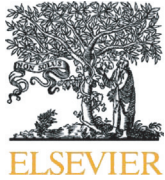




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Hotels' COVID-19 innovation and performance

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ABSTRACT

To navigate the uncharted terrain that has resulted from the pandemic, there is a palpable need for hotels to re-assess current business practices, and quickly devise new and innovative strategies that safeguard the health and safety of guests as well as employees and, consequently, restore consumer confidence. The objective of this article is to assess the utility of these new innovations by looking at shareholders' perceptions. The empirical application shows that the innovations implemented are seen as effective, although differential effects exist among innovation types. The results could help hotels sustain and expand the innovative responses that work (among which product innovations stand out), and discontinue those that are less effective.

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Introduction

The sudden onset and the accelerated spread thereafter of the COVID-19 pandemic has had a devastating effect on many businesses. Over 130 corporations in the United States have declared bankruptcy since March 2020, citing at least in part, the COVID-19 outbreak as a contributor to their demise (Sciigliuzzo et al., 2020). The nature of the crisis has meant that the hospitality industry has also been affected severely (Sharma & Nicolau, 2020), with reductions in household and business travel having direct implications for hotel performance. Even hotel companies that survive likely face a highly difficult, and in many ways, unprecedented operational environment for which few might have been prepared.

In order to navigate the uncharted terrain that has resulted from the pandemic, there is a palpable need for hotels to re-assess current business practices, and quickly devise innovative strategies that safeguard the health and safety of guests as well as employees. It is only then that stakeholder confidence in hotels might be restored, and would currently underperforming hotel performance indicators such as occupancy and average daily rate be rejuvenated. Indeed, many hotels have already deployed a host of innovations in response to the pandemic (Shin & Kang, 2020) - ranging from procedures that ensure increased hygiene standards and social distancing to adjustments in booking and cancellation policies, etc. (Gross, 2020; Hang, Aroean, & Chen, 2020; Hao et al., 2020; Hu et al., 2020).

Because of the historically unparalleled nature of the present crisis, many of these newly implemented innovations have likely been concocted in an ad-hoc manner, without a clear understanding of their effectiveness. There is a pressing need to better understand the utility of these new innovations, and the extent to which they affect firm performance. Moreover, there is perhaps also a need to answer some of these questions using readily available performance metrics rather than wait for popular backward

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looking accounting based metrics like profits or revenues to become available. Doing so would help hotels sustain and expand the innovative responses that work, and also discontinue those that are less effective. It is this critical knowledge gap towards which the present study contributes.

Using the forward-looking metric that is market value – a finance-based performance indicator reflected in a company's stock returns, the objective of this study is to investigate the effect of COVID-19 related hotel innovations by measuring shareholders' perceptions. Observing the way different shareholders react helps look at the prism from different angles, which might unearth unknown effects (Qiu et al., 2020); accordingly, this article observes the perceptions of COVID-19 related innovation that shareholders have.

Next section provides an overview of hospitality innovation literature while also describing innovative practices in the context of the COVID-19 pandemic specifically. Although an understanding of the general innovation literature is perhaps not strictly necessary to support the conclusions of the present study, familiarity with previous innovation literature nonetheless helps provide theoretical support for the hypotheses used in the study. Additionally, the four hypotheses that are central to this study are described. The following section details the methodology employed for the study, while also providing a more thorough justification for the techniques used. In addition, the data collection procedures are also outlined. Finally, the results obtained are presented to go on with a concluding discussion of our primary findings, while also summarizing the relevant implications.

Literature review and hypotheses development

Theoretical aspects of innovation

The topic of innovation has intrigued researchers for decades. As early as the 1930s, major theories of innovation began to emerge. Schumpeter (1934) saw economic development as aligned with developments of new products that are different from old products. Under the still relevant Schumpeterian framework, innovation was described as a process of “creative destruction which enables new productions or processes to replace outdated ones in an industry” (Schumpeter, 1934, p.66). Over the years, various other definitions and theories associated with innovations (e.g., the theory of disruptive innovation, the diffusion of innovation theory) have been proposed in business and marketing research (e.g., Christenson, 1997; Rogers, 1962). In the service context, multiple theoretical lenses have been used to study innovation, covering a range of service domains such as improvements in service product offerings, new internal service processes to enhance organization process productivity and efficiency, and enhancements in customer experiences (Zeithaml et al., 2017, p.225).

Researchers often consider innovation in terms of two ascending tiers or levels. The first - incremental innovation, refers to a form of innovation based on existing technologies or knowledge. The main target of incremental innovation is the existing market. On the other hand, radical innovation includes innovations created by new technologies or knowledge targeted towards a new market. Radical innovation is created by destruction or suppression of the existing infrastructure (Garcia & Calantone, 2002; Ordanini & Parasuraman, 2011). Considering these two levels of innovation in conjunction, Wooder and Baker (2012) defined service innovation as a combination of innovation related with technology developments, business practices, knowledge developments, organization structures, and demand with the objective of enhancing current services in an incremental way or developing completely new services in a radical way. While most service innovation research has followed this binary incremental and radical innovation typology (Ordanini & Parasuraman, 2011; Souto, 2015), it is important to recognize that most innovation is incremental; radical innovation is rare within service and hospitality industry (Garcia & Calantone, 2002). Thus, this study mainly focuses on incremental innovation adopted by hotels to deal with the impact of the COVID-19 pandemic.

There are also other dimensions along which innovations have been classified in the literature. The Oslo Manual proposed the most extensive typologies for innovation: product, process, marketing, and organizational innovation (Oslo Manual, 2005). Product innovation is “a new or significantly improved goods or services” based on technical or non-technical improvements especially during service delivery processes. Process innovation is “a new or significantly improved production or delivery process”. Marketing innovation refers to “a new marketing method or practice involving significant changes in product, placement, promotion or pricing”. Lastly, organizational innovation is “a new organizational method in business practices, processes, workplace organizations, or external relations”.

Out of Oslo Manual innovation types described above, it is perhaps product and process innovations that have been of most interest to hospitality and tourism researchers. In this strand of the literature, studies that focus on product innovation have examined issues like improvements in property renovation (e.g., Hassanien & Baum, 2002; Horng et al., 2013) and technology systems (e.g., Rodgers, 2007; Shin et al., 2019). In comparison, the process innovation research in hospitality and tourism has investigated topics like the development of new business models and management practices that are aimed at improving hospitality service efficiency and productivity in service delivery processes (Gomezelj, 2016). Despite the marked theoretical distinction between product and process innovation, in practice the line between the two is often quite blur. Indeed, Orfila-Sintes et al. (2005) argue that the close interaction between production and consumption in hospitality and tourism makes it hard to divide product and process innovations.

Service innovation, in particular, has attracted considerable scholarly interest in the hospitality and tourism management literature (Hjalager, 2010; Shin et al., 2019). In terms of research topics, three historical streams of innovation research are apparent. The first research line revolves around detecting critical procedures for developing innovations (e.g., Ottenbacher & Harrington, 2007; Ottenbacher & Harrington, 2009). The second research thread focuses on innovation typologies and categorizations (e.g., Orfila-Sintes & Mattsson, 2009; Ottenbacher & Harrington, 2007), while the third investigates factors that may enhance hospitality and tourism innovation success (e.g., Hjalager, 2002; Ottenbacher & Gnoth, 2005).

Recently, there has been an elevated interest in the hospitality and tourism scholarship in studying organizational and managerial innovation. In this growing body of the literature, researchers have examined the effect of managerial practices on employee innovation behaviors (e.g., [Chen, 2017](#); [Liu, 2017](#); [Uen et al., 2018](#)), business model innovation (e.g., [Alegre & Berbegal-Mirabent, 2016](#)) and the impact of leadership on innovation (e.g., [Hassi, 2019](#); [Sipe, 2016](#)). The research has adopted various perspectives, such as organizational culture (e.g., customer orientation, innovativeness) ([Grissmann et al., 2013](#)) and human resource management (e.g., employee selection and trainings) ([Chang et al., 2011](#); [Martínez-Ros & Orfila-Sintes, 2012](#)). Another popular innovation related topic in hospitality and tourism pertains to innovations in technology (e.g., [Orfila-Sintes et al., 2005](#); [Shin & Kang, 2020](#)). Still, when compared to broader service innovation research, hospitality and tourism innovation research appears somewhat limited, both theoretically and empirically ([Souto, 2015](#)).

As making new products (services) and processes to operations and customer experiences are critical to achieve long-term success of hospitality firms ([Martin-Rios & Ciobanu, 2019](#)), it is essential to understand how innovations influence the value of firms especially in times of uncertainty.

Hotel innovation evaluation in the COVID-19 pandemic

The COVID-19 pandemic is forcing tourism and hospitality firms to innovate and adapt to unprecedented changes of business environment. Successful service innovation is, of course, critical for hospitality and tourism businesses to maintain competitiveness during and after the pandemic ([Gössling et al., 2020](#)). Even though hotels do not have experience in dealing with a crisis like this one, they have quickly adopted many innovative practices to deal with the pandemic.

Although the unprecedented nature of the crisis has meant that hotels have been forced to innovate without the benefit of past experience, the previously described Oslo Manual categories of innovation – product, process, organizational and marketing innovations – are still applicable to many of measures that have been deployed by hotels in response to the pandemic. In terms of product innovation, hotels have adopted new technology systems for safe and clean service delivery in an incremental way, such as fully automated hotel check-in systems (e.g., mobile keys) and self-service kiosk check-in machines, in order to permit social distancing ([Shin & Kang, 2020](#)). In addition, several major hotel brand chains (e.g., Marriott International, Hilton, and Hyatt) are using new technologies or upgrading existing technologies (e.g., cleaning robots, electrostatic sprayers etc.) for enhanced disinfection ([García, 2020](#)). In accordance with the arguments of [Orfila-Sintes et al. \(2005\)](#), product innovation accompanies process innovation; and innovative new guest interaction mechanisms as well new cleaning procedures have also been introduced for hotel service delivery. Recently, [Shin and Kang \(2020\)](#) found that hotels' incremental innovations for reducing guest interactions and improving cleanliness level have a positive impact on hotel booking intention in pandemic times. In line with the position of [Orfila-Sintes et al. \(2005\)](#), it is difficult to clearly distinguish between product and process innovations, we thus grouped these two innovations into a single category under the label of product-process innovations.

Additionally, the pandemic has resulted in hotels adopting new innovations at the organizational level. Unlike product-process innovation, these organizational innovations especially pertain to increased cost-efficiencies and human resource management related practices adopted by hotel firms during the pandemic ([Kilgore, 2020](#)). For example, a number of hotel chains are implementing cost cutting measures including layoffs, reduced salaries, furloughs, and reduced work hours to preserve liquidity ([Chaturvedi, 2020](#)). Lastly, several of the strategies adopted by hotels may be described as marketing innovations. These include, for instance, practices relating to brand membership programs of hotels ([Clark et al., 2020](#)). For example, Hyatt announced in 2020 February that they will offer their loyal members a series of tier status and benefit extensions.

As a theoretical tool to examine the success of innovations, this study assumes a life cycle model of innovation processes that includes innovation creation, diffusion, and evaluation ([Schumpeter, 1934](#)). Innovation creation processes focus on internal research and development (R&D) processes, or external antecedents of innovation (e.g., engagement of external shareholders, the development of new technology, etc.) ([Spohrer & Maglio, 2008](#)). Innovation diffusion processes indicate innovation adoption processes including idea, technology, policy, and knowledge adoption ([Al-Jabri & Sohail, 2012](#); [Autant-Bernard et al., 2013](#)). Lastly, innovation evaluation processes are focused on evaluating the consequences and performances of innovation. Generally, managerial performances (e.g., financial performance, return of investment, etc.) are the major evaluation tools ([Martin-Rios & Ciobanu, 2019](#)). In addition, customer evaluation of innovation, such as perceived quality or satisfaction, can be a tool for measuring the effectiveness of innovation ([Mahmoud et al., 2018](#)).

Along with the successful creation and delivery of innovation ([Gössling et al., 2020](#)), it is even more critical to assess the managerial consequences of innovations during and after the pandemic. The evaluation of innovation is often the basis of on-going innovation success; the accurate evaluation of innovation performances leads to sustainable innovation creation and diffusion. A body of hospitality and tourism research focused on managerial performances of innovation by operationalizing the effects of innovations ([Pikkemaat & Peters, 2006](#)). For example, [Hu et al. \(2009\)](#) examined the effects of employee knowledge sharing practices on hotel innovation performances. [Kallmuenzer and Peters \(2018\)](#) examined the positive correlation between the innovativeness of hospitality family firms and their financial performance. In addition, several papers have examined innovation performance issues, such as firm managerial outcomes ([Den Hertog et al., 2011](#)) and average occupancy rate ([Orfila-Sintes & Mattsson, 2009](#)).

Hypotheses development

In general, innovation enables firms to improve profitability by reducing costs, expanding market share, and enhancing service or product quality ([Walker et al., 2011](#)). Existing research (e.g., [Den Hertog et al., 2011](#); [Pikkemaat & Peters, 2006](#)) has found

positive effects of innovation practices on hospitality firms' managerial performances. Among various tools for measuring managerial performances of innovation, analyzing market value has several advantages. Because market value of a firm represents the discounted present value of future cash flows, it is regarded as an unbiased estimate of financial value. Furthermore, the metric serves as an objective tool to measure firm performance since it reflects all available information on a firm.

Under the tenets of neoclassical finance theory, when new information arises – including information regarding innovations deployed by hotels in response to the COVID-19 pandemic – the effects would be instantly incorporated into the market value. Changes in market value that occur as soon as a new innovation is announced can thus be attributed to the innovation itself. The use of the market value to assess the effect of innovations is not new to the hospitality literature. Nicolau and Santa-María (2013), for instance, examined the impact of *general* hotel innovations on hotel performance. The method would be equally applicable in the context of this study, where we are interested in assessing the impact of COVID-19 specific innovations.

The current study proposes that hotel innovations during the pandemic will result in positive impacts on hotel market value; hotels' proactive actions to deal with the crisis will deliver the message that the hotels are taking care of their guests and employees, leading to increased confidence of investors. Specifically, product-process innovations for ensuring safety and enhancing cleanliness would make shareholders believe that the hotels are taking necessary measures to transform service delivery processes to attract hotel customers. When hotels make an announcement on these innovative measures in the pandemic, the number of hotel visitors are expected to increase since they should perceive fewer risks (Quintal et al., 2010; Reisinger & Mavondo, 2005). In addition, organizational innovations for financial and human resource management (e.g., reducing expenses and preserving liquidity, changing work schedules, etc.) would be positively evaluated by shareholders believing the effectiveness of those managerial actions to improve financial position of the hotels which can help overcome the crisis. Lastly, marketing innovations in membership management and hotel promotions can receive positive reactions from shareholders for their impact on customer retention and brand membership management during the pandemic. Given together, the following hypotheses are suggested.

Hypothesis 1. Hotel product-process innovation for dealing with the COVID-19 pandemic has a positive effect on shareholders' perceptions.

Hypothesis 2. Hotel organizational innovation for dealing with the COVID-19 pandemic has a positive effect on shareholders' perceptions.

Hypothesis 3. Hotel marketing innovation for dealing with the COVID-19 pandemic has a positive effect on shareholders' perceptions.

Examining the impact of different types of innovation on shareholders' reaction can provide an important insight into what innovation practices should be sustained, expanded, and discontinued for the success of hotel businesses. Under the theoretical framework of the market value-based method, such decisions can be made soon after the innovations have been deployed, and well before accounting based metrics become available. Considering the significant impact of the pandemic on the hotel industry (American Hotel and Lodging Association, 2020), focusing on the effectiveness of innovation strategies in a timely manner is essential.

To better understand the impacts of innovations, it is important to understand how different types of innovations produce different results (Hjalager, 2010). Each innovation (e.g., product, process, marketing, and organizational innovation) has a different characteristic, leading to distinct impacts on managerial performances. Some previous research examined the dissimilar impacts of innovations. For example, process innovation is considered to have more influence than product innovation (Hjalager, 2002; Weidenfeld et al., 2010). Nicolau and Santa-María (2013) found that process and marketing innovations result in a higher positive impact than organization and product innovations. Most recently, Verreynne et al. (2019) found that the impact of innovations on managerial performances is depended upon the diversity of innovation types.

Considering previous research and the nature of hotel innovation during the pandemic, this study proposes that product-process innovation will have a stronger impact on shareholders' perceptions than organizational and marketing innovation. Given that attracting hotel customers by reducing safety is the most important strategy in the hotel industry during the pandemic (Shin & Kang, 2020), product-process innovation for ensuring safe service delivery will have a stronger impact than organizational and marketing innovation associated with broader managerial actions for brand marketing, revenue management, and human resource management. The following hypothesis is additionally postulated.

Hypothesis 4. Product-process innovation has stronger impacts on shareholders' perceptions than organizational and marketing innovation.

Data and methodology

Methodological overview

In order to assess the impact of COVID-19 related innovations, we follow McWilliams and Siegel's (1997) guidelines to conduct a statistical event analysis. Assessments are based on changes in market value – a finance based metric that is used to describe the present value of all future cash flows relating to an asset, which in the case of a publicly traded firm, is commonly assumed to be reflected in its stock prices. Each new innovation – as per the date of announcement of the innovation - is treated as an independent unit of study for purposes of the analysis. Innovations are grouped thereafter on the basis of the previously described

innovation categories in order to understand the implications on firm performance of the different types of innovations that hotels have undertaken in response to the COVID-19 pandemic.

Under the central postulations of the modern finance paradigm, more commonly referred to in the literature as neoclassical finance theory, capital markets are inherently efficient, and asset prices are therefore accurate and reflect all relevant information (Fama, 1965; Fama, 1970). This follows that the market value of a firm is a strong approximation of its intrinsic value, and therefore any change in market value resulting from any shocks is a satisfactory estimate of the impact of the shock. The conclusions resulting from the neoclassical tradition have found a range of applications over the years, and are particularly useful in the analysis of market as well as firm level shocks. Although more popular in the traditional business disciplines like Marketing and Management, the event study methodology has in recent years gained traction in the hospitality and tourism literature.

The technique has, for example, been used to study a wide variety of shocks including those resulting from hospitality industry mergers and acquisitions (Yang et al., 2009), regulatory changes in the hotel and online travel agency landscape (Nicolau & Sharma, 2019), food safety incidents (Seo et al., 2013) and multinational company entry modes (Graf, 2009). Zach et al. (2020) investigate the strategic responses undertaken by market incumbents as a consequence of Airbnb's innovative but disruptive business model. As such, we believe that the event study technique would also be appropriate to study the effects of innovative business practices that hotels have undertaken in response to the COVID-19 pandemic.

Although the versatility of the methodology we propose for the present study might be evident in the sheer range of its potential applications as described above, it is perhaps also important to specifically highlight the advantages of the method in comparison to possible alternatives. One might, for example, be tempted to use accounting-based metrics like profits or revenues to assess the effects of COVID-19 innovations by hotels on firm performance. While the accounting numbers like these might provide some useful insights, one has to consider that they tend also to be vulnerable to managerial misrepresentation (Benston, 1982). This might especially true during the crisis caused by the pandemic, with the hotel industry experiencing a turbulent business environment.

A second advantage of the methodological framework utilized here is that analysis is based on forward-looking metrics rather than the backward-looking analysis to which one would be restricted when using accounting numbers (Duso et al., 2010). Given the nature of the innovations under investigation in our study – those undertaken by hotels in response to a fast-evolving pandemic, there is likely a preference for swift assessments regarding the effectiveness of the innovations implemented. Note that, although approach is *ex-ante* in the sense that we are estimating the returns that investors can expect to earn from the action the firm is announcing, it is not “fully *ex-ante*” as we use daily data showing the way shareholders reacted to the announcements. An alternative procedure with fully *ex-ante* measures could be the estimation of the implied cost of capital estimation; however, this approach is not problem-free, especially considering that this approach is usually constrained to quarterly or annual analyses due to the less-frequent availability of accounting data. As pointed out earlier, in an environment like the current one where news are changing on a daily basis, the cumulated information in a quarter (let alone a year) is of such magnitude, that trying to predict the effects of a specific event that took place on a specific day could be full of noise (in fact, one would never know for sure the real cause of the value obtained in the prediction).

Third, the method used here is less susceptible to possible confounding effects. The current business environment is – in the midst of the pandemic – highly uncertain, with multiple new issues arising regularly, each with the potential to also impact firm performance. However, under the efficiency assumption of the neoclassical framework, adjustments in valuation occurs quickly following new relevant information. Consequently, there is less potential for “noise” in the method used here in comparison to accounting-based numbers, which, when prepared at the end of the accounting period, would reflect the cumulative effect of multiple issues affecting firm performance.

A fourth but nonetheless important advantage of the method employed here is that it is not affected by seasonality (Nicolau & Sharma, 2019). Popular hotel performance metrics such as occupancy and Average Daily Rate (ADR), as well as accounting numbers like profits and revenues tend to exhibit seasonal trends which would need to be controlled for when used in analysis. Here, however, we use market value, which reflects the discounted value of all future cash flows. The need to control for seasonality is thus negated.

Methodological steps

Detection of event window and sample selection

In accordance with the steps outlined by McWilliams and Siegel (1997), we first detect the relevant event dates and select the appropriate data sample for analysis. The dates, in this study, consist of those when a hotel announced the implementation of a new innovation in order to cope with the COVID-19 pandemic. A preliminary search using relevant keywords such as “COVID-19”, “pandemic”, etc. was conducted on the Factiva database across the major publicly traded hotels in US stock markets between January and June 2020. Search results were then manually filtered so any strategic responses that may be described as innovations remained. Only regional or corporate level initiatives were considered, as single property level innovation initiatives by hotels would not be expected to exert a significant enough impact on market value. One of authors initially collected and categorized hotel announcements about innovation actions during the pandemic and the other three authors reviewed the categorized innovation announcements separately to judge the suitability of announcements and the categorizations.

After that, the four authors comparatively reviewed and discussed on the announcements. Announcements that have less overlaps in terms of innovation contents were chosen to minimize potential confounding effects. As a result, 24 COVID-19

innovation announcements were detected and each innovation was classified into one of three innovation types identified in the Oslo Manual (2005) – product-process, organizational or marketing innovation.

Event window definition

In studies like this, it is generally agreed that not all shareholders will receive information simultaneously. As such a cushion around the window is typically preferred. In order to detect possible effects from the COVID-19 related innovation announcements, we therefore select a window that would permit us to also detect possible late reactions. Additionally, as is customary in this literature, the window must also permit the detection possible news leakages that might occur prior to the official announcement regarding the innovation. At the same time, however, one has to be cautious against the possibility of any confounding effects that could be introduced with longer windows (McWilliams & Siegel, 1997). The chances of contamination from other shocks might be particularly significant in current times, when new developments – both positive as well as negative – are taking place on a day-to-day basis. As such, to reduce the possibility of any such confounding events affecting our results, we choose a $(-2,+2)$ day event window enveloping the date of each innovation announcement.

Exclusion of contaminated news item

Although the use of the relatively short event window described above reduces the possibility of non-relevant developments in the market confounding our results, the short windows do not fully eliminate the possibility of some contamination. In line with the guidelines of McWilliams and Siegel (1997) another scan of the Factiva database was conducted to detect whether other possible news items happened on the event day that might also affect the market value of the hotels under study—with special attention to any potentially favorable news item that could artificially favor our hypotheses. Although no event was removed from this screening process, two of the previous 24 announcements were likely to be affected as they were made two days after the World Health Organization (WHO) officially declared the COVID-19 outbreak to be a pandemic on 11th of March 2020. In fact, circuit breaks occurring around that time were also considered. As a result, at the end of this step we were left with a total 22 COVID-19 related innovation announcements published by Marriott, Hilton, Hyatt, Choice and Intercontinental Hotels (See Table 1).

Estimation of the market model

Next, under the previously mentioned neoclassical theory, the market model predicts that the returns of firm i 's at time t is proportional to market portfolio returns, R_{mt} , which describes the Dow Jones Industrial Average, such that:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \quad (1)$$

where ε_{it} is the normally distributed error term. The parameter α_i captures the returns of company i independent of the market, while the parameter β_i is representative of the sensitivity of i to volatility in market returns. A 150-day estimation period ending December 31st, 2019 is used to establish normal returns. The dates of the estimation period are deliberately such that the last day in the estimation period occurs well in advance of the outbreak. Doing so provides an additional precaution against possible confounding – this time in the estimation period – resulting from possible market distortions that are likely to have occurred as the outbreak grew. In fact, the results obtained by Baek et al. (2020) suggest that using a pre-pandemic estimation period is appropriate. Abnormal returns, AR_{it} , are then calculated as the difference between the returns that occurred as a result of the COVID-19 innovations, and the returns that have been expected to occur had the hotels not implemented the innovative responses to the pandemic.

$$AR_{it} = R_{it} - (\hat{\alpha}_i + \hat{\beta}_i R_{mt}) \quad (2)$$

Testing of abnormal returns

The significance of the previously estimated abnormal returns is tested by employing Brown and Warner's (1980) and Patell's (1976) tests. Brown and Warner's test is defined as

$$t_1 = \frac{\sum_{i=1}^N AR_i}{\sqrt{\sum_{t=1}^N \sigma_{\varepsilon_i}^2}} \quad (3)$$

where N is the number of news items and $\sigma_{\varepsilon_i}^2$ is the variance of share i obtained from the estimation period.

Patell's (1976) test is similar to the previous one but it standardizes each abnormal return prior to the calculation of the test statistic. The test is defined as:

$$t_2 = \frac{\sum_{i=1}^N \frac{AR_i}{S_i \sqrt{1 + \frac{1}{D} + \frac{(R_{mt} - R_m)^2}{\sum_{t=1}^D (R_{mt} - R_m)^2}}}}{\sqrt{\sum_{t=1}^N \frac{D_t - 2}{D_t - 4}}} \quad (4)$$

Table 1
Announcements of the innovation activities (chronological order).

Hotel firm Name	Date of publication	Announcement/URL	Innovation type
Hyatt	20-Feb-20	World of Hyatt extends tier status and benefits, advancing care for members during COVID-19 https://newsroom.hyatt.com/news-releases?item = 123,947	Marketing innovation
Marriott International	10-Mar-20	Marriott International statement on cleaning protocols https://news.marriott.com/news/2020/03/10/marriott-international-statement-on-cleaning-protocols	Product-process innovation
Marriott International	16-Mar-20	A Message from our CEO https://www.marketscreener.com/quote/stock/MARRIOTT-INTERNATIONAL-I-14633490/news/Marriott-A--Message-from-Our-CEO-30168157/	Product-process innovation
Wyndham	19-Mar-20	Statement from Wyndham Hotels & Resorts: COVID-19 https://www.franchising.com/news/20200316_statement_from_wyndham_hotels_amp_resorts_covid19.html	Product-process innovation
Hyatt	26-Mar-20	Hyatt implementing new business and support measures https://www.hoteliermagazine.com/hyatt-implementing-new-business-and-support-measures/	Organizational innovation
Hilton	26-Mar-20	Hilton CEO forgoing salary as part of company's coronavirus response https://www.usatoday.com/story/money/2020/03/26/coronavirus-furloughs-job-cuts-hilton-ceo-forgoing--salary/2922894001/	Organizational innovation
Wyndham	30-Mar-20	Wyndham Hotels to cut jobs, lower salaries and reduce hours as part of cost-cutting measures https://www.marketwatch.com/story/wyndham-hotels-to-cut-jobs-lower-salaries-and-reduce-hours-as-part--of-cost-cutting-measures-2020-03-30	Organizational innovation
Marriott International	03-Apr-20	Marriott borrows \$2B to guard against impacts of pandemic https://www.bizjournals.com/washington/news/2020/04/03/marriott-borrows-2b-to-guard-against-impacts--of.html	Organizational innovation
Choice Hotels	08-Apr-20	Choice Hotels International Provides COVID-19 Business Update http://media.choicehotels.com/2020-04-08-Choice-Hotels-International-Provides-COVID-19-Business-Update	Organizational innovation
Marriott International	10-Apr-20	COVID-19: Hotels across the board undertake pay cuts, give unpaid leave options to staff https://economictimes.indiatimes.com/industry/services/hotels/-restaurants/covid-19-hotels-across-the-board--undertake-pay-cuts-give-unpaid-leave-options-to-staff/articleshow/75069700.cms?from=mdr	Organizational innovation
Marriott International	14-Apr-20	Marriott International Announces New \$1.5 Billion 364-day Revolving Credit Facility Commitment and Leverage Covenant Waiver for Existing Revolving Credit Facility https://news.marriott.com/news/2020/04/14/marriott-international-announces-new-1-5-billion-364-day--revolving-credit-facility-commitment-and-leverage-covenant-waiver-for-existing--revolving-credit-facility	Organizational innovation
Hyatt	15-Apr-20	Hyatt Launches Hyatt Care Fund to Provide Financial Relief to Global Colleagues https://www.hotelbusiness.com/lending-a-hand-karisma-hyatt-and-more/	Organizational innovation
Wyndham	15-Apr-20	Statement from Wyndham Hotels & Resorts: COVID-19 https://corporate.wyndhamhotels.com/news-releases/statement-from-wyndham-hotels-resorts-coronavirus-2/	Product-process innovation
Hilton	16-Apr-20	Hilton Selling \$1 Billion Loyalty Points to American Express https://www.bloomberg.com/news/articles/2020-04-16/hilton-selling-1-billion-in-loyalty-points-to--american-express	Marketing innovation
Marriott International	21-Apr-20	Marriott International Launches Global Cleanliness Council to Promote Even Higher Standards of Cleanliness in the Age of COVID-19 https://news.marriott.com/news/2020/04/21/marriott-international-launches-global-cleanliness-council--to-promote-even-higher-standards-of-cleanliness-in-the-age-of-covid-19	Product-process innovation
Choice Hotels	21-Apr-20	Choice Hotels secures \$250 M loan, implements furloughs in response to pandemic https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/choice-hotels--secures-250m-loan-implements-furloughs-in-response-to-pandemic-58117726	Organizational innovation
InterContinental Hotels	27-Apr-20	InterContinental Hotels Group secures new funding as sales drop https://www.standard.co.uk/business/intercontinental-hotels-group-secures-new-funding-as-sales-drop--a4424906.html	Organizational innovation
Hilton	27-Apr-20	'A new normal': Hilton follows Marriott, Airbnb with cleanliness initiative amid	Product-process innovation

(continued on next page)

Table 1 (continued)

Hotel firm Name	Date of publication	Announcement/URL	Innovation type
		coronavirus pandemic https://www.usatoday.com/story/travel/hotels/2020/04/27/coronavirus-hilton-announces-new--cleanliness-measures/3032384001/	innovation
Hyatt	29-Apr-20	Hyatt Announces Global Care & Cleanliness Commitment https://newsroom.hyatt.com/global_care_cleanliness_commitment	Product-process innovation
Choice Hotels	04-May-20	Choice Hotels Announces Commitment to Clean Initiative http://media.choicehotels.com/2020-05-04-Choice-Hotels-Announces-Commitment-To-Clean-Initiative	Product-process innovation
Marriott International	03-Jun-20	Marriott sells another \$1 billion in debt https://www.bizjournals.com/washington/news/2020/06/03/marriott-sells-another-1-billion-in-debt.html	Organizational innovation
Hyatt	18-Jun-20	Exclusive: Hyatt CEO talks coronavirus hotel reopening creativity, need for 'humanity' behind face masks https://www.usatoday.com/story/travel/hotels/2020/06/18/hyatt-hotels-amid-coronavirus-ceo-talks--reopenings-yoga-weddings/3204940001/	Product-process innovation

where S_i is the standard deviation of the residuals obtained during the estimation period, D is the number of days in the estimation period plus the event window, and R_m is the mean return on the market portfolio during the estimating period.

Once the abnormal returns are estimated, we regress them on the different innovation types, so that the following model is estimated via ordinary least squares:

$$AR_i = \lambda_1 + \lambda_2 OI_i + \lambda_3 PI_i + \sum_{j=1}^J \delta_j CV_j + \mu_i \quad (5)$$

where OI_i and PI_i are dummy variables that reflect the types "organization innovation" and "product innovation" types (marketing innovation is used as the baseline alternative), and CV_j are control variables related to the firm size; the parameter represent the effects of these variables on the abnormal returns; and μ_i is an error term assumed to be normally distributed.

Results

The effect of COVID-19 innovation announcements on firm value is presented in Table 2. The results show that, on average, COVID-19 innovation announcements are related with positive abnormal returns on the day of the announcement. Specifically, the average impact of the announcement of these innovative activities on firm value is 0.60%. This result is in accordance with hypothesis 1, 2, and 3 that COVID-19-related innovation including product-process, organizational, and marketing innovation exerts a positive influence on a hotel's market value, which is in agreement with the conclusions of Quintal et al. (2010) and Reisinger and Mavondo (2005). The innovative strategies deployed by hotels are perceived as reducing hotel guest and employee exposure to risk, and results in the creation of conditions that are clearly valued in the current climate.

After estimating and testing potential abnormal returns, we analyze the different effects of innovation types on these abnormal returns through regression models estimated. Table 3 shows the descriptive statistics of the innovation types as well as the firm size measured by number of properties. As hotel companies tend to announce innovations with multiple components on the same news item (e.g. organizational and product), the addition of the percentages of innovation types exceeds 100%.

Eq. (1) in Table 4 shows significant yet opposing effects of "organization innovations" and "product innovation", the former with a negative sign and the latter for a positive one. These results mean that while product innovation has a significantly higher impact on firm value than marketing innovation (the baseline alternative), organizational innovation has a significantly lower

Table 2
Effect of COVID-19-related innovation announcements.

Day	Abnormal returns	Brown and Warner's test	Patell's test
2	-0.0059	-2.8143***	-1.9819*
-1	-0.0150	-7.1248***	-6.8854***
0	0.0060	2.8416***	3.0587***
1	0.0007	0.3333	-0.2661
2	-0.0025	-1.1929	-1.1225

*** $p < 0.001$.

* $p < 0.05$.

Table 3
Descriptive statistics of the independent variables.

Independent variables	Proportion/mean/amount
Organizational innovations	95.4%
Product-process innovations	27.2%
Marketing innovation (baseline variable)	4.54%
Number of properties	5585.20 (Std Dev = 2996.44)
Intercontinental properties	5903
Hyatt properties	924
Hilton properties	6110
Marriott properties	7349
Choice properties	7000
Wyndham properties	9280

effect on firm value. This outcome supports [hypothesis 4](#) that product-process innovation has stronger impacts on shareholders' perceptions than organizational and marketing innovation.

Eq. (1) also includes the control variable of number of properties (in thousands of units), in its linear and quadratic specifications. The parameter associated with the linear variables is not significant and the one related with the quadratic variable is significant and negative. The resulting inverted U-shaped effect means that the larger the firm the greater the returns derived from COVID-19-related innovation, but there is a threshold after which this increase shows a decreasing return.

In order to test the robustness of the results obtained for the hypotheses tested, Eq. (2) replicates the estimation by using a different specification of firm size. The number of properties of each hotel company is included in the model, so that the effect of each firm is identified. We find that the proposed hypotheses are again supported, in line with the evidence found in Eq. (1). Regarding the parameters associated with the firm size, the parameters associated with Intercontinental, Hyatt, Marriott and Choice are significantly positive.

Conclusion and implications

Theoretical implications

The COVID-19 pandemic has spread quickly around the world, causing significant disruptions across the global economic landscape. The pandemic has caused a substantial drop in the demand for travel, and as a result, the fallout for the hospitality industry has been immense. In order to cope with the unprecedented crisis, hotels have had to devise a number of impromptu innovations to safeguard health and safety of all parties involved, and in the process restore consumer process in the lodging industry. While organizations routinely innovate by leveraging past knowledge in new ways ([Hargadon, 2002](#)), they may occasionally face situations that are so unique that relying on past knowledge and experience may not be sufficient. This has been the case with the COVID-19 pandemic – the unparalleled global health emergency has caused firms in the hotel industry to reassess several standard operational practices, and quickly devise new and innovative strategies. Because hotels have minimal experience with this kind of a crisis, past knowledge is of limited value. As such, hotels have had to deploy innovations without a clear sense of the effectiveness of the innovations.

In this study, we use a market value-based approach to investigate the impact of these COVID-19 related hotel innovations as reflected in market value, and in turn firm performance. Our findings suggest that the innovations that have been implemented by hotels are perceived to be effective and expected to increase confidence in the ability of hotels to create a safe environment. In addition, we also find that not all innovations that have been deployed have a similar effect. Product-process innovations in

Table 4
Innovation type and market value.

	Eq. (1)		Eq. (2)	
	Regression coefficients	t-values	Regression coefficients	t-values
Organizational innovations	-0.0245*	-2.3310	-0.0327*	-2.7071
Product innovations	0.0380*	3.2011	0.0400*	2.4309
Number of properties	0.0210	1.9280		5.7121
Number of properties ²	-0.0025*	-2.2576		2.8660
Intercontinental properties			0.0141***	1.4236
Hyatt properties			0.0497*	2.7289
Hilton properties			0.0068	3.5591
Marriott properties			0.0068*	-2.7071
Choice properties			0.0105***	2.4309
Constant	0.0083	0.5390	-0.0086	-0.4883
R ²	0.3138		0.4323	

*** p < 0.001.

* p < 0.05.

particular, appear to be providing the highest level of confidence. Given that existing research found conflicting results about the impacts of different innovations on firm performances (e.g., Hjalager, 2002, 2010; Weidenfeld et al., 2010; Verreynne et al., 2019), this finding contributes to better understanding the impact of hotel innovations. In particular, unlike previous studies, this study initially found the stronger impacts of product and process innovation than other types of innovation.

This indicates that innovations for ensuring safe service delivery (e.g., enhanced cleaning procedures, new technologies for reducing guest interactions, etc.) are more significant than organizational and marketing innovations that mainly focuses on broader managerial actions during the pandemic. This result is in line with the finding of Shin and Kang (2020) that technology product innovations are effective in reducing health risk perceived by consumers, resulting in higher hotel booking intention.

Importantly, the result of this study can provide a conceptual basis to differentiate hotel innovations in uncertain times. The conflicting views towards the impact of innovations on firm performances indicates context-specific influences of hotel innovations (Martin-Rios & Ciobanu, 2019; Pikkemaat & Peters, 2006). During the pandemic, product-process innovation can be a direct tool for influencing prospective customers' decision-making behaviors. On the other hand, the significant lower impact of organizational innovation indicates that the proposed business methods by most hotel companies to deal with the pandemic, such as new financial plans and human resource practices, should be accompanied by fundamental solutions associated with new ways of service delivery processes and products. Merely changing business practices or introducing new marketing methods to address the pandemic are inadequate to be strongly evaluated by shareholders.

The study findings emphasize the importance of product and process innovations for new ways of service delivery processes in the hotel industry. While the nature of hospitality services has been traditionally characterized with "high-touch and low-tech" experiences, this study shows that product and process innovations via technological tools can transform the hospitality service into "low-touch and high-tech" experiences (Bitner et al., 2000; Shin & Kang, 2020).

Practical implications

Regarding managerial implications, three courses of action can be suggested. First, the positive effect of COVID-19-related innovation on a hotel market value shows that shareholders' perceptions of these actions are positive. From the perspective of hotel's decision-makers the key question is to assess whether these perceptions—materialized via share price reactions—are as positive as they should be. The analysis of the market value offers an immediate response to this question. If the main purposes of COVID-19-related innovations in hotels are to protect the health and safety of guests and employees, portray the image that hotels are able to navigate the uncharted waters created by the pandemic and to show that they have re-assessed their current business practices for service delivery in today's uncertain times, then hotel's decision-makers need to know whether these objectives have been accomplished and to what degree. Accordingly, if the actual positive reactions are not as positive as expected, or simply they are not positive, then decision-makers need to implement corrective measures—if they think that shareholders' perceptions are right—or release additional clarifying information—if they consider shareholders' perceptions are incorrect due to misinterpretation or lack of complete information.

Second, having obtained a positive association between COVID-19-innovation and hotel market value means that hotels must intensively communicate any innovative actions they undertake in this respect. In other words, it is not only that hotels must face the current pandemic with innovation but that they must communicate that they are doing it.

Third, while a hotel must use any types of COVID-19-related innovations with the purpose of maximizing protection, the fact that not all innovations are perceived equally relevant by shareholders helps hotels' decision-makers discern whether their risk-diminishing innovation strategy is perceived to be in the right path and find a balance among product, organizational and marketing innovations.

Limitations and future research directions

Despite the benefits of the methodology employed in this study and the relevance of the implications identified above, it is important to acknowledge the limitations of this study. First, this study uses finance metrics, which means that hotels that are not publicly traded have not been considered. Although there is no reason to believe that effect of COVID-19 innovations would not be similar in privately owned hotels, one cannot conclusively assume this to be the case based on the results of this study. Thus, more collaborative approaches are required to better understand the impact of COVID-19 innovations on financial and managerial performances of privately-owned hotels. In addition, future research may need to analyze the impact of radical innovation on shareholders' perception since this study mainly focuses on incremental innovation.

Second, we are not using a fully *ex-ante* analysis to predict the impact of the announcements. Accordingly, as previously discussed, the use of implied cost of capital could complement our results; still, considering the frequency with which accounting data are published, extra caution should be included as these measures (quarterly or annual) could include a plethora of information apart from the information derived from the event itself.

Third, this study has used an analytical framework that is based on the fundamental neoclassical economics principle of market efficiency. While the neoclassical perspective has been the cornerstone of much of the economics literature for several decades, it has nonetheless been challenged by several alternative schools of thought. Accordingly, it is important to acknowledge that our results hold only to the extent that the postulations of the neoclassical paradigm are valid, and markets are efficient.

CRediT authorship contribution statement

1. What is the contribution to knowledge, theory, policy or practice offered by the paper?

Considering the unparalleled nature of the present crisis, many of the newly implemented innovations have likely been concocted by hotels in an ad-hoc manner, without a clear understanding of their effectiveness. Thus, there is a pressing need to better understand the utility of these new innovations, and the extent to which they affect firm performance. Moreover, there is also a need to answer some of these questions using readily available performance metrics rather than wait for popular backward looking accounting based metrics like profits or revenues to become available. Doing so would help hotels sustain and expand the innovative responses that work, and also discontinue those that are less effective. It is this critical knowledge gap towards which the present study contributes. Using shareholders' perceptions, the objective of this study is to investigate the effect of COVID-19 related hotel innovations on hotel performance.

2. How does the paper offer a social science perspective/approach?

A basic social component of tourism is the interactions between consumers and service providers. Under the so called "new normalcy" established by COVID-19, firms attempt to manage these interactions by implementing innovative actions and procedures that ensure increased hygiene standards or social distancing. The extent to which these innovative initiatives serve their intended purpose is critical to foster the alluded social interactions in a safe environment. Accordingly, this research attempts to measure the perceived effectiveness of these actions by looking at shareholders' perceptions.

Declaration of competing interest

None.

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