International Journal for Quality Research 13(3) 591–604
ISSN 1800-6450

Iman Adeinat[1]

Article info:
Received 04.03.2019
Accepted 07.06.2019

UDC – xxxxxxxxxx
DOI – 10.24874/IJQR13.03-06

MEASURING SERVICE QUALITY EFFICIENCY USING DINESERV

Abstract: *Many Instruments that are developed and used to measure and evaluate the service quality do not provide a metric for firms to reference in order to adjust their resources to improve service quality. To address this deficit, this study aims at measuring the relative service-quality efficiency of fast food restaurants in a franchise system using data envelopment analysis (DEA). According to the results of the DEA model, efficient and inefficient outlets in the franchise system are identified even though there are no statistically significant differences between the restaurants in regard to their respective service quality scores. The findings open up a new discussion on how would service provider view service quality while taking into consideration efficiency of their business since the results suggest that when firms focus strongly on service quality, a decline in efficiency may result.*

Keywords: *DINESERV, Data envelopment analysis, Service quality, Benchmarking.*

1. Introduction

Since the proposal of Service Dominant (S-D) Logic (Vargo & Lusch, 2004), service providers with an S-D logic orientation have placed their customers at the heart of their business activities. That is, such service providers have focused on the factors that impact customer satisfaction and loyalty and ultimately service quality has come to be seen as an essential factor in driving financial performance. In fact, firms that excel in terms of service quality can show a distinct competitive advantage, which leads to consistently superior performance as compared to that of other firms.

To retain their customers in a competitive market, service providers must ensure that consistent service quality is maintained in order to satisfy customers' needs, which can be wide-ranging and complex (Wang, Wang, & Tai, 2016). However, because of the unique attributes of service quality in the service industry and the fact that service quality is assessed by customer perception and the interaction between the service provider and the customer (co-production), service providers have to understand how customers perceive the quality of services provided and how these perceptions translate into customer satisfaction and loyalty (Olorunniwo et al., 2006; Tse & Wilton, 1988). In fact, Hult et al. (2017) tested the drivers for customer satisfaction using three factors: perceived quality, perceived value, and customer expectations. Their structural model results show that perceived quality has a strong and positive influence on both perceived value and customer satisfaction.

One business model that offers substantial advantages for consistent service quality is franchising (Knott, Corredoira, & Kimberly,

[1] Corresponding author: Iman Adeinat
Email: iadeinat@kau.edu.sa

2008). In a franchise system, customers expect to receive the same standard of service or quality regardless of a store or service's location and regardless of the form of management at any given operation, thus the need to ensure consistent service quality ends up to be an essential strategic competency for franchisor who are likely interested in building superior customer satisfaction and loyalty and well eventually help in building a strong brand. Cao & Kim (2015) argued that customer perception of underperforming service quality in one unit could potentially lead to poor perception about the brand as a whole.

The franchise system has been is prominent part in the hospitality industry where franchisees can provide franchisor with the specialized knowledge in product design and marketing. In addition, franchising can facilitate building a competitive advantage for the franchisor since they can offer managerial and financial resources to ensure the business success of the franchisor (Stanworth et al., 2004). Sun and Lee (2018) argued that providing such needed support in equipping the franchisor with knowledge and resources that would aid in building their competitive advantage is more critical in the hospitality industry compared to other service industries. However, hospitality industry is very competitive which would require high quality services that may provide competitive advantage for service provider (Zaibaf et al., 2013). In fact, Zaibaf et al. (2013) results indicate a positive and significant effect of perceived quality on customer satisfaction in the hospitality industry.

In the management literature, many models and instruments have been used to assess service quality. The earliest and most popular assessment tool is the SERVQUAL instrument based on the GAP model (Parasuraman, Zeithaml, & Berry, 1985). (For a comprehensive review of service quality instruments see Seth, Deshmukh, and Vrat (2005). The SERVQUAL instrument was then pursued by many other models that sought to develop the generic SERVQUAL. One such model, which is of interest to this research, is DINESERV (Stevens, Knutson, & Patton, 1995), which is used to measure service quality in restaurant-type settings. The DINESERV instrument has been used in many restaurant settings, including fine dining (Knutson, Stevens & Patton, 1996), casual dining (Kim, McCahon, & Miller, 2003), fast food (Adeinat & Gregg, 2018; Bougoure & Neu, 2010; Wang, Lin & Tsai, 2018), food courts (Keith & Simmers, 2011), chain restaurants (Polyorat & Sophonsiri; 2010), and school dinning (Kim, Ng, & Kim, 2009).

DINESERV is of great use in measuring the performance of restaurants because it has the ability to compare the overall quality scores of service units with the average performance of a set of similar service units under consideration in order to identify those that are underperforming, those that are performing to an average standard, and those that are performing to the highest standards. However, this approach, though useful in terms of a general indicator of standards provides little guidance to service providers in regard to the specific quality dimension(s) that underperforming service units should focus on in order to effect needed improvements.

To address this limitation, the present paper relies on data envelopment analysis (DEA) to determine the efficiency of individual service units. DEA is a linear programming tool used to measure the relative efficiency of decision-making units (DMUs) with complex relations between multiple inputs and multiple outputs. DEA does not assign any prescribed functional forms or any prescribed weights to each input and output. In addition, Paradi and Zhu (2013) emphasized that DEA can be used successfully to provide benchmarking guidelines for inefficient DMUs by assigning efficient DMUs to function as role models. In fact, in the fast food industry Min and Min (2011) stressed out that benchmarking is considered an effective way to sustain

service excellence in the industry.

Although DEA was originally developed to measure the efficiency of DMUs with multiple inputs and multiple outputs, dealing with service quality in this context is challenging as the relevant service-quality dimensions are more difficult to identify as an input or output than is the case with conventional production processes. Using the SERVQUAL gap as a pure input model, Charles and Kumar (2014) assessed the service of 13 major banks in Malaysia. Other researchers have considered service-quality dimensions as an output of the DEA model (Lee & Kim; 2014; Najafi, Saati, & Tavana, 2015; Soteriou & Stavrinides, 2000).

However, the links in the framework of the service profit chain (SPC) proposed by Heskett et al. (1994) clearly show that service quality constitutes an input to customer satisfaction and customer loyalty. Many researchers have confirmed the positive significant relationship between service quality and customer satisfaction and customer loyalty (see Adeinat & Kassim, 2019; Kamakura et al., 2002; Maddern et al., 2007; Maritz & Nieman, 2008; Pritchard & Silvestro, 2005; Silvestro & Cross, 2000; Yee et al., 2011, among others) in different industries and in developing and developed countries. Therefore, the present study utilizes the gap in the dimensions of service quality as the inputs for the DEA model and use customer satisfaction and loyalty as the outputs for the model. This approach is used to determine the service quality of fast food restaurants in a franchise system.

In order to evaluate these DMUs, the study control for ownership and location to obtain a group of DMUs that are similar in terms of inputs, outputs, and management style. Whereas Adeinat and Gregg (2018) assessed the service quality of fast food franchises owned by the same franchisee and found evidence of consistent service quality across them. This present study consider how to rate differences in service quality and efficiency across franchise units. It is expected to find that the relative DEA efficiency score will provide insights into any difference in efficiency between DMUs, thereby establishing a basis for benchmarking the DMUs in terms of both efficiency and service quality.

The remainder of this paper is organized as follows. In Section 2, the mathematical model related to DEA is presented. In Section 3, the DINESERV instrument employed to measure service quality in restaurant settings is introduced and described. Section 4 comprises descriptions of the data collection procedure and the study sample, and Section 5 presents the finding and analysis. Finally, in Section 6, the results are explored further and the implications of the research findings are discussed.

2. Mathematical model

DEA is a linear programming model designed to determine the relative efficiency of decision-making units' performance as characterized by multiple attributes. First proposed by Charnes, Cooper, and Rhodes (1978) (CCR, hereafter) based on the work of Farrell (1957), DEA is considered a powerful management tool for determining the efficiency of similar entities. In fact, a wide variety of DEA applications have been implemented in various settings such as hospitals (Miller et al., 2017; O'Neill et al., 2008), airports (Lozano, Gutiérrez, & Moreno, 2013; Yoshida & Fujimoto, 2004), banks (Staub et al., 2010; Schaffnit, Rosen & Paradi, 1997), and schools (Sagarra, Mar-Molinero & Agasisti, 2017).

The defining purpose of DEA is to determine the efficiency of DMUs while estimating the relative efficiency of each. Consider a set of j restaurants. Each restaurant in the set has a vector of inputs $X = (x_{1j}, x_{2j}, \dots, x_{ij})^T$ that produce a vector of outputs $Y = (y_{1j}, y_{2j}, \dots, y_{rj})^T$. The relative efficiency (ϕ) is then defined as the ratio of the weighted sum of its outputs to the weighted

sum of its inputs and is calculated as follows:

$$\phi = \frac{\sum_r u_r y_{ro}}{\sum_i v_r x_{io}} \quad (1)$$

where u_r is the weight given to input x_{io} and v_i is the weight given to output y_{ro}. The relative efficiency ϕ is used to determine the relative ratios of the DMUs as the CCR construction of reducing the multiple-output/multiple-input situation for each DMU. In this model, each DMU determines its own optimal weights and achieves its highest level of efficiency. The CCR model can then be stated as

$$\begin{aligned} &\max \phi \\ &\text{s. t.} \\ &\frac{\sum_r u_r y_{ro}}{\sum_i v_r x_{io}} \leq 1 \ \forall j \\ &u_r, v_i \geq 0 \text{ for } i \text{ and } r \end{aligned} \quad (2)$$

To transform this CCR model into a linear programming (LP) model, the denominator is fixed to a constant value, which translates into a new constraint on weight v_i. This transformation results in the following model:

$$\begin{aligned} &\max \sum_r u_r y_{ro} \\ &\text{s. t.} \\ &\sum_i v_r x_{io} = 1 \\ &\sum_r u_r y_{ro} \leq \sum_i v_r x_{io} \ \ \forall j \\ &u_r, v_i \geq 0 \text{ for } i \text{ and } r \end{aligned} \quad (3)$$

In general, the efficiency score is usually given by a number between 0 and 1. The efficiency score of any one DMU shows its efficiency relative to that of the other units in the sample. To compute the CCR model, a dual LP model is preferable. Thus, the dual CCR model can be stated as

$$\begin{aligned} &\min \Theta_j \\ &\text{s. t.} \\ &\sum_i \lambda_j x_{io} \leq \Theta x_{io} \\ &\sum_r \lambda_j y_{ro} \geq y_{ro} \\ &\lambda_j \geq 0 \\ &u_r, v_i \geq 0 \end{aligned} \quad (4)$$

As noted above, DEA is also used to benchmark the DMUs and to set target values for the inputs and outputs for an inefficient DMU to achieve. For example, the target value for an input is set by multiplying the input value by the optimal efficiency score and then subtracting the slack values. Then, the slack values can be determined using the following LP model:

$$\begin{aligned} &\max \sum_m s_i^- + \sum_s s_r^+ \\ &\text{s. t.} \\ &\sum_i \lambda_j x_{io} + s_i^- = \Theta x_{io} \\ &\sum_r \lambda_j y_{ro} - s_r^+ = y_{ro} \\ &\lambda_j \geq 0 \\ &u_r, v_i \geq 0 \text{ for } i \text{ and } r \end{aligned} \quad (5)$$

3. Measuring Service Quality: DINESERV Instrument

Stevens, Knutson, and Patton (1995) introduced the DINESERV instrument to assess customers' perceptions of the service quality at restaurants. Adapted from the SERVQUAL model developed by Parasuraman et al. (1985), DINESERV is considered a reliable and relatively simple tool for determining how customers view a restaurant's quality. In fact, the DINESERV model has been validated by scholars in multiple dining settings. Specifically, Stevens, Knutson, and Patton (1995) validated the use of DINESERV for measuring service quality in three distinct restaurant settings: quick service,

casual/theme, and fine dining restaurants. Kim, McCahon, and Miller (2003) validated the service dimensions of DINESERV in casual dining restaurants in Korea while highlighting possible differences between them in terms of the perceived service quality of each.

Kim, Ng, and Kim (2009) investigated the relative importance of the five dimensions of the DINESERV instrument for customer satisfaction with dining facilities at a US public university. Their results show that each of the five dimensions had a significant positive effect on customer satisfaction. Using a similar approach, Polyorate and Sophonsiri (2010) utilized the five dimensions of the DINESERV instrument to determine the potential influence of each dimension on customer satisfaction with and loyalty to chain restaurants in Thailand. Their results show that only two of the five dimensions have a significant influence on customer satisfaction and customer loyalty: namely, tangible and empathy.

The DINESERV instrument comprises a 29-item service-quality scale covering five dimensions of quality: tangible (TAN), reliability (REL), responsiveness (RES), assurance (ASS), and empathy (EMP). Some studies present a modified version of DINESERV and include other dimensions of quality such as the taste of the food, price, cleanliness, location, amenities, safety, employee courtesy, operating hours, and the availability of healthy menu choices (Kara, Kaynak, & Kucukemiroglu, 1995; Min & Galle, 1996; Tsai, Shih, Chen & 2007).

The survey used in this study comprises the 29 DINESERV items. The respondents were asked to rate each of the 29 statements using a 7-point Likert scale. In addition, as part of the survey, the respondents were asked to rate their level of satisfaction with and loyalty to the restaurant. In particular, four items designed to measure customer satisfaction (SAT) were developed to assess the customers' level of satisfaction with the purchased meal, the service provided, the transaction, and handling of customer dissatisfaction. In terms of customer loyalty (LOY), five items were developed to assess the extent to which customers were likely to make more purchases in the future and to recommend the restaurant to others. The complete survey used in this study can be found in the Appendix.

4. Sample and data collection

To control for franchisee ownership, three restaurants owned by the same franchisee were selected. The name of the chain restaurant is withheld due to a non-disclosure agreement with the franchises management. The three selected DMUs are located in south Kanas City in the US. DMU1, the oldest location, opened in 1997, followed by DMU2, which opened in 2000, and DMU3, which opened in 2005. The DMUs range from between 3,000 to 4,500 sq. ft. The average number of customers served daily varied considerably between the DMUS: DMU2 had the highest daily average of 375 customers; DMU1 came in second with 366 customers, followed by DMU3 with only 150 customers.

The customers at the three DMUs constituted the target population for the study. The respondents were targeted at the DMUs, where the author distributed the surveys in person after the customers had ordered their food and was sitting down ready to eat. The customers were asked to fill out the survey after they had finished eating and to bring the completed survey to the counter at the front of the restaurant. The author gave the respondents a chance to ask any questions they might have while filling out the survey and to add their own comments at the end of the survey if they wished. The fieldwork took place over a one-month period.

One hundred and twenty surveys were handed out equally in each of the DMUs of which ninety surveys were obtained, of which seven were excluded because of

missing data. The sample size was determined using Cochran's sample size formula (Barlett et al., 2001). In which, sample size n=(z^2 p(1-p))/m^2 , where z =1.645 for 90% confidence interval, m: margin of error which generally ranges from 3% to 7% in social science research, and p: is the estimated value of the proportion of a sample that will respond a given way to survey questions. The respondents represent a diverse sample in terms of educational level, gender, and age. In terms of educational level, the highest level achieved by 12% of the respondents was a High School diploma, for 72% the highest level was a bachelor's degree, and for about 16% the highest level was higher education.

The respondents ranged in age as follows: 13% were aged between 18 and 24, 24% were between 24 and 34, about 15% were between 35 and 44, 30% were between 45 and 60, and the rest were 20 years of age and older. In regard to gender, 40% of the respondents were male and 60% were female. Table 1 shows the respondents' profile for each of the three DMUs.

Table 1. Respondents' Profile for Each Location

		DMU1	DMU2	DMU3
Gender	Male	53.57%	40.74%	25.00%
	Female	46.43%	59.26%	75.00%
Educational level	High school diploma	10.71%	11.11%	14.29%
	Bachelor's degree	60.71%	74.07%	82.14%
	Higher Ed.	28.57%	14.81%	3.57%
Age group	18–24	14.29%	11.11%	14.29%
	25–34	17.86%	25.57%	28.57%
	35–44	14.29%	14.81%	14.29%
	45–60	28.57%	44.44%	17.86%
	>60	21.43%	18.52%	14.29%

Source: Survey data

5. Analysis and findings

Next, the reliability of the measure is established used for the survey. The reliability measurement instrument was determined using Cronbach alpha coefficients (Cronbach, 1951). Table 2 shows that the Cronbach alpha coefficient for all the constructs ranged from 0.742 to 0.937, which is considered a very high level of reliability

Table 2. Reliability Test

	DMU1	DMU2	DMU3
TAN	0.876	0.922	0.910
REL	0.782	0.937	0.787
RES	0.816	0.749	0.848
ASS	0.854	0.914	0.816
EMP	0.835	0.856	0.742
SAT	0.865	0.852	0.841
LOY	0.798	0.793	0.756

Source: SPSS output

Based on DINESERV, Table 3 reports the results for the expectation and perception score for each of the five dimensions for each DMU. The items with the highest expectation scores were REL and EMP. For example, DMU1's highest expectation scores were for REL and RES, DMU2's highest expectation scores were for REL and ASS, and DMU3's highest expectation scores were for REL and ASS. On the other hand, the highest perception scores were also REL and EMP: DMU's1 highest perception scores were for REL and EMP, DMU2's highest perception scores were for REL and ASS, and DMU3's highest perception scores were for REL and ASS. In summary, REL seems to be the most valued attribute from the customer point of view for each of the DMUs.

In addition, service quality scores (SQ) can be determined as the average of customers' perceptions for service quality dimensions. All three DMUs have relatively had very high score on service quality. DMU2 received the highest score (*SQ=6.41*) followed by DMU1 (*SQ=6.38*) and finally DMU3 (*SQ=6.33*). Further to test if any statistical difference between the SQ at these DMUs exist ANOVA test is carried out. The ANOVA result suggest that no statistical difference in the level of service quality $F(2, 86) = 0.66, p = 0.52$.

To test whether service quality scores differ based on gender amongst respondent, one way ANOVA was carried out for the entire sample size and the result suggest that there is no statistical difference among female and male group $F(5, 83) = 1.69, p = 0.15$. In addition, the ANOVA results for the individual DMU suggests no statistical difference between gender groups in both DMU1 ($F(3, 25) = 1.09, p = 0.37$) and DMU 2 ($F(3, 26) = 1.69, p = 0.14$), but it does indicate that a statistical difference between female and male view on service quality in DMU3 $F(2, 27) = 3.46, p = 0.05$, which could be explained by the disproportioned sample in regard to gender in DMU3 compared to the two other DMUs (see Table 1).

Table 3. Customers' Expectations and Perceptions

	TAN	REL	RES	ASS	EMP
Customers' expectations					
DMU1	6.50	6.69	6.60	6.58	6.65
DMU2	6.52	6.71	6.63	6.83	6.65
DMU3	6.56	6.70	6.61	6.67	6.66
Customers' perceptions					
DMU1	6.18	6.52	6.40	6.47	6.32
DMU2	6.28	6.55	6.35	6.63	6.23
DMU3	6.24	6.48	6.33	6.36	6.24

Source: SPSS output

As discussed, the focus of the present study is the gap score—i.e., the difference between the customers' expectations and the customers' perceptions — on each DINESERV dimension as inputs to the DEA model, with SAT and LOY serving as the model outputs. Najafi, Saati, and Tavana (2015) argued that the CCR model without inputs (or without outputs) is meaningless. In fact, an input- (or output-) oriented CCR model coincides with the corresponding Banker-Charnes-Cooper (BCC) model (Banker, Charnes & Cooper, 1984). On this basis, the model has five inputs and two outputs for each DMU included in the study, as reported in Table 4.

It is worth noting that the highest gap scores were for TAN, EMP, and RES. More specifically, DMU1's highest gap scores were for TAN and EMP, DMU2's highest gap scores were for RES and EMP, and DMU3's highest gap scores were for TAN and EMP. The disparities of service quality gap scores are not surprising given that different level of management evolvement in these DMUs, as reported by employees, even though it is the same investor. In addition, it is clear that the gap score in EMP was found in all DMUs which indicate that customers of this franchise feel that they are not given attention to their needs. Management should focus on giving proper training to their employees to address customer needs and reduce the gap between customer perception and expectation in regard to empathy. Adeinat and Kassim (2019) argued that investment in frontline employees in the service industry is critical to customers' perception of service quality and so management in the service industry should recognize the need to revamp recruiting and training practices.

Table 5 reports the efficiency score for each DMU. The scores show that two of the three restaurants, DMU1 and DMU2, are operating efficiently, whereas DMU3 is considered inefficient. This result suggests that similar service-quality scores across restaurants do not indicate that they are operating at a similar level of efficiency in terms of inputs and outputs. In fact, Brissimis and Zervopoulos (2012) argued that an increase in perceived service quality

may require additional resources, which could, in turn, reduce a restaurant's efficiency score.

Table 4. Inputs and Outputs for the DEA Model

	Inputs						Outputs	
	TAN	REL	RES	ASS	EMP		SAT	LOY
DMU1	0.32	0.17	0.20	0.11	0.33		6.59	6.15
DMU2	0.24	0.16	0.28	0.20	0.42		6.75	6.36
DMU3	0.32	0.22	0.28	0.31	0.42		6.16	5.32

Source: SPSS output

Table 5 reports the results for the λ (lambda) weights, which are estimated by solving the dual version of the LP in (Eq. 4). The λ scores represent the efficiency reference set for each inefficient DMU. Thus, the inefficient DMU3 can be benchmarked with both DMU1 and DMU2. The λ weights are very close in value for DMU1 and DMU2; however, the immediate goal of DMU3 would be to become more like DMU1 rather than more like DMU2, as observed from the respective λ weights of DMU1 and DMU2 ($\lambda 1 = 0.498$, $\lambda 2 = 0.427$, respectively). It is worth noting that Table 5 does not report a reference set for the efficient DMUs, which indicates that such DMUs function as their own benchmarks.

Table 5. Efficiency Scores

	Score	Rank	Reference set
DMU1	1.000	1	/
DMU2	1.000	1	/
DMU3	0.818	3	DMU1 (λ = 0.498) DMU2 (λ = 0.427)

Source: DEAP output

In addition to providing a basis for benchmarking, DEA also indicates the extent to which the inputs and outputs for the inefficient DMU must improve in order for that DMU to operate efficiently. Table 6 shows the target value for each input and output for each DMU. The target values are a measure of the slack value added to the proportional reduction amount for each input needed to improve outputs. As can be seen from the table, the target values for efficient restaurants are equivalent to their original values. However, the projection indicates that DMU3 must improve its customer satisfaction level by 22.29% and its customer loyalty level by 32.74%. For DMU3, this can be achieved by reducing the gap score for ASS by 44.74%, REL by 15.02% and RES by 4.35%. It is worth mentioning that the highest reduction in all three DMUs is related to EMP dimension, management can start working on setting training course to their employees that would help in reducing the gap score regarding empathy dimension of quality.

Table 6. Projection Values

		TAN	REL	RES	ASS	EMP	SAT	LOY
DMU1	Original	0.32	0.17	0.20	0.11	0.33	6.59	6.15
	Projection	0.32	0.17	0.20	0.11	0.33	6.59	6.15
DMU2	Original	0.24	0.16	0.28	0.20	0.42	6.75	6.36
	Projection	0.24	0.16	0.28	0.20	0.42	6.75	6.36
DMU3	Original	0.32	0.22	0.28	0.31	0.42	6.16	5.32
	Projection	0.32	0.19	0.27	0.17	0.42	7.53	7.07

Source: DEAP output

6. Conclusion and Implications

Service-quality instruments have been used extensively in the literature to measure and evaluate the average performance of many types of service firms. However, these instruments fail to provide a metric whereby firms can adjust their resources to improve service quality. To overcome this issue, the DEA approach is used herein to measure the relative efficiency of firms that are similar in regard to inputs and outputs in order to determine which firms are operating efficiently and which are operating inefficiently. The approach proposed herein also offers inefficient firms a benchmark for best practices and projections in order to improve their inputs and/or outputs as needed according to the benchmarking protocol.

Scholars who have used DEA to assess service quality have addressed service-quality dimensions as either inputs or outputs on the grounds that it is considerably more difficult to identify the service-quality dimensions than is the case for conventional production processes. In this study, service-quality gaps—i.e., the difference between customers' expectations and customers' perceptions—were considered inputs to the DEA model whereas customer satisfaction and customer loyalty were considered as outputs from the DEA model. According to the results of the analysis, two efficient firms and one inefficient firm were identified and the latter was provided with a reference set as a benchmark for best practices. Another interesting result of this paper is that even firms with similar service quality scores do not necessarily function at a similar level of perceptive. efficiency. It could be that this result is attributable to the fact that a firm's focus on perceived service quality requires additional resources, which may reduce the efficiency score.

Another practical observation is that although the DEA model provides service providers with target values for their inputs and outputs, it is often difficult to eliminate all existing gaps in quality quickly. However, management can use the projected target value estimated by the DEA model to improve service quality in the long term by focusing on the firm's weaknesses and inefficiencies relative to other firms that share same inputs and outputs.

The results of this paper shows that empathy dimension should receive the at most attention as it received the highest gap reduction among the different DMUs under study. This highlights an important managerial implication that shed the light on the importance of improving frontline employees through investment in people and training practices offered to address customer needs.

Finally, some limitations should be addressed. First, this study only examined one fast food service quality from the customer perspective by addressing the gap between their expectations and perception. One of the future scopes of the study could be incorporating management expectations and perceptions towards service quality into the DINESERV to address other gaps in the gap model, the results would be used to benchmark the different DMUs against service quality from the management's

References:

Adeinat, I., & Gregg, C. (2018). Does ownership matter in service quality? *International Journal of Services and Operations Management, 30*(2), 254–266. https://doi.org/10.1504/IJSOM.2018.091908

Adeinat, I. & Kassim, N. (2019). Extending the service profit chain: the mediating effect of employee productivity. *International Journal of Quality & Reliability Management.* https://doi.org/10.1108/IJQRM-03-2018-0064

Banker, R. D., Charnes, A., & Cooper, W. W. (1984). Some models for estimating technical and scale inefficiencies in data envelopment analysis. *Management Science, 30*(9), 1078–1092. https://doi.org/10.1287/mnsc.30.9.1078

Barlett, J., Kotrlik, J.W., & Higgins, C.H. (2001). Organizational research: Determining appropriate sample size in survey research appropriate sample size in survey research. *Information Technology, Learning, and Performance Journal*, *19*(1), 43–50.

Brissimis, S. N., & Zervopoulos, P. D. (2012). Developing a step-by-step effectiveness assessment model for customer-oriented service organizations. *European Journal of Operational Research, 223*(1), 226–233. https://doi.org/10.1016/j.ejor.2012.06.003

Bougoure, U.S., & Neu, M.K. (2010). Service quality in the Malaysian fast food industry: An examination using DINESERV. *Services Marketing Quarterly, 31*(2), 194–212. https://doi.org/10.1080/15332961003604360

Charnes, A., Cooper, W.W., & Rhodes, E. (1978). Measuring the efficiency of decision making units. *European Journal of Operational Research, 2*(6), 429–444. https://doi.org/10.1016/0377-2217(78)90138-8

Charles, V., & Kumar, M. (2014). Satisficing data envelopment analysis: An application to SERVQUAL efficiency. *Measurement, 51*, 71–80. https://doi.org/10.1016/j.measurement.2014.01.023

Cao, Y., & Kim, K. (2015). How do customers perceive service quality in differently structured fast food restaurants?. *Journal of Hospitality Marketing & Management*, *24*(1), 99-117. https://doi.org/10.1080/19368623.2014.903817

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika, 16*(3), 297–334. https://doi.org/10.1007/BF02310555

Farrell, M. J. (1957). The measurement of productive efficiency. *Journal of the Royal Statistical Society. Series A (General), 120*(3), 253–290. https://doi.org/10.2307/2343100

Heskett, J. L., Jones, T. O., Loveman, G. W., Sasser, W. E., & Schlesinger, L. A. (1994). Putting the service-profit chain to work. *Harvard Business Review, 72*(2), 164–174.

Hult, G. T. M., Morgeson, F. V., Morgan, N. A., Mithas, S., & Fornell, C. (2017). Do managers know what their customers think and why?. *Journal of the Academy of Marketing Science*, *45*(1), 37-54. https://doi.org/10.1007/s11747-016-0487-4

Kamakura, W. A., Mittal, V., De Rosa, F., & Mazzon, J. A. (2002). Assessing the service-profit chain. *Marketing Science, 21*(3), 294–317. https://doi.org/10.1287/mksc.21.3.294.140

Kara, A., Kaynak, E., & Kucukemiroglu, O. (1995). Marketing strategies for fast-food restaurants: A customer view. *International Journal of Contemporary Hospitality Management, 7*(4), 16–22. https://doi.org/10.1108/09596119510146823

Keith, N. K., & Simmers, C. S. (2011). Measuring service quality perceptions of restaurant experiences: The disparity between comment cards and DINESERV. *Journal of Foodservice Business Research, 14*(1), 20–32. https://doi.org/10.1080/15378020.2011.548209

Kim, H. J., McCahon, C., & Miller, J. (2003). Assessing service quality in Korean casual-dining restaurants using DINESERV. *Journal of Foodservice Business Research, 6*(1), 67–86. https://doi.org/10.1300/J369v06n01_05

Kim, W. G., Ng, C. Y. N., & Kim, Y. S. (2009). Influence of institutional DINESERV on customer satisfaction, return intention, and word-of-mouth. *International Journal of Hospitality Management, 28*(1), 10–17. https://doi.org/10.1016/j.ijhm.2008.03.005

Knott, A. M., Corredoira, R., & Kimberly, J. (2008). Improving consistency and quality of service delivery: Implications for the addiction treatment field. *Journal of Substance Abuse Treatment, 35*(2), 99–108. https://doi.org/10.1016/j.jsat.2007.09.005

Knutson, B. J., Stevens, P., & Patton, M. (1996). DINESERV: Measuring service quality in quick service, casual/theme, and fine dining restaurants. *Journal of Hospitality & Leisure Marketing, 3*(2), 35–44. https://doi.org/10.1300/J150v03n02_04

Lee, H., & Kim, C. (2014). Benchmarking of service quality with data envelopment analysis. *Expert Systems with Applications, 41*(8), 3761–3768. https://doi.org/10.1016/j.eswa.2013.12.008

Maddern, H., Maull, R., Smart, A., & Baker, P. (2007). Customer satisfaction and service quality in UK financial services. *International Journal of Operations & Production Management, 27*(9), 999–1019. https://doi.org/10.1108/01443570710775838

Maritz, A., & Nieman, G. (2008). Implementation of service profit chain initiatives in a franchise system. *Journal of Services Marketing, 22*(1), 13–23. https://doi.org/10.1108/08876040810851923

Min, H., & Galle, W. P. (1996). Competitive benchmarking of fast-food restaurants using the Analytic Hierarchy Process and competitive gap analysis. *Operations Management Review, 11*(2/3), 57–72.

Min, H., & Min, H. (2015). Benchmarking the service quality of airlines in the United States: an exploratory analysis. *Benchmarking: an International journal*, *22*(5), 734-751. https://doi.org/10.1108/BIJ-03-2013-0029

Najafi, S., Saati, S., & Tavana, M. (2015). Data envelopment analysis in service quality evaluation: An empirical study. *Journal of Industrial Engineering International, 11*(3), 319–330. https://doi.org/10.1007/s40092-014-0090-6

Olorunniwo, F., Hsu, M. K., & Udo, G. J. (2006). Service quality, customer satisfaction, and behavioral intentions in the service factory. *Journal of Services Marketing, 20*(1), 59–72. https://doi.org/10.1108/08876040610646581

Parasuraman, A., Zeithaml, V. A., & Berry, L. L. (1985). A conceptual model of service quality and its implications for future research. *The Journal of Marketing, 49*(4), 41–50. https://doi.org/10.2307/1251430

Paradi, J. C., & Zhu, H. (2013). A survey on bank branch efficiency and performance research with data envelopment analysis. *Omega, 41*(1), 61–79. https://doi.org/10.1016/j.omega.2011.08.010

Pritchard, M., & Silvestro, R. (2005). Applying the service profit chain to analyse retail performance: The case of the managerial strait-jacket? *International Journal of Service Industry Management, 16*(4), 337–356. https://doi.org/10.1108/09564230510613997

Polyorat, K., & Sophonsiri, S. (2010). The influence of service quality dimensions on customer satisfaction and customer loyalty in the chain restaurant context: A Thai case. *Journal of Global Business and Technology, 6*(2), 64–76.

Seth, N., Deshmukh, S.G., & Vrat, P. (2005). Service quality models: a review. *International Journal of Quality & Reliability Management*, *22*(9), 913-949. https://doi.org/10.1108/02656710510625211

Silvestro, R., & Cross, S. (2000). Applying the service profit chain in a retail environment: Challenging the "satisfaction mirror." *International Journal of Service Industry Management*, *11*(3), 244–268. https://doi.org/10.1108/09564230010340760

Stanworth, J., Stanworth, C., Watson, A., Purdy, D., & Healeas, S. (2004). Franchising as a small business growth strategy: a resource-based view of organizational development. *International Small Business Journal*, *22*(6), 539-559. https://doi.org/10.1177/0266242604047409

Stevens, P., Knutson, B., & Patton, M. (1995). DINESERV: A tool for measuring service quality in restaurants. *Cornell Hotel and Restaurant Administration Quarterly*, *36*(2), 56–60. https://doi.org/10.1177/001088049503600226

Soteriou, A. C., & Stavrinides, Y. (2000). An internal customer service quality data envelopment analysis model for bank branches. *The International Journal of Bank Marketing*, *18*(5), 246–252. https://doi.org/10.1108/01443579710175556

Sun, K. A., & Lee, S. (2018). Effects of franchising on industry competition: The moderating role of the hospitality industry. *International Journal of Hospitality Management*, *68*, 80-88. https://doi.org/10.1016/j.ijhm.2017.10.002

Tsai, M. C., Shih, K. H., & Chen, J. C. (2007). A comparison of the service quality of fast food chain franchises. *International Journal of Services and Standards*, *3*(2), 222–238. https://doi.org/10.1504/IJSS.2007.012930

Tse, D. K., & Wilton, P. C. (1988). Models of consumer satisfaction formation: An extension. *Journal of Marketing Research*, *25*(2), 204–212. https://doi.org/10.2307/3172652

Vargo, S. L., & Lusch, R. F. (2004). Evolving to a new dominant logic for marketing. *Journal of Marketing*, *68*(1), 1–17. https://doi.org/10.1509/jmkg.68.1.1.24036

Wang, J. C., Wang, Y. C., & Tai, Y. F. (2016). Systematic review of the elements and service standards of delightful service. *International Journal of Contemporary Hospitality Management*, *28*(7), 1310–1337. https://doi.org/10.1108/IJCHM-08-2014-0400

Wang, C. H., Lin, I. H., & Tsai, J. Y. (2018). Combining fuzzy integral and GRA method for evaluating the service quality of fast-food restaurants. *Journal of Interdisciplinary Mathematics*, *21*(2), 447-456. https://doi.org/10.1080/09720502.2017.1420574

Yee, R. W., Yeung, A. C., & Cheng, T. C. E. (2011). The service-profit chain: An empirical analysis in high-contact service industries. *International Journal of Production Economics*, *130*(2), 236–245. https://doi.org/10.1016/j.ijpe.2011.01.001

Zaibaf, M., Taherikia, F., & Fakharian, M. (2013). Effect of perceived service quality on customer satisfaction in hospitality industry: Gronroos' service quality model development. *Journal of Hospitality Marketing & Management*, *22*(5), 490–504. https://doi.org/10.1080/19368623.2012.670893

Iman Adeinat
King Abdulaziz Yniversity,
Faculty of Econmoics and
Adminstrations,
Jeddah,
Saudi Arabia
iadeinat@kau.edu.sa

Appendix

Table A1. Research Questionnaire

a) Tangible	
TAN 1	The parking area and the building exteriors are visually attractive
TAN 2	Dining area us visually attractive
TAN 3	Staff are clean, neat and appropriately dressed
TAN 4	The restaurant décor is keeping with its image and price range
TAN 5	The menu is easy to read
TAN 6	The menu reflects the restaurant's image
TAN 7	The dining area is comfortable and easy to move around in
TAN 8	The restrooms are thoroughly clean
TAN 9	The dining areas are thoroughly clean
TAN 10	The seats in the dining room is comfortable
b) Reliability	
REL 1	The food was served in the time promised
REL 2	Quickly corrects anything that is wrong
REL 3	The service is dependable and consistent
REL 4	The bill provided to me was accurate
REL 5	I was served the same food that I ordered
c) Responsiveness The restaurant ……	
RES 1	maintains their speed and quality during busy times
RES 2	provides prompt and quick service
RES 3	makes extra effort for handling special requests
d) Assurance	
ASS1	Employees can answer my questions completely
ASS2	The restaurant make me feel comfortable and confide t in dealing with them
ASS3	The restaurant's staff are able and willing to give me information about menu items, their ingredients, and methods of preparation
ASS4	The restaurant makes me feel personally safe
ASS5	The restaurant's staff seems well trained, competent and experienced
ASS6	The restaurant seems to give employees support that they can do their jobs well
e) Empathy The restaurant …..	
EMP 1	employees are sensitive to my individual needs and wants, rather than always relying on policies and procedures
EMP 2	makes me feel special
EMP 3	anticipates my individual needs and wants
EMP 4	employees are sympathetic and reassuring if something is wrong
EMP 5	seems to have customers' best interests at heart
f) Customer Satisfaction I am satisfied with the ….	
SAT 1	price of my purchase at this restaurant
SAT 2	inquiry service provided by this restaurant
SAT 3	customer service in transactions.
SAT 4	service of handling customer dissatisfaction in this restaurant
g) Customer Loyalty	
LOY 1	I intend to do more visits to this restaurant in the coming weeks.
LOY 2	I will recommend this restaurant to others
LOY 3	I will encourage my friends and relatives to visit from this restaurant