SERVICE COMPETITION AND TOP SERVICE DESIGNERS: IMPACTS ON PRICE AND QUALITY

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ABSTRACT

Service firms today leverage the talents of many top designers who built reputations of excellence upon past design successes and prior competitive performances. Service firms often hire top designers to help meet consumer needs. Top service designers may design better experiences, due to unique aesthetic approaches or knowing how to perform exceptionally well in service environments. Yet service operators must consider both the benefits from investment in high quality designs and the monetary returns from customers. Thus, managers need to know how much of an impact top service designers may have on quality and price within a service segment. Using proprietary data on golf courses and top golf course designers, we study whether top designers influence the quality and pricing of golf courses. We look at the effects of top designer expertise and the effect of lead user designers. We find empirical results that support our hypotheses, providing insights for managers about the possible impacts of using top designers and lead user designers on the business performance of services.

Keywords: service design, lead user, designer, empirical, regression analysis

INTRODUCTION

Service firms today must design and deliver service environments and experiences that can stand out and capture customer attention [66]. One way to design and develop unique and memorable services is to use a well-known, top, or star designer. In some service sectors, a popular fascination with top design experts has led to a bevy of cable television design shows in which well-known top designers show off their talents, and “reality shows” in which designer-vs.-designer competitions determine the upcoming generation of top designers. For example, *Iron Chef* identifies new star chefs who have the talent to defeat existing top chefs, perhaps parlaying success into new restaurants to design. Interior design shows such as *Top Design* competitively identify which designer possesses the best interior design aesthetic.

In other service sectors like sports and entertainment, star designers who were lead users as well, such as basketball player Michael Jordan (athletic apparel), golfer Jack Nicklaus (golf courses), and musician Gwen Stefani (clothing), built design practices upon prior exceptional performance in their fields. Lead user theory [64] [61] [18] [50] motivates this phenomenon that exceptional users, such as the above, can yield commercial success. Lead users are defined as "users whose present strong needs will become general in a market place months or years in the future" [64, p. 791]. In this study, we explore these phenomena. We expect top designers and lead users will influence service performance.

The use of external designers and outsourced design services has grown in many product and service sectors. Top designers may design higher quality products and service experiences due to unique aesthetic approaches or their innate ability to perform exceptionally well in their fields. Department stores have long benefited from cachet provided by star product designers such as Martha Stewart and Jaclyn Smith. Hotels, cruise lines, and Las Vegas casinos often use top chefs and celebrity designers to design the amenities in their guest rooms and the experiences in their spas and restaurants. For instance, Las Vegas has 15 Michelin guide rated restaurants, and all these top-chef designed restaurants are located in casino hotels [69] striving to provide superior service to customers. Yet, while outsourced design efforts are often undertaken to generate cost savings or improve product quality, prior academic studies show that perhaps two-thirds of these design efforts fail due to misaligned objectives, project rivalries, or poor project controls [1]. Also, little is known about the long-run impact of the outsourcing of service design upon service businesses.

Using a top designer can be a costly proposition. Many top service designers charge huge fees for their design services. In golf course design, a mid-level designer of golf courses for master-planned housing communities may generate design fees in the six-figure to $1 million dollar range, while top designers can earn design fees upwards of $5 million [21]. These design fees do not include the $1.5 million to $10 million of construction costs to bring such designs into operation [49]. Notably, the design aesthetics and practices of low- and mid-tier designers can differ greatly from those of top designers, leading to very different construction and operating costs and constraints [21] [49]. The differing facility maintenance costs can contribute a very significant proportion of the cost of a round of golf [49]. In general, service operators need to consider both investments in high quality designs and the monetary returns from expected customer bases. Managers need to know how much of an impact top service designers may have on quality and price within a segment. Thus, we focus on the following research questions: *Does the use of top service designers lead to quality and price benefits for service operators?* Also, *do lead user designers generate additional price and quality benefits?*

To examine these questions, this paper looks at the business impact of top designers of golf courses and the impact of lead user course designers. Golf course operations provide a relatively new area of academic managerial inquiry. Nevertheless, golf is a huge service sector with over $60 billion in revenues, 32,000 golf courses, and 60 million golfers worldwide. Golf is also an industry in which service facilities are often designed by well-known top course designers. Furthermore, many top designers are also likely to design their unique golf courses based on their lead user expertise derived from winning professional golf championships.

Using several proprietary data sets, we analyze the impact of top service designers (i.e., golf course designers) upon the quality and prices of golf courses after controlling for other relevant factors. We use data from *Golf Digest* magazine to identify the level of excellence of each golf course designer and to identify the time-period during which each designer was designing. We use data from the *Professional Golf Association (PGA)* to identify lead users (top golfers) who also design courses. We use various metrics of designer excellence to estimate the impact of top designers upon the quality ratings and the pricing across a sample of golf courses. We also use data from various sources, including the *Texas State Department of Tourism*, *Dallas Morning News*, and *Golf Link*, to control for other factors.

We find empirical results that indicate a beneficial impact of top golf course designers and their expertise levels, and further beneficial impacts due to lead user designers. Our conclusions are robust to a number of alternate variable constructions, empirical specifications, and model assumptions. The findings provide useful information for golf course managers who are evaluating whether to design golf courses using top designers. We contribute to academic research in two ways. First, no prior literature explores top designers of services, yet they are very important in many service industries. For instance, in financial service industries, firms use top investment managers for better profitability. In fashion, retailing companies hire top designers to improve brand name and profitability. Thus, our research contributes by exploring this issue. Second, no empirical research shows top designer benefits, thus, our study contributes by quantitatively demonstrating the substantive impact of top designers.

THEORETICAL PERSPECTIVE AND LITERATURE REVIEW

Golf course operations and design

The golf industry is large and growing, yet exposed to dynamic exogenous factors and many challenges. According to SRI International [56], the U.S. golf industry yields an economic impact of $76 billion and its annual growth rate was 4.1 percent from 2000 to 2005. Comparing this growth with the annual inflation growth rate of 2.5% during this period [62] the golf industry growth rate has been substantial. However, in the aftermath of recent economic downturns, many golf courses are financially in bad shape [56]. In particular, the annual growth rate of the U.S. golf industry from 2007 to 2012 is -0.3%, suggesting the industry has leveled off at approximately $23 billion in revenues [36].

Golf providers pursue various methods to gain a competitive advantage. These methods often focus on choosing a competitive course design and redesigning courses to improve playability. The ASGCA [3] lists best practices for how golf course operators should conduct the overall process from site selection to course operations. Since golf operations are challenged by reduced revenues and memberships, these firms often employ top service designers to survive in the competition. Studies in the service literature suggest that a service provider's decision to redesign its service can significantly affect the quality of service [31] [58]. Heim and Ketzenberg [31] explore the impact of learning effects upon service quality when service providers decide to redesign golf courses, finding that the golf courses can have strong learning patterns. Other recent golf industry research explores consumer perceptions of golf service experiences, impacts of gender, and consumer ritual behaviors [44] [45] [46]. These studies, however, pay little attention to service design and related operations implications. Also, prior studies do not examine the role of the design excellence exhibited by golf course designers.

As Goldstein et al. [22] point out, service design refers to the process of developing an idea about a new service specification [26] [42] [51]. A service organization designs a service using both physical and non-physical components that will be used to deliver the service to customers. The golf service industry adopts both physical service attributes (i.e. a course design) and non-physical service attributes (i.e. club house management) for developing a quality service design.

Golf course design is quite important for survival as a comprehensive course, especially in the present economic environment. Since golf playing is an outdoor activity, golf courses should possess a combination of beauty and functionality that appeals to all levels of golfers [13]. Players look for appropriate levels of difficulties, unique course experiences, and emotional relaxation through walking around the courses. Golf course designers play a key role in ensuring such outcomes. Depending on the design of golf courses, each golf course has its own unique characteristics. Well-known designers exhibit in their courses the classic characteristics for which they are well known. That is, a Jack Nicklaus course will tend to have a “Jack Nicklaus” feel. More experienced or famous design architects, therefore, should construct better interactive golf course experiences.

Using top golf course designers is often a worthy attempt to ensure good golfing experiences. Golf course developers expect that top designers’ aesthetic works can distinguish between top golf courses and non-top golf courses. In this research, we define the specific notion of the top golf course designer based on the golf course architecture awards given by *Golf Digest* magazine, which has tabulated whomever designed the top 100 U.S. award winning golf courses since 1965. Like other service industries, golf service firms are highly influenced by the capabilities of many famous golf designers who earned names of quality through their historical performance as nationally and internationally competitive golfers. Moreover, these top players may best know the needs of customers who are using the service. Thus, we expect a study of the impact of top designers will provide valuable implications for service industries.

Outstanding performers and top designers

In the service literature, few studies examine the characteristics and impacts of outstanding performers, such as top service designers. Instead, several researchers in other social science disciplines have studied the impact of master hands in diverse fields. Star scientists, for instance, can provide a critical bridge between biotechnology academia and the pharmaceutical industry [6]. The top scientists are capable of managing the interconnected research and innovation processes between large public firms, academic institutions, and other high-tech start-ups [35]. Using scientific publication data, Zucker and Darby [70] [71] [72] investigated the impact of a firm’s star scientists by analyzing co-publishing by top university scientists in U.S. and Japan biotechnology areas. They found that star scientists in biotechnology are critical for deciding firms’ operating choices. In particular, they show that star scientists can lead to the development of profitability in existing industries. Also, empirical findings suggest almost 40% of all research publications of pharmaceutical companies were developed by the top one percent of authors [35]. We ground our study upon the phenomena documented in the above top performer literature.

Lead user theory and golf course design

von Hippel [65, p.22] defines a lead user as a user "(1) who is at the leading edge of each identified trend in terms of related new product and process needs, and (2) who expects to obtain a relatively high net benefit from solutions to those needs." Lead user theory argues that if lead users develop and modify products, then the products should have commercially attractive appeal [64] [61] [18]. Researchers in innovation management define lead users using two characteristics – leading market trends, and expecting high benefits from their solutions [64] [50] [65]. Several studies in innovation research support the nature and effects of lead users [61] [19] [41] [50]. These studies show that the innovation of lead users in techniques is as significant as their equipment innovation over a variety of industries including sports communities, hospitals, libraries, and software companies. For instance, Franke and Shah [19] explored user-innovators in four sports communities (sailplaning, canyoning, boardercross, handicapped cyclists), finding that the lead users who invented products or techniques are more likely to be commercially successful than the inventors who were not lead users.

Similarly, lead users are often pertinent to service innovation. We conjecture that this lead user phenomenon will hold in the golf industry. During a golf game, golfers sometimes talk about developing their own golf courses and trying to create a better course for their own use [13]. In particular, lead users (exceptional golfers) will experience earlier how a golf course needs to be modified and improved relative to other golfers. If top golfers have opportunities to develop or redesign a golf course, they will consider their own needs, and the resulting golf course should exhibit high quality. The case of Jack Nicklaus provides a good example to explain the lead user theory in the golf course industry. Nicklaus is one of the greatest golfers in the world, having won 18 men's major golf championships (six Masters tournaments, four U.S. Open tournaments, five The Open tournaments, and five PGA tournaments). No golfer has more total wins than Jack Nicklaus (www.pga.com). While Nicklaus was a professional golfer, he meticulously measured golf courses, and figured out innovative techniques for winning championships [37]. As a result, Nicklaus's experience as a lead user prepared him to become one of the greatest golf course designers. As literature in the innovation management field argues the impacts of the lead user with respect to product design, our study proposes that being a lead user will enhance the impact of a top service designer in the golf industry.

In summary, the service operations literature pays little attention to the impact of top designers. From the social science literature, we observe many samples of top performer studies are based in a specific field (i.e., biotechnology), and they do not focus on service design or operational performance. Thus, we view the service business impact of top designers and lead users to be considerable questions that have not been explored yet.

HYPOTHESIS DEVELOPMENT

According to the American Society of Golf Course Architects [5], golf course development has a unique sequence. In early development stages, a developer analyzes whether the business can be successful. Developers consider different aspects depending on whether a new club is private or public. This stage usually includes market analysis, feasibility studies, and economic impact of the course [3]. If the development project is feasible, then the project moves to the next stage, which begins with master planning. In this stage, the project team is composed of a course designer, architect, engineers, land planners, environmental specialists, and construction contractors. This team improves the actual course design including course routing, hole layouts, bunker design, irrigation, and environmental planning. In addition, a documentation process for items such as permit processing is initiated in the second stage. The final stage includes the actual construction of the course.

The underlying rationale for a golf course development is that the process should follow the traditions of golf [13]: a course requires a total of 18 holes per play; each hole should be designed for par 3 to par 5; and the total number of par should be 72. Thus, like an orchestra conductor, a golf course designer is not only the designer of the course (e.g. the level of conducting), but also a creative re-interpreter of traditional compositions [15]. Since one role of the designer is to coordinate the project team, the designer must have enough understanding relevant to the development process, such as land planning, permit processing, drainage, irrigating, construction, botany and maintenance management [15]. Thus, the choice of a course designer is one of the most crucial factors when a developer considers their golf club development process.

If a course designer has had experience as a successful golf course developer, then a potential developer can trust the experienced designer to smoothly handle the golf project, and ensure the quality of the golf course. Thus, we presume that if a course developer is in a decision making situation supportive of high ultimate design quality of a golf course, using a course designer who is well-known for great course design may be an appropriate choice. In support for this notion, we follow prior research on the pharmaceutical industry. Star scientists in the pharmaceutical industry can provide strong intellectual knowledge through their research performance [35]. Prior research investigating the role of star scientists shows that using star scientists is a critical factor to increase a firm's performance [35] [70] [71] [72]. According to Furukawa and Goto [20], star scientists publish a tremendous number of journal articles, which develops a critical foundation of knowledge. As with star scientists who create and sustain a firm's competitive advantage using their existing and newly generated knowledge, star golf course designers create an organization's value through their characteristic designs. Thus, we hypothesize:

H1: After controlling for the propensity to use high quality designers, a top golf course designer is positively associated with service quality.

Top performer literature suggests star scientists and innovators positively impact profitability [70] [71] [72]. In addition, since the attributes of the golf experience involve hedonic elements [48] [66], customers are willing to pay more for a better service. Employing a top golf course designer will affect the hedonic utility arising from the golf course. In turn, the customer's overall assessment of the golf round at a course should influence the price level of the golf round. Thus, we posit the following hypothesis:

H2: After controlling for the propensity to use high quality designers, using a top golf course designer is positively related to the price of a golf round.

We expect that designers who are lead users will moderate the above hypotheses. The role of the lead user in influencing innovation and commercial benefits are well identified by literature [64] [40] [61]. For example, Lilien et al. [40] posit that firms can use lead users to improve the success of product development efforts. Urban and von Hippel [61] examined the impact of lead users in the software industry. They argued that lead users are ahead of market trends relative to other users. Because we explore the impact of top golf course designers, these findings suggest that the golf courses' quality and price will be improved by using a course designer, if that designer was a leading golfer. We posit the following hypotheses:

H3: The relationship between a top golf course designer and service quality is greater when the designer was a lead user.

H4: The relationship between a top golf course designer and service price is greater when the designer was a lead user.

RESEARCH METHODOLOGY

Data sources

The data used in this study consists of top designer activities related to Texas golf courses and their business operations. The primary data comes from various sources including *Dallas Morning News (DMN), Golf Digest, Golf Link,* the *Professional Golf Association (PGA),* and the *Texas State Department of Tourism.* All these sources are leading golf organizations and widely circulated golf publications in the United States. The data set contains a list of golf courses in Texas, names of each course's designers, rankings, price, and other related characteristics of each golf course. We also collected economic data from the *U.S. Census Bureau* for control purposes.

Our data on golf course designer expertise comes from a list of the top 100 USA golf course rankings prepared annually by *Golf Digest* magazine [23]. In the magazine, the list of award winning golf courses provides the designer name of the course and other course information. Next, we collected information about whether each golf course designer ever won a major golf tournament (i.e., Masters, U.S. Open, The Open, and PGA open tournaments) from each tournament record book website [43] [55] [59] [63]. Our data on Texas golf courses comes from the Texas state department of tourism [14]. These data pertain to each golf course's location, pricing, and other information. Finally, we use data from the *Dallas Morning News* newspaper pertaining to an annual quality ranking of the top 100 golf courses in Texas, using data reported in 2008 [12]. Given these sources, we obtained 585 observations related to Texas golf courses.

Econometric models

Our models focus on estimating impacts of top golf designers and lead users (that is, top players) upon the quality and price of Texas golf courses. Using a top designer is a self-selection problem, as a golf course developer decides whether or not to select a top designer. Many statisticians and econometricians have developed sample selection models and estimators. The treatment effect model is one extension of the sample selection problem [25] [27]. However, the treatment effect model is different from traditional sample selection models suggested by the Heckman model [28] or Heckman-type models (Tobit or Logit). While these models assume that the dependent variable of the regression equation is observed only if the binary treatment condition is either 1 or 0, the treatment effect model observes the dependent variable in both treatment conditions (1 and 0). We can measure the treatment effect by maximum likelihood estimation [24] [27] [54] as a form of the following regression model. The switching regression model derives the binary treatment variable that has instrument variables in which causes two separate models under each binary treatment condition. Equations (1) and (2) express the switching regression model:

$$y_i = x_i\beta + w_i\delta + \varepsilon_i \qquad \textbf{(Eq.1)}$$
$$w^*_i = z_i\gamma + u_i, \quad w_i = 1 \text{ if } w^*_i > 0, \text{ and } w_i = 0 \textbf{ otherwise} \qquad \textbf{(Eq.2)}$$

where w_i is the binary variable that explains the treatment condition, and x_i is the set of control variables. In addition, z_i is the set of instruments for the treatment variable for w_i, and $E(\varepsilon_i\, u_i) \neq 0$ for each individual i = 1,2, …, n. Thus, we can estimate our empirical model using the switching regression model. We estimate the impacts of top designers and top golfers using STATA [57].

The selection model includes the following two steps. First, we construct the selection equation. The desired quality or price depends on the choice to use a top designer. Thus, the problem of the first equation describes factors that drive the use of top designers, but an actual observation occurs when the golf club owner hires the top designer(s). Thus, the impact variable in the first equation should be incidentally truncated [25]. In the second step, we estimate δ and β by regression of y on x and w. Our specific models are described next.

Selection mechanism of latent variable Top Designer* $_i$

When a golf course developer decides to hire a top designer, the developer may consider using a top designer to be more beneficial than using a non-top designer. We define the variable $TopDesigner^*_i$ as the difference in the expected value of using a top designer and not using a top designer for a golf course *i*. Thus, we can estimate $TopDesigner^*_i$ as a function of a golf course developer's choice attributes. We include three selection attributes. The number of golf courses in the city (*NumberofCourses*) measures the level of local competition to the golf course. The number of yards in the championship golf course (*ChampionshipCourseYards*) identifies the targeted challenge level of the golf course. The median value of owner occupied housing in a county (*Housing*) measures the potential customer's household wealth.

We cannot observe $TopDesigner^*_i$, but we can observe a developer's decision (that is $TopDesigner_i = 1$ if a developer used a top designer, $TopDesigner_i = 0$ if a developer did not use a top designer). We can then estimate the direction of $TopDesigner^*_i$. Thus, we formulate a binary choice model to estimate the treatment effect of the use of a top designer.

$$TopDesigner^*_i = \theta_0 + \theta_1\, NumberofCourses_i + \theta_2\, ChampionshipCourseYards_i + \theta_3 Housing_i + v_i$$
$$= w_i'\theta_i + v_i \quad TopDesigner_i = 1 \quad \text{if } TopDesigner^*_i > 0, \textbf{ 0 otherwise.} \qquad \textbf{(Eq. 3)}$$

where i =1,…, N represents each golf course, w_i and θ_i represent the vectors for a 4x1 matrix that includes *NumberofCourses*, *ChampionshipCourseYards*, *Housing*, and a constant, and ν_i represents unobserved errors that are normally distributed with zero mean and variance one. We estimate Equation (3) using a probit equation by maximum likelihood [28] [25].

Regression model of $Rating_i$ and $Price_i$

Next, we turn to the estimation of quality and price. The key variable used to assess H1 and H2 is $TopDesigner_i$, the binary variable based on Equation (3). After demonstrating the significance of this variable, we include several other variables related to designer and lead user characteristics. We also include a control variable *ClubTotalHoles* for the sum of the number of holes across all golf courses in a country club, because the scope of operations may directly affect quality and price of a golf course. In addition, we add two golf club dummy variables (*PrivateClub, ResortClub*) that may influence quality and price. Finally, we include a series of dummy variables *Region* to control for regional environments. Our specific model is the following:

$$RATING_i = \beta_0 + \beta_1\, ClubTotalHoles_i + \beta_2\, PrivateClub_i + \beta_3\, ResortClub_i + \textstyle\sum_4^{11} \beta_i\, Region_i + \eta\, TopDesigner_i + \varepsilon_i$$
$$= X_i'\beta_i + \eta\, TopDesigner_i + \varepsilon_i \qquad \textbf{(Eq. 4)}$$
$$PRICE_i = \pi_0 + \pi_1\, ClubTotalHoles_i + \pi_2\, PrivateClub_i + \pi_3 ResortClub_i + \textstyle\sum_4^{11} \pi_i\, Region_i + \lambda\, TopDesigner_i + \varphi_i$$
$$= X_i'\pi_i + \lambda\, TopDesigner_i + \varphi_i \qquad \textbf{(Eq. 5)}$$

We assume the error terms ε and φ are exogenous of each dependent. In addition, we assume that error term pairs (ν, ε) and (ν, φ) have bivariate normal distributions with zero mean and covariance matrix $\begin{bmatrix} \sigma & \rho \\ \rho & 1 \end{bmatrix}$. Thus, using Equation (3) and Equation (4) (or Equation (5)), we find that:

$$\mathrm{E}[RATING_i \text{ or } PRICE_i \mid TopDesigner_i = 1, x_i, w_i] = X_i'\beta_i\,(X_i'\pi_i) + \eta\,(\lambda) + \mathrm{E}[\varepsilon_i \mid TopDesigner_i = 1, x_i, w_i]$$
$$= X_i'\beta_i\,(X_i'\pi_i) + \eta\,(\lambda) + \rho\,\sigma\lambda(-w_i'\theta_i) \qquad \textbf{(Eq. 6)}$$
$$\mathrm{E}[RATING_i \text{ or } PRICE_i \mid TopDesigner_i = 0, x_i, w_i] = X_i'\beta_i\,(X_i'\pi_i) + \rho\,\sigma\,[\,-\phi(w_i'\theta_i) / 1 - \Phi(w_i'\theta_i)\,] \qquad \textbf{(Eq.7)}$$

where w_i represents explanatory variables that affect $TopDesigner^*_i$ and matrix X_i represents independent variables for $RATING_i$ except the $TopDesigner_i$ variable. Here ϕ represents the normal density function, and Φ represents the cumulative normal density function. Since we assume that error terms are bivariate normal, we can apply the inverse Mill's ratio, which can provide the truncated normal distribution. Thus, the result of Equation (6) will account for the self-selected nature of using a top designer [25], and we can correct for the self-selection problem as an omitted variable problem. We can also model for golf courses not designed by top designers, which represents Equation (7).

Definition of variables

Table 1 describes dependent and independent variables used in this study.

Dependent Variables We include two key measures as dependent variables to assess the impacts of top designers and lead users in the golf industry: annual rankings of top Texas golf courses (*RATING*) and the price of playing a round at a Texas golf course (*PRICE*). *RATING* is an ordinal ranking variable for Texas golf courses (1-100). We assign a value of "101" to non-ranked courses. *PRICE* indicates the price of playing a round at a Texas golf course. From Dunham (2008), *PRICE* is categorized by the following index: "$", "$$", "$$$", and "$$$$", with more "$" signs indicating the greens fees are more expensive. We numerically represent these as 1-4, with “4” assigned to the most expensive golf courses. Thus, for example, a golf course might have *RATING* of “2” and *PRICE* of “3” indicating that the course is ranked 2 out of the sample of Texas golf courses, and its price is located in the high price group (3 out of 4).

Table 1. Variable Construction

Variable	Units or values	Description	Source
Dependent Variables			
Rating	1 to 101	Annual golf course rankings in 2008	DMN
Price	1 to 4	Price range from $ to $$$$	Texas State Department of Tourism
Key Independent Variables			
TopDesigner	0/1	Denotes a designer who is ranked in *Golf Digest* as 1, and 0 otherwise	GolfDigest.com
NumberofTopDesigners	0 to 4	The number of top designers, who participated in a golf course	DMN, GolfDigest.com
DesignerRankedCourses	0 to 62	The top designer(s)’ previous ranked courses	DMN, GolfDigest.com
DesignerRankedYears	0 to 1,314	The accumulated years of top designer(s)’ ranked courses	DMN, GolfDigest.com
PGAStar	0/1	Denotes a designer who has ever won a men’s major golf championships as 1, and 0 otherwise	Masters.com, PGA.com, TheOpen.com, and USOpen.com
PGAWins	0 to 18	Total number of wins of top designer(s)’ previous men’s major golf championships	Masters.com, PGA.com, TheOpen.com, and USOpen.com
Control Variables			
Region	Big Bend Country, Gulf Coast, Hill County, Panhandle Plains, Piney Woods, Prairies and Lakes, and South Texas Plains	Dummy variables for each Texas Region	Texas State Department of Tourism
ClubTotalHoles	Positive	Sum of number of holes across all separate golf courses at a country club	DMN, GolfLink.com
Private Club	0/1	Indicator variable (1=Private Golf Club, 0=others)	DMN, GolfLink.com
Resort Club	0/1	Indicator variable (1=Resort Golf Club, 0=others)	DMN, GolfLink.com
Selection Model			
NumberofCourses	1 to 44	Number of golf courses in the city in which course is located	U.S. Census Bureau
ChampionshipYards	805 to 7508	Number of championship golf course.	DMN, GolfLink.com
Housing ($)	38,900 to 243,900	Median value of housing price in county within which course is located	U.S. Census Bureau

Notes: DMN = *Dallas Morning News*.

Independent Variables The key independent variables related to our research hypotheses are the following. *TopDesigner* is a binary variable denoted as “1” if the golf course is designed by a top designer and “0” otherwise. *PGAStar* is a binary variable that is “1” if the designer has won a major men’s golf championship and “0” if the designer has not won in a major tour as a player. We also generate three additional explanatory variables representing different facets of the use of top designers: *NumberofTopDesigners*, *DesignerRankedCourses*, and *DesignerRankedYears*.

NumberofTopDesigners indicates the number of top designers who participated in designing a golf course, since some courses have been designed by multiple designers. The *DesignerRankedCourses* variable provides a count of the top designers' previously ranked golf courses, and the *DesignerRankedYears* variable shows the accumulated years of the top designers' ranked golf courses. We use these variables in addition to the *TopDesigner* variable. Similarly, we constructed the *PGAWins* variable to represent effects of lead user characteristics.

Control Variables We also include golf course characteristics as control variables in our model. We use variables pertaining to course operations and processes. The *Private* and *Resort* indicator variables indicate whether a golf course is a private or resort golf club. *ClubTotalHoles* provides a sum of the number of holes across all separate golf courses at a country club. Finally, *Region* consists of a series of dummies to control for regional course categories, based upon seven Texas course regions as defined by the Texas department of tourism.

In addition, since we need to model the treatment effect of using a top designer, we use in three explanatory variables for this model. *NumberofCourses* provides a count of how many golf courses a city has, representing local competition. For instance, if many golf courses are already located in a golf club developer's city, the developer may be more likely to hire a top designer. *ChampionshipYards* indicates the length of the championship golf course. In general, the longer the golf course is, the harder to design a golf course, because the golf course requires a balanced difficulty level. Thus, if a developer wants to create a long golf course, the developer may be more likely to hire a top designer who already has experience with longer championship distance golf courses. Finally, *Housing* price for nearby real estate represents the nature of local customer demand. If the housing price is high, customers may have more economic means to afford top designer experiences and the golf course developer is likely to use a top designer to meet demand.

EMPIRICAL FINDINGS

Econometric results

To estimate our regression model, we employ Quandt's (1958, 1972) treatment effects method as previously described. For efficiency, we use robust standard error estimation. Table 2 provides results for the quality models while Table 3 presents results for price models. Models 1 to 4 analyze the impact of top designers (H1 and H2), and models 5 to 7 analyze the moderator effects of a lead user (H3 and H4). Since we measure quality as the ranking of each golf course, the negative direction of the estimator will indicate a positive relationship between quality and the explanatory parameters.

Since the treatment effect model assumes correlation ρ between the selection equation and the regression equation is non-zero to avoid estimation bias, we need to check ρ for both Table 2 and Table 3. Models (1) to (7) indicate ρ is non-zero and significant at the $p < 0.01$ level (Wald test). Thus, we can conclude that our models are appropriate. All models' inverse Mill's ratio (λ) were statistically significant. For the goodness of fit, we check a Wald test of the regression model (Equation (2), (3)), and the chi-square results of all models were statistically significant at the $p < 0.01$ level. Therefore, our regression models in Table 2 and Table 3 are appropriate for the treatment effect model. As can be seen, the propensity to using a top designer increases if the county housing price is more expensive, there are more other golf clubs in the city, or the golf course developer will build a long championship course.

Table 2. Estimation of the Quality Model

Regression Model	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Intercept	108.258***	108.324***	107.059***	107.434***	108.209***	107.890***	108.014***
	(1.533)	(1.517)	(1.565)	(1.612)	(1.512)	(1.482)	(1.477)
TopDesigner (Selection Indicator)	-18.728***	1.128	-8.578***	-11.764***	-16.429***	-16.909***	-16.34***
	(3.096)	(6.621)	(3.158)	(3.321)	(3.159)	(3.174)	(3.123)
NumberofTopDesigners		-15.890***					
		(4.971)					
DesignerRankedCourses			-1.016***				
			(0.254)				
DesignerRankedYears				-0.0460***			
				(0.0169)			
PGAStar					-10.696		5.942
					(6.628)		(10.051)
PGAWins						-1.0310*	-0.615
						(0.5796)	(0.958)
Region Controls	Included	Included	Included	Included	Included	Included	Included
ClubTotalHoles	-0.2364***	-0.2602***	-0.2248***	-0.2209***	-0.2407***	-0.2305***	-0.235***
	(0.074)	(0.074)	(0.079)	(0.0815)	(0.073)	(0.071)	(0.071)
Private	-10.104***	-8.8876***	-8.933***	-9.485***	-9.385***	-9.4706***	-9.32***
	(1.736)	(1.724)	(1.737)	(1.756)	(1.745)	(1.768)	(1.75)
Resort	-25.137***	-25.8044***	-19.885***	-21.728***	-24.099***	-25.2760***	-24.645***
	(6.792)	(6.832)	(7.697)	(7.40)	(7.227)	(7.002)	(7.27)
Selection Model							
Intercept	-3.9091***	-3.8960***	-3.8952***	-3.9256***	-3.887***	-3.883***	-3.9047***
	(0.53605)	(0.5315)	(0.519)	(0.528)	(0.532)	(0.53)	(0.525)
Housing	6.77E-06***	6.82E-06***	6.84E-06***	6.85E-06***	6.73E-06***	6.75E-06***	6.74E-06***
	(1.55E-06)	(1.55E-06)	(1.55E-06)	(1.55E-06)	(1.55E-06)	(1.55E-06)	(1.56E-06)
NumberofCourses	0.01351***	0.0126**	0.0124***	0.01288***	0.0132***	0.0132***	0.0127***
	(0.00514)	(0.0050)	(0.005)	(0.005)	(0.0051)	(0.0051)	(0.005)
ChampionshipYards	0.000349***	0.00035***	0.0003***	0.00035***	0.0003***	0.0003***	0.0003***
	(0.00007)	(0.0001)	(0.00007)	(0.00007)	(0.0001)	(0.0001)	(0.0001)
Observations	585	585	585	585	585	585	585
χ^2 (df)	129.4(10)	142.27(11)	176.2(11)	157.1(11)	124.53(11)	130.9(11)	127.72(12)
λ	3.6575	3.2677	3.1609	3.5089	3.4268	3.3889	3.367
ρ	0.2238	0.2064	0.2107	0.2262	0.2119	0.2097	0.208

Notes: Ɨp<0.1, *p<0.05, **p<0.01, ***p<0.001; robust standard errors of each coefficient are presented in parentheses.

Moving to Table 2, the results of our estimation for quality are significant and consistent. Model 1 presents an estimate of the specification that using a top designer positively relates to the golf course's quality (i.e., η = -18.728, $p < 0.001$). That is, other things held equal, a golf course designed by a top designer had a mean score that was 18.728 rankings better than a golf course that was not designed by a top designer. Models 2, 3, and 4 differ from Model 1 in that they include different qualitative characteristics of top golf course designers. These characteristics show whether golf course quality gets better when more top designers are involved the course (Model 2), as well as whether the top designer(s)' number of ranked courses (Model 3) or ranked years (Model 4) are associated with quality. We observe results consistent with Model 1. Thus, the findings support Hypothesis 1.

To estimate moderating effects of a lead user top golf player, we include the *PGAStar* variable with top designer (Model 5). The direction indicates that star golfer designers are positively related to quality, but the estimate is not significant. Model 6 provides weak evidence that characteristics of a top golfer (*PGA Winnings*) are associated with quality. Thus, we cannot strongly support the Hypothesis 3 that a lead user improves the relationship with quality.

Table 3. Estimation of the Price Model

Regression Model	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Intercept	1.4325***	1.4272***	1.4607***	1.453***	1.4386***	1.445***	1.434***
	(0.111)	(0.112)	(0.111)	(0.111)	(0.1106)	(0.111)	(0.114)
TopDesigner	1.708***	1.438***	1.591***	1.6222***	1.632***	1.676***	1.631***
(Selection Indicator)	(0.155)	(0.213)	(0.164)	(0.164)	(0.169)	(0.16)	(0.169)
NumberofTopDesigners		0.2078***					
		(0.0885)					
DesignerRankedCourses			0.0107***				
			(0.0037)				
DesignerRankedYears				0.00047**			
				(0.0002)			
PGAStar					0.248*		0.299*
					(0.115)		(0.147)
PGAWins						0.0139	-0.0067
						(0.009)	(0.010)
Region Controls	Included	Included	Included	Included	Included	Included	Included
ClubTotalHoles	0.014**	0.0147***	0.0133**	0.0134**	0.014**	0.0136**	0.014**
	(0.006)	(0.0062)	(0.006)	(0.0061)	(0.006)	(0.006)	(0.006)
Private	0.7346***	0.716***	0.7184***	0.725***	0.716***	0.7247***	0.716***
	(0.734)	(0.0744)	(0.0735)	(0.074)	(0.075)	(0.074)	(0.074)
Resort	0.1584***	1.164***	1.154***	1.159***	1.130***	1.163**	1.121***
	(0.169)	(0.172)	(0.19)	(0.084)	(0.174)	(0.169)	(0.180)
Selection Model							
Intercept	-3.3268***	-3.344***	-3.343***	-3.9256***	-3.361***	-3.333***	-3.365***
	(0.482)	(0.478)	(0.466)	(0.528)	(0.486)	(0.481)	(0.488)
Housing	5.83E-06***	6.0E-06***	5.95E-06***	5.96E-06***	5.83E-06***	5.85E-06***	5.82E-06***
	(1.35E-06)	(1.4E-06)	(1.36E-06)	(1.36E-06)	(1.36E-06)	(1.36E-06)	(1.36E-06)
NumberofCourses	0.0072**	0.0064*	0.0065*	0.0068*	0.0071**	0.0072**	0.0072**
	(0.0035)	(0.0037)	(0.0036)	(0.0036)	(0.0036)	(0.0036)	(0.0036)
ChampionshipYards	0.0003***	0.0003***	0.0003***	0.0003***	0.0003***	0.0003***	0.0003***
	(0.0001)	(0.0001)	(0.00006)	(0.00006)	(0.0001)	(0.0001)	(0.0001)
Observations	571	571	571	571	571	571	571
χ^2 (df)	730.52(10)	771.86(11)	743.88(11)	729.13(11)	915.13(11)	892.42(11)	931.74(12)
λ	-0.8007	-0.7883	-0.7899	-0.792	-0.780	-0.792	-0.779
ρ	-0.8611	-0.8545	-0.8567	-0.857	-0.848	-0.855	-0.848

Notes: ǂp<0.1, *p<0.05, **p<0.01, ***p<0.001; robust standard errors of each coefficient are presented in parentheses.

Table 3 reports regression estimates for price. As with Table 2, Models 1 to 4 measure the impacts of top designers upon price, and Models 5 to 7 estimate moderating effects of a lead user. Model 1 presents evidence that a top designer is positively related to the golf course's price (i.e., λ = 1.708, p< 0.001). That is, other things held equal, a golf course designed by a top designer had a mean price score that was 1.708 (out of 4) higher than a golf course that was not designed by a top designer. Models 2, 3, and 4 also support the finding from Model 1, providing further evidence that using a top designer is positively related to the price. Therefore, the findings support Hypothesis 2.

While using a lead user did not strongly relate to quality, *PGAStar* is significant in the price model ($p < 0.05$). Thus, we find support for Hypothesis 4. However, the extent of player wins *(PGAWins)* is not significant in the price models. The findings indicate that how well the lead user designer played golf may not be a crucial factor.

DISCUSSION AND CONCLUSION

This study examines whether top designers affect service performance, notably service quality and service price. In addition, we measure whether lead users moderate the relation between the top designer and service performance. Our study extends previous service research on service performance to the golf industry, reinforces prior studies that show the use of expert specialists positively affect a firm's overall performance, and demonstrates the moderating impact of a lead user upon performance. To our knowledge, our study is the first research to contribute empirical evidence concerning the top designer's potential impact on service operations. Thus, we expect this paper can provide a productive steppingstone for future service operations work.

Indeed, we hope these findings can generate interest in examining the roles of service personnel upon other service factors. Academics in service operations need to look more skeptically and critically at the roles and performance of service designers, service managers, service executives, and so on. In accounting, for instance, research on impacts of CEOs and top executives has been explored for a long time [11] [16] [17] [38]. However, the field of service operations has not seriously examined performance of key service management personnel or designers. In this way, we break new ground by examining top service designer performance.

Limitations of our research also exist. One limitation concerns the sources of data. Since we obtain our data set from several external sources, we cannot control how the external information is obtained by the firms collecting it. Therefore, we have to assume that the data sets are collected correctly. A second potential limitation is the size of the sub-sample for the lead user moderation hypothesis. The moderate sample size may contribute to the insufficient evidence of convincing statistical significance for this variable. Thus, if we could obtain more and better data, the results might be more significant.

We see several opportunities for future research. First, since our study is based on cross sectional analysis, future studies can explore the impacts of top designers across time using panel data. For improved generalizability, future researchers can extend their data sets from Texas to other states, the USA as a whole, or other countries' golf courses. Second, other important factors may affect quality and price in addition to our proposed factors. Thus, considering other operating features is worthy in future research studies. Finally, we view this study as only the first stepping-stone for a stream of literature on the impact of top designers and other service personnel, for which little research has been done so far. Other methodological approaches, such as mathematical modeling, experiments, or case studies can also fertilize this important service operations topic.

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