertinent to mention the importance of suppliers due to perishable services and products found in this sector, framing information about demand and purchases needed in stock otherwise, it would be unaccomplished the maximum level of potential in the business (Kimes 1989; Karaesmen and Van Ryzin 2004; Ivanov 2014).

Without RM through hotels' services management, it is arduous to forecast with precision and advance core activities such as purchases or stock management (Noone and McGuire 2014; Ivanov 2014). The need for the scorecard is to approach lead times for forecasting in a service context. Booking window (i.e., the timeframe between guests' reservation and arrival to the unit) must be carefully managed for rooms sales, even more when taking leverage of social media (SM) opportunities for distribution (Kimes 2003; Noone et al. 2011; Bujisic et al. 2014), moreover when concerns driven for hotels' sustainability, and the correspondent perishability implied of this department.

### Context

As mentioned, hotel products and services are perishable, which implies the need for daily business cash-flows to keep the competitive advantage. Nowadays, there is the adoption

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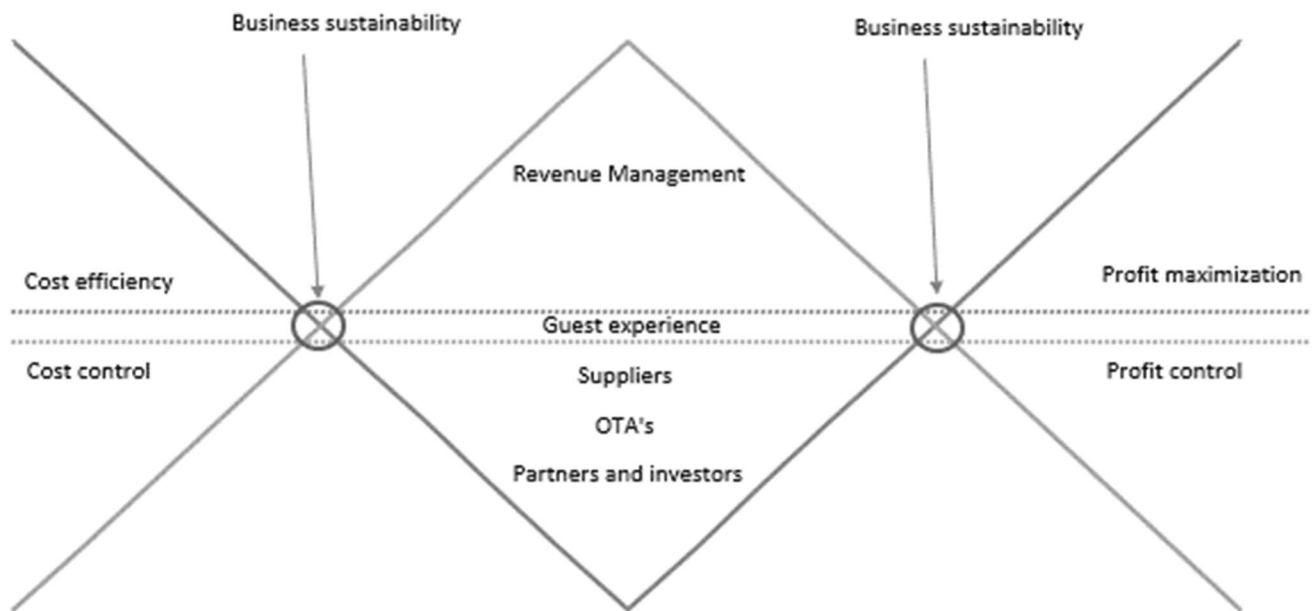


Fig. 1 Intended perspectives about revenue management, simplified example. Source Author

of dynamic pricing (Elmaghraby and Keskinocak 2003; Heo and Lee 2011), also known as yield management (YM), allowing significant benefits for daily revenue, even though there is a lack of a tool that provides in-time, relevant data for decision-making/decision-support for business growth.

In the end, the hotels' outlets should achieve the principle of “right time – right guest – right channel”, through which price maximization, cost reduction, and consequent profit efficiency lead to hotels' efficiency.

There are still some perceptions about RM tools that need to be clarified, such as clients' perceptions about the value<sup>1</sup> fairness for the guest and concerning pricing variance without following the market trends (Wirtz and Kimes 2007; Hsu et al. 2010; Heo and Lee 2011; David and Forest 2015; Guizzard et al. 2016; Anderson and Xie 2010). That is the reason why any unmeasured service sale can limit the cross-selling opportunities (Wirtz et al. 2003).

Representing challenges for hotels, there are the frequent issues concerning inter-department conflicts (internal perspective), in which one generates more Revenue than others—especially the ones with point of sales (POS)—putting in need of clusters mix of Revenue per hotel outlet (Cetin et al. 2016), in which each POS would be cross-sold for higher activity dynamics. This concern implies the design of a GA (generic algorithms) with several applications (financial perspectives). There were used in previous literature, seeking supply chain efficiency through managing

decision-making processes to optimize the supply chain network through the multi-objectives (external perspectives), as ANNs (artificial neural networks), being the most common to find patterns that humans cannot find easily (learning and growth perspective) (Toorajipour et al. 2021).

### Research question

As GA is designed to understand the dynamization of hotels' outlets' demands and consequent revenue through the internal and external factors, above mentioned and the clusters' mix, and managing this insight with hotel managers, researchers, and consultants, is expected to answer the question: How is it perceived the impact of RM on the SCM? Retrieving the inputs of how are being developed the RM strategies for Portuguese hotels, independent units vs. chain hotels.

### Qualitative variables to understand

Throughout the critical aspects identified by interviewees, there are two approaches to leading businesses: (a) sustainability, (b) efficiency. From cost management other by profit management, as the figure below: (1) the seek in-between is the balance, through the RM that would trigger cost-efficiency and profit increase simultaneously, (2) through the connection of all supply chain variables + guest experience, the activity would be better perceived in quality (Fig. 1).

<sup>1</sup> Value =  $\frac{\text{Quality}}{\text{Price}}$  perceived through Hsu et al. (2010).



## Literature review

### Hotel revenue management practices

Pricing dynamics, room size, seasonal demand, inventory control, length of stays, overbooking, are the critical practices of Hotels' RM strategies included for analysis as they are hotels' challenges (Wirtz et al. 2003; Anderson and Xie 2010; Serrat and Maria 2011; Ivanov 2014; David and Forest 2015; Cetin et al. 2016; Tsai and Wang 2016; Abrate et al. 2019).

Economic indicators are placed as guidance for decision-making strategies about external activities to prevent the correlation between internal and external activities where the SCM would influence RM, therefore, there is a need for data mining (Badinelli 2000; Choi and Kimes 2002; Cetin et al. 2016; Melis and Piga 2017).

The representation of dynamic pricing and its fluctuation can be internally adjusted, but on the opposite side, the consumer will be scrutinizing the hotels' characteristics besides prices, such as brand value, branding, services, and packages (Noone and McGuire 2014; Ivanov 2014; David and Forest 2015). Related to airlines and hotels' reservations, found the typical method to manage capacity profitably, and ensure the sale of the right product, to the right customer, at the right time, for the right price, in the right channel, and at the correct cost, combining the key-factors to optimize the desired market mix (Kimes 1989; Baker and Collier 1999; Ivanov 2014; Sun et al. 2020). The study goes further, stating that audio-visuals diminish guests' concerns about expected live experiences that were still lacking development (Sun et al. 2020).

Databases and Big Data management are compelling shreds of evidence to keep the continuous adjustment of dynamic pricing on RM and prevent the variability in the fares (Ivanov 2014; Melis and Piga 2017). Evolving SCM (supply chain management), on RM, many statistics are provided as, for instance, keywords data for guests and travel agents to find desired services, for example, language assistance (Font et al. 2021; Lv et al. 2021).

RM connects to SCM to minimize the cost impact of managing stocks and inventory, due to its performance complexity related to purchases and deliveries (Toorajipour et al. 2021), in which some techniques are applied to guide hotel managers for an autonomous SCM strategy, providing interactive and in-time information about seasonality, delivery periods, and timeframes between actual stocks, orders, and fresh products (Go et al. 2020; Lv et al. 2021), creating a sustainable environment for the hotel business. In terms of SCM and extensive data analysis is needed to compare the efficiency between a hotel and the online distributors' impact for each sold room throughout the website, including

the impact of the feed and commissions associated—when speaking about lodging and its channels of distribution (Guo et al. 2013), also very important to determine if that or those particular OTA is suitable for the hotels' segment.

For short-term rentals, RM prompted by the city marketing implied that the development happens with the help of each local community (DiNatale et al. 2018). Besides this, there are related terms concerning RM, namely perishable asset revenue management (PARM; Subramanian et al. 1999), in that services are held for a specific timeframe. Otherwise, they will not sell (i.e., a room sold for tomorrow will not increase my occupancy rate for today), even with a higher impact on short-term rental when selling the unit as one and not by room (Choi and Kimes 2002).

### Hotels' supply chain management

An integrated supply chain tool on the property management system (PMS) will guide hotels' units to maximize their profits, from which integration should conduct according to each unit's needs and efforts (Guo et al. 2013; Ivanov 2014). SCM is revealed to be a critical aspect of data management due to problem-solving, concerning supply chain planning through the complex behavior of the consumer and negotiations with suppliers, especially OTA's and their commissions (Toorajipour et al. 2021). It is also important to mention that data cannot be used as something manageable by itself as the consumer decision-making process is influenced by their motivation to pursue a goal that exceeds their expectations. Therefore, there has been a development for outdoor management integration on the KPIs of a hotel, designing the global distribution system (GDS), integrating the management of booking requests into reservations, treating the guests in the best way possible, and finally integrating them in a loyalty program; also suitable to manage the cost of OTA's commissions (Choi and Kimes 2002; Cetin et al. 2016).

Through the online cooperation between hotels and OTA's, the competition over price efficiency tested by RM managers for the optimal value for both parties: the hotel and the guest (Guo et al. 2013), the same study, went sideways by speaking about allotments<sup>2</sup> as hotels should retain a certain number of hotel rooms to prevent losing the loyalty of the regular clients by offering all rooms online. Also, by implementing allotments, the hotel is using a technique to protect themselves from overbooking, which hotels often use to sell as many units as possible, targeting the excess of capacity availability for a day or similar period focused on

<sup>2</sup> The number of rooms given to an OTA for online sales minus the number of rooms blocked by the hotel for direct sales.



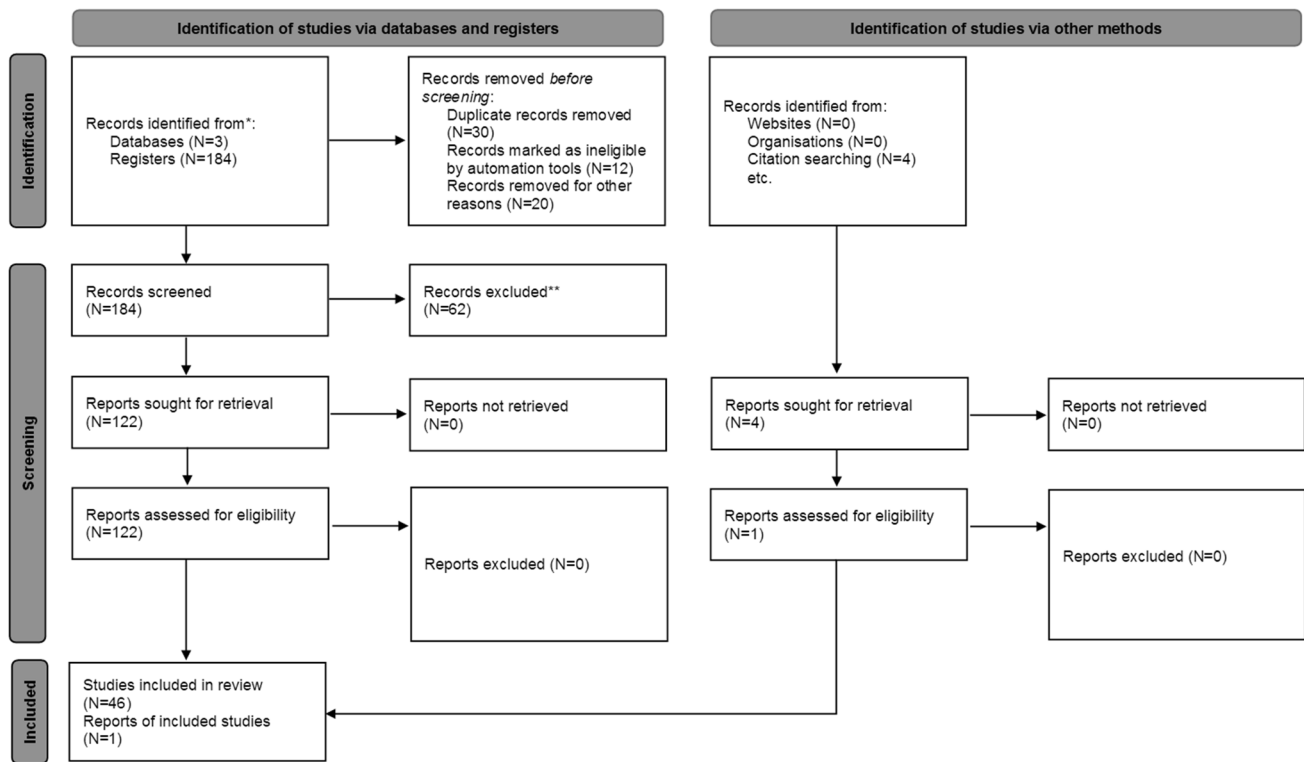


Fig. 2 Report of identified records from literature review. Source Page et al. (2021)

diminishing the impact of cancellations and no-shows (Ye et al. 2017).

**Literature and research values**

Given the previous literature, we may understand that tourism services are strongly affected by the perishability of services affecting guests' experience. Although the article from Sun et al. (2020), found the gap between managing the climate sustainable tourism performance over time progressively, there is still the gap between the supplier efficiency and the subsequent sustainability of the supply chain through the final experience to the guest. Customers' understanding of the quality has several stages upon delivery (Park et al. 2020). To minimize the negative impact of these KPIs on hotels' activity, managers may follow the framework modeled by Sun et al. (2020), based on a multi-criteria decision analysis that reinforces the focus needed for the proper management of the market segment. It intends that managers should be more active in their market penetrations, which identifies it as "largely passive" (Sun et al. 2020, p. 10).

Through the interviews, it was also possible to identify several gaps in the RM subject and its applications in the Portuguese hotel management culture, whereas, besides the lack of know-how to proceed with applicable techniques and tools, as secondary revision on what is being said, as top

managers often said: "lots of offer and none is comprehensive enough, either on a user perspective or the data analysis itself".

**Methodology**

**Investigation procedure**

The preliminary information was through the aspects adopted during the pandemic, followed by interviews with the theme experts, such as researchers, hotel managers, revenue managers, and supply chain managers, evaluating several possibilities to diversify or standardize hotels' RM, confronting chain hotels vs. independent hotels.

**Literature selection**

The exploratory research relies on a systemic literature review and bibliometrics analysis through primary databases chosen: SCOPUS, Emerald Group Publishing, and Google Scholar. It filtered articles for Q1 academic journals in English, excluding conference papers, some books, and book chapters. Below it is shown the records identified per database searched (Fig. 2).



There was also a focus on articles from the last 10 years, remaining with 36 articles to focus on before reviewing other articles. Besides this, it also relied on classic literature, namely Sheryl Kimes, Stanislav Ivanov, and David Hayes, allowing a longitudinal perspective on the evolution of RM.

Secondary data concerning tourism in Portugal could be helpful insights for the research. The central databases available, such as INE (Instituto Nacional de Estatística—National Statistics Institute), Observatório do Turismo (Tourism Observatory). Data from the Eurostat and the United Nations World Tourism Organization (UNWTO), and the Travel-BI tool developed by Turismo de Portugal facilitate more detailed knowledge about the current situation of the activity, even though the data are not as updated as needed. Only used data from UNWTO.

In total, among all the literature described, used 47 were considered the most relevant to the update of RM literature by the contrast between independent and chain hotels in Portugal.

### Sample and data collection

For the research to achieve a higher level of qualitative approaches, have opted to reach area professionals—see Table 3 in “Appendix”, from top to middle management, better understanding the state of the art of the current situation of the subject, whether it is a perspective inside the hotel, and outside the hotel.

The interviews happen during the first and second semesters of 2021, there were contacts with about 57 people but only 12 people have contributed to this study. Through the interviews, the goal was to perceive the best management model for hotel units, alongside decision-making Managers, in this case, focusing on Hotel Managers, Revenue Managers, Supply Chain Managers, Consultants, and Researchers. More information about the interviewees on Table 3—in “Appendix”.

For the meetings, the software used was MS Teams, as the meetings happened were forced to occur online due to pandemic limitations for in-person meetings, and even in terms of mobility, there were times in which we could not travel out of our town hall. It was a significant help for this essay due to the facilitation of recognizing the affection for the theme and the easier way to record audio and video, download them, and store it.

The metadata associated with the bibliometrics analysis and systematic literature review, the software used was MS Excel to filter all information data to organize by authors, year, volume, etc. After this, through the DOI of all of them download it to Mendeley's account to review.

### Validity

During the interviews, the conversation was conducted to explore the interviewees' knowledge, referring to some of their first answers to develop new middle questions to draw new paths for other hypotheses. Used open answers—see “Appendix”, Table 1—to get the full potential of answers given by the interviewees, eliminating the formatted answers, and seeking evident knowledge about the questions by perceiving hesitations on answers. Also, the choice of people to interview was based on people from different realities (independent hotels vs. chain. hotels and inside this, luxury vs. other targets, understanding the application or not of an RM strategy), from which I would be able to understand their knowledge about the subjects to approach and understand the perspective of each one and how it would be differentiated among hotels' strategy.

The qualitative approach was conducted through interviews to get perceptions about the current usage level of the RM strategy in their units and their competitors' units, among chain hotels and independent hotels—internal perspective. From external perspectives, whether from a research point of view or consultancy, the approach was to understand the critical topics of warnings for hoteliers nowadays and how they evaluate the actions of the first interviewees to confirm the Intel got in the first place.

In total, during the conversations, there were nine questions made—see Table 2 in “Appendix”.

## Results

### Results and model discussion

Through the interviews made with top managers, it is explicit that major concerns are directly connected to consumers' behavior and, consequently, guests' experience. Although, on the opposite side, there was the mindset that marketing can always create needs for clients (considering only the last phase of the SC process). In line with it is correspondent business sustainability, which should be seen as the global valued chain.

Neither profit margin is being developed on hotels' strategy, as concerns are directly pointed at occupancy rates, flex fares, and mass markets (marketing perspectives, not RM evaluations). Still, however, several distinctive perspectives are being considered. Hotels aim for revenue maximization instead of cost control or cost-efficiency (first phase of the SC process).

Through the outputs given by the interviews (Table 1 in “Appendix”), it was possible to answer the interview questions' purposed, as, for Q1, **profit is triggered by an appropriate RM strategy of a unit, that is why, in**



**Portugal, we do not perceive RM as developed has it should be, some players are doing it, some trying and some that do not even understand it.** Therefore, it is not triggered as one mass strategy even for chain hotels because each unit has different characteristics and management cultures is seen as an undergoing process, especially when contrasting departments, where RM is being considered on Rooms but not on F&B, SPA, or other outlets.

Although, in Q2, **it is understood that for independent hotels, the benefit of a good RM strategy is strongly associated with the lack of infrastructures** because, globally, *“the lack of know-how about the subject, is present in both hotels segments”* (independent and chain hotels), said by a chain hotel revenue manager and corroborated by independent hotels' managers and consultants.

**The data collection in that RM is recognized as the path leading to hotel goals, either leading through the cost or the price, lacking complete knowledge about efficiency and sustainability.** Top managers understand that a proper design of an RM strategy will approximate the performance to the company's goals due to this global vision implied through costs and revenue, pairing all together for profit maximization. The understanding implied a lack of knowledge on the evaluations to extract over the big data accessed and selection, the concern if often relying on marketing research and not as much on understanding where the competition is taking advantages on costs and pricing.

To seek the “optimal revenue” in Q3, the Portuguese culture is being driven by the **segments that value hospital-ity services...** There was consent on this topic, however, the most detailed answer was given by a hotel manager that explicitly said *“there will never exist sustainability in this industry if we do not control our costs, before thinking about customers' experience, as they can value the business, but they might not understand the pricing strategy... And they are not forced to understand, but if they do and see that we are just going along with competitors, what is our value proposition to them?”*. This brought the idea that clearly, RM must be discussed in focus group meetings with all departments to understand the dependence on sales, marketing, operations, and the strategy behind each one with the associated RM strategy.

Concerning the IT systems used among chain hotels and independent hotels, it is revealed helpful for data management and data mining. Q4 is considered “acceptable”, to make a transition from PMS/ERP reports into RM Systems, and BI tools, as managers find this **a valuable tool for in-time data analysis, allowing them to decide on strategic developments.** Which, due to the pandemic lived, is even more in need of constant updates *“as all consumption data was lost with the pandemic, a new one is being refurbished for forecasting analysis and RM development”*, said an

independent hotel owner pairing with the answers given by all other interviewees.

Still, in Q4, it is understood during the period of interviews and literature review that independent hotels take fewer advantages **from IT systems than chain hotels because these systems often imply huge investments**, that require higher profitability from the unit to sustain this cost which is a chain of hotels, the cost is distributed among the units, which even when the group is already solid, generates an internal IT management team instead of the usual outsourcing that is found on independent hotels.

It was consensual to all interviewees that the relationship among the hotel departments is fundamental to drive the knowledge regarding the RM strategy that leads to hotels' sustainability.

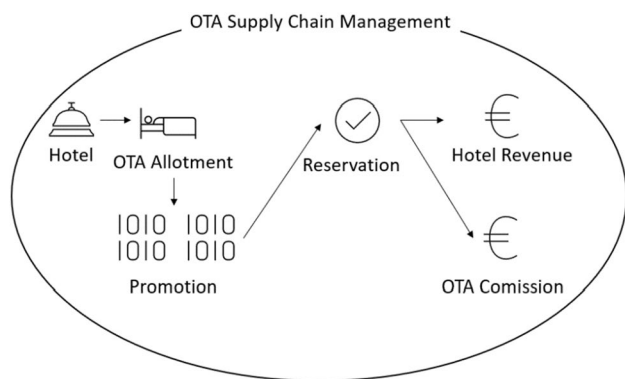
In Q5, there was the input that all data should be put into place, but correctly: **as data knowledge is shared from the commercial department to the marketing department to the reservations clerk to the F&B to the SPA, and all these departments should be able to easily access guests' information when the client uses any of the services that the hotel has to offer**, as suggested by top managers, this information is valuable for cross-selling activities among departments, but as the example given explains: *“If we have a guest that comes to the hotel just for a drink, and dinner, how do we register it? Therefore, we need to separate the number of in-house guests from walk-ins to provide the right service, to the right client, on the right channel at the right time...”*.

Still on Q5, because human intervention is needed to manage data applications on the RM tools used by hotels, there is often the question of *“How can Robots or Artificial Intelligence replace the impact of human intervention?”*. ML is yet, considered by all of the interviewees too sensitive for secondary activity KPIs many times. These data are not well suited to the yield strategy to approach the rooms' sales or the cost control of the raw materials. As suggested by interviewees, *“There are 3 levels of these tools, 1) ML resumes scenarios for the RM to work on and decide the strategy to implement; 2) ML creates suggestions based on historical data and the RM must validate what to do with that data; 3) ML pairing with AI designs and establishes the strategy to follow to approach the profit maximization”*.

## Conclusions

We may understand that tourism services are strongly affected by the perishability of services affecting guests' experience. Although the article from Sun et al. (2020), found the gap between managing the climate sustainable tourism performance over time progressively, there is still the gap between the supplier efficiency and the subsequent





**Fig. 3** Online travel agents supply chain management simplified example. *Source* Author

sustainability of the supply chain through the final experience to the guest. Customers' understanding of the quality has several stages upon delivery (Park et al. 2020). To minimize the negative impact of these KPIs on hotels' activity, managers may follow the framework modeled by Sun et al. (2020), based on a multi-criteria decision analysis that reinforces the focus needed for the proper management of the market segment.

For the hotel industry, it is especially relevant to mention that SCM does not only rely upon raw materials suppliers but also reservations distributors, as prior mentioned as OTA's (Guo et al. 2013), which results in becoming a variable of suppliers and retailer at the same time, at the same time, revealing the importance of hotels' networks for service outputs. Also relevant to mention that IT developments have empowered knowledge about this PMS management tool, as in-between promotion, sales, and consequent room-block, it is a process of seconds (Toorajipour et al. 2021; Ivanov 2014), which facilitates the diminish of costs, as hotels minimize the dependence of reservations desk, therefore focusing the RM techniques only on room sales and forgetting the other hotel outlets (Fig. 3).

For instance, managing the supply chain is a crucial role aspect, especially in a post-pandemic situation to be lived after pandemic (Altuntas and Gok 2021). Besides the impact of COVID-19, there is also a considerable variable still lacking understanding and updated data that should be given by leading players that are in front of global management, such as seasonality, which challenges all RM KPIs, namely, forecasting (Hu et al. 2021; Xie et al. 2021). Furthermore, the given insights by the literature revision imply that a well-defined RM strategy is essential not only for the unit itself but, therefore, for the government and the all supply chain industry (Hu et al. 2021). Worths mentioning that comparing the losses in tourism, in January 2020, the fall was rated at 73% (globally), and in 2021, the numbers have increased by 14%, fixing the level of loss in 2021 at 87% (UNWTO

2021). Understanding that RM is not only applied to Hotels, but the whole tourism sector makes this an exciting tool for managers as cruises, airlines, and travel operators may use data information provided by the system to forecast demand and predict the maximization of their revenue and profit (Xie et al. 2021).

As RM strategy definition relies on data management and data mining; Understanding that internet data is a significant help to forecast the demand of tourists (Li et al. 2021) is in line with the theory of the in-time updated data from, with a search engine that facilitates web traffic through multiple reliable sources (Sun et al. 2020).

## Conclusion

The insights of the impacts of RM on the SCM: managers often see the benefit but only toward guests' experience and not the cost control of their units. It is understood that maximizing the efficiency of SCM with the suppliers for the best available price for each article, per purchase, and consequent lead time minimization will correspond to a better guest experience. Purchase control is yet still unmeasured in Portuguese hotel units, even in chain hotels. First steps are being taken toward understanding the COPOR (cost operations per occupied room), such as COPAR (cost operations per available room). Through this, hotels will be pleased to offer a better experience to the guest, as margins will be more attractive for the sustainability of the activity, designing more personalized service to the guest as cost structures are built up.

Although previous studies differ clients' segments (Melis and Piga 2017), the knowledge acquired throughout this study is that the corporate segment (or as prior mentioned "business segment"), is close to being ended or will diminish its impact on the reservations that hotels had during the week, as business people are creating more virtual meeting without the need of a scheduled meeting. Consequently, they do not need to buy flight tickets or hotels rooms. This key aspect is critically relevant to emphasize for the SCM, as this implies less control over the guests' arrivals to the hotel units, as one strategy used was to check flight radar to see if the guest had already landed and then predict the timeframe between the airport and the hotel to predict approximately the hour of arrival and organize the check-in (Xie et al. 2021).

Associated to the topic of clients' segment are the management trust and hotels' credibility, which is associated with the skill of management practice (Hsu et al. 2012).

Following these concerns, the new KPIs of the score-card of good RM strategy is more focused on cancellations, no-shows, and last-minute reservations, this is because the consumers' behavior has become more complex to analyze, and as it is stated that emotions are a long-standing KPI to



analyze on the tourism sector, due to the uncertainty and complexity (Zhang et al. 2021). Empowering the need for competitive market intelligence that aligns hotels' reputation for the outdoors, but sideways, for clients and suppliers, as historical performance should be tracked within this perspective and knowledge for suppliers to stock and prepare deliveries according to each hotel unit pace.

Even though some gaps are to explore, some factors limit strategy setting, such as clients' heterogeneity (leisure vs. business), managerial costs, demand stimulus, demand uncertainty, and price reference (Melis and Piga 2017).

In the development of this essay, the data provided by tourism in Portugal were referred to as 2019 activity. Thus, bringing activity numbers from 2020 to predict 2021 was very tough. According to the interviewees and Sun et al. (2020), governments should create an API (application programming interface). There were directly connected to the hotels' PMS with the district and councils' data to manage better seasonality, perishability, and, consequently, the forecast for guests in-house. Valuing the supply chain by predicting the purchases to be made for the following weeks/months to the suppliers.

### Study limitations

This essay sought to design new strategy theories for a managerial tool for hotels' RM but has all hotel units in Portugal were under closed doors due to the pandemic situation lived. The changes in guests' emotions represented a significant challenge for hotels' revenue managers and general managers (Zhang et al. 2021). developing the main gaps identified along with the essay: mutations in consumers' behavior. Also, there was a lack of interviews because it was projected to be conducted as an exploratory study. Through invites, top managers rejected some due to a lack of know-how to answer directly. Managers should place more opinions in contrast. For example, Hotel Managers of chain hotels drive their RM strategy through a centralized department without direct contact with the approach to implement in their units.

Some databases were used due to advice from the literature to reach the best know-how possible regarding the subject and developments happening in the essay's context.

### Further studies

For further studies, it should be interesting to follow the path proposed by Sun et al. (2020), joining the added value to the supply chain to the guest, empowering the supply chain sustainability and eco-friendly management to better hotel credibility to the guest, evaluating, how the guest perceives this and how this brings return on the investment implied.

Finally, gaps were found concerning forecasting data not yet suited to Portuguese hotels, not even chain hotels. There is not enough knowledge on how to use the available data. That is why decision-making managers approve of the usage of ML software but often say that it would not solve any hotels' problems or even guide the hotel's management without a proper RM professional and strategy. Something regarding this and connecting a better understanding of hotels' services quality attributes are similar to the study of Park et al. (2020). The impact of the perceived fair pricing of the service provided with the expectations would be related to the consumer's satisfaction.

### Impact statement

This article relies on data driven from other papers, research, and hospitality databases to put into perspective the current situation of this industry. After gathering this intel, interviews were made with people working in the field and approaching their knowledge about this actual situation, how they perceived it and how it is forecasted.

The conclusion is that pandemic has brought mixed feelings to these managers. SCM, in a way that due to the perishability of products, is very tough to predict minimum or average quantities to store as it lacks knowledge concerning how the market will behave, especially in this disruptive era, and data management must be considered upon minute of each sale. The previous pattern of consumption or guest behavior is no longer enough to predict the demand. Important to state that the author has no direct link with the interviewees. All information was required through invitations.

### Appendix

See Tables 1, 2 and 3.





**Table 1** Relation between questions, goals, and hypotheses answers

Questions	Questions' objectives
<b>Q1:</b> <i>How do you see the development of Revenue Management in Portugal?</i>	Q1 goal: <i>understand the knowledge of decision-making managers about Revenue Management and its development on their units and competitors</i>
<b>Q2:</b> <i>How would you differ RM between chain hotels and independent hotels?</i>	Q2 goal: <i>get perceptions from top managers of the knowledge acquired through their experience in these differed units</i>
<b>Q3:</b> <i>To seek the "optimal revenue" how would you seek it? Under which variables?</i>	Q3 goal: <i>this question has two goals, primarily is to approach the reference of "optimal revenue" for these people and second is to understand which variables they identify as key aspects to evaluate it</i>
<b>Q4:</b> <i>How would you see the usage of software to help solve RM issues in a hotel?</i>	Q4 goal: <i>understand the development of the IT and IoT in hotels and how these applications have been helpful for managers</i>
<b>Q5:</b> <i>How do you see the impact of a good RM strategy to benefit the supply chain?</i>	Q5 goal: <i>validate the knowledge of these managers about revenue management from the beginning of the supply chain, controlling costs, until guests' sales</i>

#### Outputs retrieved from questions

*The output of Q1* overall, still lacking knowledge and advancing within several paces

*The output of Q2* the main difference between the two businesses, relies on knowledge, investments, and infrastructures

*The output of Q3* the key variables for hotels' performance evaluation are TRevPAR, RevPAR, GOP, and GOPPAR

*The output of Q4* it is a benefit, although, there is still the need for human management because machine learning is yet not sufficiently developed for decision-making

*The output of Q5* know the benefit for the guest experience, not for hotel cost control and price efficiency

*TRevPAR* total revenue per available room, *RevPAR* revenue per available room, *GOP* gross operating profit, *GOPPAR* gross operating profit per available room

Source Author



**Table 2** Interview questions the justification

Question	Literature	Reason
(1) What knowledge do you have on the current development of RM in Portugal? (for foreign researchers/consultants)		To better understand how far I could go when approaching some subjects specific to the Portuguese market
(2) How do you see the development of RM in Portugal?	Kimes (1989, 2011)	To understand how it is being perceived the loss/increase of competitive focus and if the RM is more strategic and technologically driven
(3) How would you classify to differ RM between chains and independent hotels?	Kimes (1989, 2011)	To understand the mutations over distribution, now and to the future among different management growth perspectives; also, to understand if among both there is a separation of RM applied to each department, relating to the implied hotel strategy
(4) If you had to define "revenue optimization" how would you do it through hotel KPIs?	Kimes (1989, 2011), Chaves et al. (2012), Noone and Mattila (2009), Anagnostopoulou et al. (2020) and Li et al. (2020)	To better understand the factors that would drive the data analysis from now to the future; to understand how is the control systems approach the management variable, for example, shifting the focus from revenue income to bottom-line results or the booking window changes on timing risks
(5) In your opinion, does the RM software solve the management problems of a hotel?	Kimes (1989)	To understand perspectives over the organization of yield management functions
(6) In your opinion, does a good RM strategy brings benefits to the SCM? (a) If yes, in which ways?	Kimes (1989, 2011) and Choi and Kimes (2002)	To understand the top management's commitment to the hospitality supply chain; to also understand the vision over Web 2.0 distribution

Source Author



**Table 3** Sample description per segment and reason of choice

Interviewees			
Position	Department	Segment	Reason of choice
Director	Revenue Management	Chain Hotels	Top Management
Manager	Board	Independent	Top Management
Director	Operations	Chain Hotels	Top Management
General Manager	Operations	Independent	Top Management
Group Managing Director	Board	Chain Hotels	Top Management
COO	Board	Chain Hotels	Top Management
Lead Consultant	Revenue Management	Hospitality Consultancy	Top Management
Business Development Manager	Operations	Hospitality Consultancy	Middle Management
CEO	Board	Hospitality Consultancy	Top Management
Purchasing Manager	Cost Control	Independent	Middle Management
Professor and Researcher	Revenue Management	Independent	Research
Director	Hotel	Independent	Top Management

Source Author

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