An Approach to Define Service Strategies: The Case of an Ecotourism Hotel in Mexico

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Abstract:

Purpose: This article harmonizes the causal diagram with the objective tree to evaluate service quality and to identify action strategies that improve the quality of service in the hotel industry.

Design/methodology/approach: In stage I, we obtained the quality perception records of 127 historical costumers, and 384 questionnaires. Subsequently, a causal diagram was generated in stage II. And finally, the above-mentioned strategies were created. The Causal Diagram clarifies the relationship between customer complaints and company weaknesses.

Findings: The goal tree makes it possible to categorize these strategies according to target levels.

Research limitations/implications: Costumers' opinions could generate biases in their responses. Future studies must consider other methods, such as Fuzzy Logic to reduce this bias.

Practical and social implications: This study approach can be replicated in other industrial sectors and is particularly useful for defining improvement plans related to service quality.

Originality/value: The integration of these tools will allow managers to better understand the experiences reported by guests because it allows understanding of the behaviors between the variables that influence the quality of service and the variables under the tangible elements of the service.

Keywords: customer satisfaction, hotel industry, hotel service quality, service quality management, strategy

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1. Introduction

Customer satisfaction (CS) is a crucial indicator in the service industry, as well as other industries, because of the way it is used to judge company performance. It's also valuable as reference output to obtain customer information concerning strategy re-use or recommendations (Rozita, Zana, Khairulzaman & Norlizah, 2014). Monitoring and evaluating CS is the basis for service companies to start designing strategies to improve service quality (SQ). These companies must begin the process by identifying the SQ weaknesses (Raišienė & Raišys, 2022). CS must be the core element for the simple fact that future customers' decisions are at stake. Also, costumers' loyalty and brand preference depend on service performance, especially in the actual competitive market where clients are more informed (Abdullah, Prabhu & Othman, 2022).

CS is in relationship with customers' experiences and their personal feelings of pleasure or disappointment. This arises when they evaluate their experiences with regard to their conscious or unconscious expectations (Abdullah et al., 2022; Yadollahi, Kazemi & Ranjbarian, 2018). Due to the subjectivity of CS, the process of measuring it is challenging work. Although companies plan their operations around benchmark practices, quality policies or previous market knowledge, it's important to realize that customers' feelings influence and dominate CS performance. This is seen in CS evaluation after the company has delivered service (Graf & Maas, 2008). This evaluation is a post-consumption assessment and is closely linked with customer value (CV), the antecedent of CS. CV is a theoretical construct about the customer perspective. Relationally, CS is a measure that expresses the degree to which expectations are met during and after a customer purchase process. These are quality models which companies have used for a long time as a reference to solve problems related to CS (Colmenares & Saavedra, 2007; Serrano-Bedia & López-Fernández, 2007). It's also been mentioned that not only CS, but service quality (SQ) and CV as well have been the most widely used themes in studies of SQ measurement in topics such as hospitality and tourist discipline (Oh & Kim, 2017). The customers' complaints under the classical models SERVPERF or SERVQUAl and the perception of service understanding in recent years have been analyzed using big data or fuzzy logic (Babroudi, Sabri-Laghaie & Ghoushchi, 2021; Padma & Ahn, 2020). SERVQUAL and SERVPERF models are the most important references in SQ research, and they both use a survey as a measuring instrument to get the customers' experiences. By and large, most studies focus on measuring the organization's current performance, but leave strategic actions as a separate implementation for the future (Oh & Kim, 2017). In these cases, it is common to design a survey on the Likert scale to do a statistical treatment of the data to define the strategies to incorporate the service with the highest score. This method allows responding to the customer's claim through an event as a latent variable. However, the system cannot be analyzed as a generalized service. In this sense, the Likert scale data is at an ordinal level, and it is not appropriate for analyzing the data using a statistical method (Vonglao, 2017). Nevertheless, Fuzzy Logic was used to transfer the data to a suitable scale for further statistical analysis.

Other studies have used system dynamics as a tool to model service variables and measure customer satisfaction (Hamon, Kambanje, Pryor, Kaponda, Mwale, Webster et al., 2022; Octabriyantiningtyas, Suryani & Jatmiko, 2019a; Riaz, Iqbal-Ahmad-Khan, Ullah, Bilal-Tahir, Alqurashi & Alsulami, 2022). In the service industry, the use of system dynamics from the Causal Diagram has allowed for the comprehension and complexity of many problem (Sterman, 2000). Besides, in any of these cases, the methods require the involvement of experts as a differentiating element (Quintero-Posso, & López-Muriel, 2010). In this context, will the Causal Diagram help to understand the causal relationships between customer experience (CS), and the quality of service (SQ) provided; and will the Objective Tree, based on the variables identified in the Causal Diagram, help to define strategies that influence customer satisfaction?

This paper reports the integration of the Causal Diagram harmonized with the Objective Tree to identify and quantify the interrelation of events that help determine strategies that improve SQ. We used these tools taking SERVQUAL results as a basis; the integration of which shows the elements of system relationships with the SQ. In addition, this knowledge allows the identifying of the most important variables on the scale of the SERVQUAL model and the designing of strategies to improve customers' satisfaction through the Objective Tree.

2. Related Works

In the literature review, studies on the measurement of SQ are reported as a strategic decision to improve the creation and delivery of products and services that meet customer needs and expectations (Ahmad, Ahmad &

Papastathopoulos, 2019; Bandyopadhyay, 2015; Lupo, 2016; Meesala & Paul, 2018; Parasuraman, Zeithaml & Berry, 1988; Rauch, Collins, Nale & Barr, 2015). In the literature, you can find empirical studies regarding this process (Kuo, Chang, Cheng & Lai, 2013), and others that use "SERVQUAL" dimensions to determine customer expectations and opinions (Cheng, 2014; Luo & Qu, 2016; Ounsri & Thawesaengkulthai, 2019; Swaroop-Debasish & Dey, 2015). It is known that customer opinion positively impacts the quality of the service, and the reputation of the organization. Inefficient service leads to negative perceptions, and adversely, efficient delivery of the service leads to the positive. Subsequently, customer loyalty and satisfaction are strategic components that must be measured to maintain the sustainability of any company (Mmute & Shonhe, 2017). Other studies have adopted more than one methodology to measure this satisfaction and loyalty (de Oliveira-Barreto, Pinheiro & Silva, 2019; Jasinskas, Streimikiene, Svagzdiene & Simanavicius, 2016). These studies report several SQ models related to three elements of service marketing to increase the quality of the services offered: physical environment, people and process (Yarimoglu, 2014). Likewise, another work presents models to measure the quality of services in the hotel industry and models to measure customer satisfaction at the micro and macro levels (Sekulic & Mandaric, 2014).

Other works comment that tourist hotels are an emerging research trend and are constantly growing in hospitality marketing research (Kim, 2014). Particularly for resort hotels, the association between the quality of Pakistani hotel services was analyzed to find the causes of customer satisfaction, image and loyalty (Saleem & Sarfraz-Raja, 2014). Other authors have evaluated the quality of a large hotel through fuzzy SERVQUAL and fuzzy AHP (Iannone, Martino, Miranda & Riemma, 2015; Stefano, Casarotto-Filho, Barichello & Sohn, 2015). While other researchers propose a review to evaluate and improve the SQ in the Taiwanese hotel industry (Lee, Wang, Chien, Wu, Lu, Tsai et al., 2016). They conclude that this method of study supported by fuzzy SERVQUAL and fuzzy AHP was more effective in guiding the development and improvement of SQ. Adversely, it was found difficult to judge the impact of separate service elements on quality (Jasinskas et al., 2016).

The analysis of the interrelation between the dimensions of traditional models for measuring SQ can be complemented with modeling through complex systems, to develop simulations that allow creating scenarios to support decision making. In addition to measuring satisfaction, other variables can be inserted, such as costs or comparison with other competitors (Octabriyantiningtyas, Suryani & Jatmiko, 2019b). Although there are numerous studies on quality in service, new frameworks are required to allow the dynamic analysis of SQ, and its changes over time (Zuo, Bai, Zhu, He & Qiu, 2022). Customer evaluation requires a multidimensional approach, including functional, social, emotional, reputational and value epistemology (Madinga, van Eyk & Amoah, 2022).

The studies reviewed in this article describe the use of approaches to estimate causal relationships from statistical data and qualitative assumptions about the causality of customer opinion and expectation. Other studies combine methodologies or have used Fuzzy Logic to handle the ordinality of the data collected through instruments such as the Likert scale. However, they leave studies open to help identify the strategies to follow once the study data has been analyzed.

On the other hand, we have found that in practice, strategies are defined to deal with the effects of the service problem and not the causes of the problem. In this sense, the use of tools such as "Five whys" and "Fishbone" can be useful to identify the cause of a problem, while the Causal Diagrams lead to understanding the relationship of the causes (Labarca, 2008). However, their uses in studies related to service evaluation are still limited as tools to define service strategies. With this purpose, this article addresses this lack of studies in the field of service engineering by proposing the use of causal analysis tools to prioritize goal-oriented strategies that improve quality in the service industry. This paper contributes to the field of service engineering by focusing on the evaluation of service quality in hotels and highlights the integration of the Causal Diagram and the Objective Tree. The integration of these tools provides a systematic way to identify the relationships between customer complaints and business weaknesses, allowing for a better understanding of guests' reported experiences in order to design effective strategies to improve customer satisfaction.

3. Material and Methods

This research takes the case of evaluating the SQ in Business Resorts. The study approach in this research is described in Figure 1 in three stages for the diagnosis and evaluation of SQ. In Stage I, a diagnosis is carried out for

127 historical and real time records (2012-2018) based on the quality dimensions of the SERVQUAL model (Reliability, Assurance, Tangibles, Empathy, Responsiveness). Research variables were determined during the guest's stay in a hotel in Veracruz-Mexico, considering the hotel facilities and the elements of natural environment in which it is immersed. Historical records include customer opinion with regard to complaints, claims and service suggestions, product delivery and facilities.
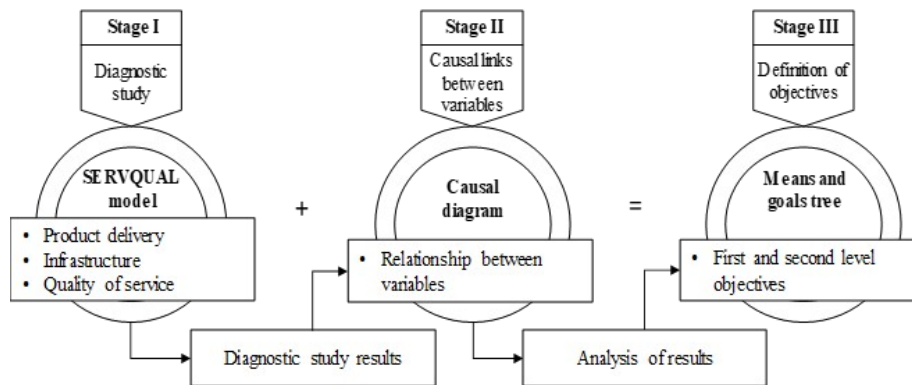

Figure 1. Architecture of integration between the Causal Diagram and Objectives Tree

To collect information, 384 questionnaires were given out. The instrument was designed with elements of the SERVQUAL model dimensions to evaluate the facilities and service capacity of the hotel. This evaluation made it possible to measure the customers' perception of the quality of the service, as well as the guest expectations of the service they received. The study variables were Product Delivery and Infrastructure, which collectively included hotel facilities, recreational areas and customer service. The questionnaire was validated by the Kaiser Mayer-Olkin (KMO) and Bartlett physical fitness tests; supported by SPSS®, using a level of significance of 0.05. The instrument was validated with 30 items, resulting in Cronbach's alpha of 83.7. Likewise, the Kaiser-Mayer-Olkin (KMO) adequacy test was performed, obtaining a statistical value of the test of 0.707, while the significance represented by the Bartlett test has had a statistical value of 0.0. This means that the significance value was less than the test statistic of 0.05, and in this way, it the instrument is considered valid for collecting the information. In Stage II, the results of the Stage I diagnosis are used to construct a Causal Diagram and analyze the behavior of the study variables related to the opinions and expectations of the service delivered to the customer. Causal Diagrams were constructed according the customers information and staff hotel opinions, the diagrams relationships were validated by them due their deep system study knowledge.

An interaction matrix to model customer expectations and opinions has been built with the dimensions of the SERVQUAL model. Finally, in Stage III, with the information of the "analysis of results", the goals and objectives for the design of strategies that allow the improvement of the SQ in Business Resorts are defined.

To demonstrate the utility of the study approach, the customer opinion of the SQ of an Ecotourism Hotel in Veracruz-Mexico was evaluated. However, the evaluation of the SQ does not consider the purchase of hotel insurance (internal or external).

4. Results and Discussion

The guest opinions were collected in 2018 with 384 face-to-face interviews with guests from different countries: 38% USA, 30% Mexico, 12% France, 11% Spain, 5% Canada, 3% Japan. Observe in Figure 2 that 50% of the clients' opinions are related to the service provided to the client during the use of the facilities within the Hotel.

Figure 3 shows that 40% of the tangible elements (personnel and the hotel facilities) influence the SQ; and the way the service is communicated directly influences CS. However, the security dimension (33% of guest opinions) had a significant impact on CS, due to the lack of experience of the employees and the conditions of the facilities. This means that more than 70% of the quality dimensions influence CS. Likewise, the "customer

service" dimension affects the quality of the service by 50%. Therefore, it could be argued that the main solution is to improve the service.
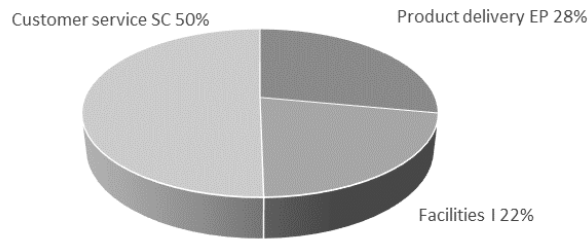
Figure 2. Quality dimensions found through the diagnosis reported in (logs) of complaints and suggestions
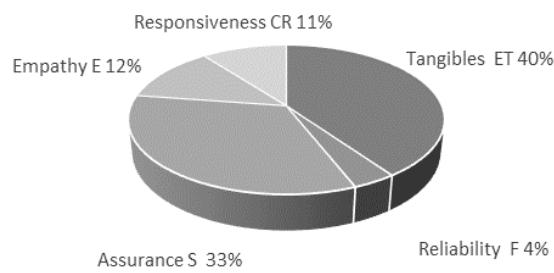
Figure 3. SERVQUAL quality dimensions of guest opinions

Observe in Figure 4 that the area of opportunity and improvement of the hotel SQ consists in how the client receives the service of the hotel facilities and delivery of the product. This result shows that the most important elements to the client are the human resource, the hotel facilities, and the security of the facilities. This finding coincides with the report of (Padma & Ahn, 2020; Pawlicz, Petaković & Vrtodušić-Hrgović, 2022) who point out that the evaluation of the SQ of a hotel depends on the personnel, as well as its characteristics and rooms.
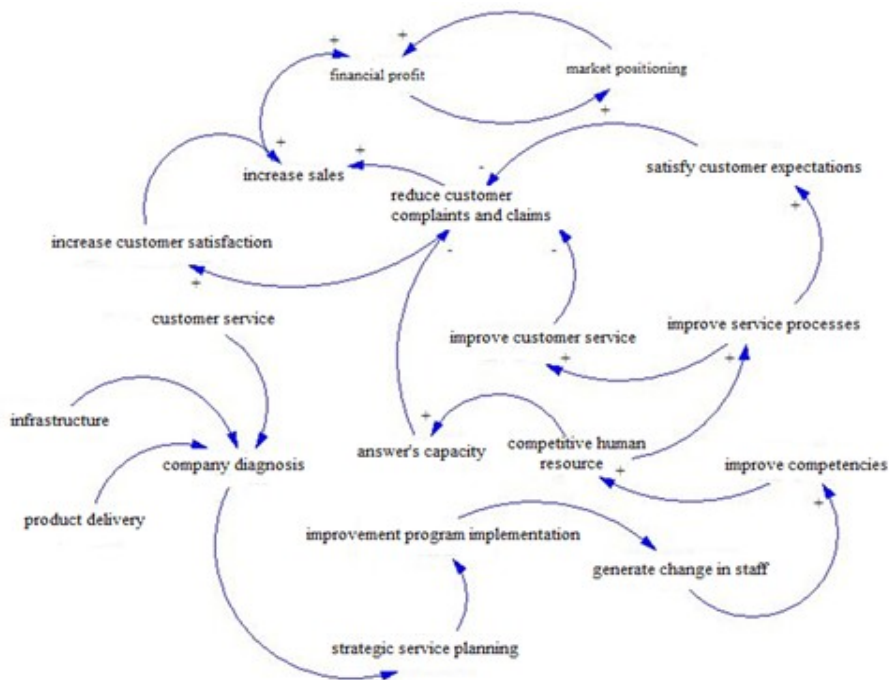
Figure 4. The causal relationship of factors that impact the SQ in the study Hotel

To evaluate the quality dimensions of the SERVQUAL Model and the study variables in this investigation, Table 1 is used, in which 127 records of the client's opinions and expectations are characterized between 2012-2017. The categories description highlights that more than 40% of opinions belong to tangible elements, while 33% belong to service security. Equations 1, 2, and 3 are designed to determine the magnitude of service perception, while Equations 1 and 2 measure the quality dimensions of the SERVQUAL Model. Equation 3 adds the result of Equations 1 and 2.

$$\sum_{Perceptions\,(i)}^{n} = \frac{\sum_i^n ET + F + S + E + CR + EP + I + SC}{Perceptions} \tag{1}$$

$$\sum_{Expectations\,(i)}^{n} = \frac{\sum_i^n ET + F + S + E + CR + EP + I + SC}{Expectations} \tag{2}$$

$$\sum_i^n \frac{MI + FS + C + CS + MA}{Perceptions} + \frac{NS}{Expectations} \tag{3}$$

$$P(Perceptions) = P(P) \tag{4}$$

$$P(Expectations) = P(EX) \tag{5}$$

$$P(P/S) = \frac{P(D.SERVQUAL \cap D.of\ quality)}{P(Perceptions)} \tag{6}$$

$$P(E/S) = \frac{P(D.SERVQUAL \cap D.of\ quality)}{P(Expectations)} \tag{7}$$

$$P(Product\ Delivery) = P(EP) = \frac{MI + C + MA + NS}{Perceptions + Expectations} \tag{8}$$

$$P(Facilities) = P(I) = \frac{MI + CS + NS}{Perceptions + Expectations} \tag{9}$$

$$P(Customer\ Service) = P(SC) = \frac{MI + FS + C + CS + MA + NS}{Perceptions + Expectations} \tag{10}$$

$$P(Tangibles) = P(ET) = \frac{MI + CS + NS}{Perceptions + Expectations} \tag{11}$$

$$P(Reliability) = P(F) = \frac{NS}{Perceptions + Expectations} \tag{12}$$

$$P(Assurance) = P(S) = \frac{FS + CS + MA + NS}{Perceptions + Expectations} \tag{13}$$

$$P(Empathy) = P(E) = \frac{C+NS}{Perceptions+Expectations} \tag{14}$$

$$P(Responsiveness) = P(CR) = \frac{C + NS}{Perceptions + Expectations} \tag{15}$$

Equation 4 determines the probability of receiving a customer complaint about the delivery of the product and infrastructure. Equation 5 determines the probability of receiving a customer complaint about not meeting their expectations. Equation 6 determines the probability of receiving a customer complaint about the service they receive from the staff. Equation 7 determines the probability that the customer's complaint is for not fulfilling the service rendered by the hotel. Equation 8 determines the probability that insufficient product delivery is a source of customer dissatisfaction. Equation 9 determines the probability that the inadequate infrastructure is a source of customer dissatisfaction. Equation 10 determines the probability that the client will file a complaint about the lack of administrative service provided by the hotel. Equation 11 determines the probability of not delivering a product to the customer according to their comfort expectations. Equation 12 determines the probability of delivering a service appropriate to the client's needs. Equation 13 determines the probability of delivering a service in which the client feels safe in receiving it. Equation 14 determines the probability of delivering a service to the customer according to their needs with special attention. Equation 15 determines the probability of delivering a service as expected by the customer in time, form, and confidence. The use of the Causal Diagrams for the modeling of these probabilities is different from traditional models implemented in the measuring of SQ. The probability results are: First, the probability of receiving a complaint from a customer related to the delivery of the product and the infrastructure is 75%. Second, 86% is the probability of receiving a complaint from a customer related to the service provided (the percentage was reduced by 50.2% in 2018). Finally, 12.2% is the probability of delivering customer service according to their needs. The results that concern hotel management are those related to customer service, tangible elements, and security of the services of delivered, since they are the ones that have the greatest impact on the SQ of the Ecotourism Hotel. The values described in Table 1 are the proportion values for each category element evaluated, which quantify each study variable. For example, the value of 0.79 (in the frequency column) represents the coefficient of the proportion of the frequency of 38 (line LSI: facility cleaning) and the total sum of 48 (Σ), and so on.

From the results of Table 1, the system of equations estimates the probabilities of occurrence for the study variables of this investigation and the level of service of the quality dimensions of the SERVQUAL model, in accordance with the following acronyms: PR = Perceptions; EX = Expectations; S = Assurance; I = Facilities; ET = Tangibles; EP = Product Delivery; E = Empathy; F = Reliability; SC = Customer service; CR = Responsiveness.

This analysis provides knowledge to design strategic actions that reduce the problem of customer dissatisfaction. In this sense, it is important to study the dependence and interrelation of the study variables on the SQ of the Ecotourism Hotel. For this purpose, Figure 5 describes the relationship and interrelation of causal events and events of the Ecotourism Hotel service during the study period. It can be observed within this environment that the improvement process converges in reducing customer complaints and claims, which can be achieved by improving the competence of the human resource (to which works toward achieving the company's profitability).

The events of the total of services expressed in Figure 3 in variables related to the quality dimensions of the SERVQUAL model are summarized in Table 2. The variables of human resources and infrastructure can be seen as tangible elements described in the process of improving customer service. This does not imply that the rest of the variables are minor as a system, because they relationally represent the entry and exit of the hotel service. This is noticeable by observing the variables at first and second levels.

This study approach is useful to identify and measure the impact of the study variable on the scale of the SERVQUAL model. Figure 3 and Table 2 merge to build Figure 6, to express probabilistically the causal relationship between events and the SERVQUAL scale. In the middle of Figure 4, they converge through directed arcs, connecting service factors to nodes of research variables, and thus connecting the quality dimensions of the SERVQUAL model. The probability of impact is described in the arcs.

MI:	Maintenance of facilities
FS:	Service Failures
C:	Training
CS:	Service Comfort
MA:	Environment
NS:	Need for Service

			Impacto de las percepciones del cliente	Frec.	Σ	Tangibles ET	Reliability F	Assurance S	Empathy E	Responsiveness CR	Product delivery EP	Facilities I	Customer service SC	SERVQUAL Dimensions Σ:1	Variables under study Σ:2	Σ:T	
Percepción (servicio ofrecido)	MI:	LDI:	Facility cleaning	38	48	0.79	0	0	0	0	0.79	0.79	0.79	0.79	2.37	3.16	
		HEH:	Humidity in the rooms	7		0.15	0	0	0	0	0.15	0.15	0.15	0.15	0.45	0.60	
		MR:	Restaurant maintenance	3		0.06	0	0	0	0	0.06	0.06	0.06	0.06	0.18	0.24	
	FS:	SI:	Internet service	13	34	0	0	0.38	0	0	0	0	0.38	0.38	0.38	0.76	
		SAC:	Hot water service	7		0	0	0.21	0	0	0	0	0.21	0.21	0.21	0.42	
		STH:	Room telephone service	14		0	0	0.41	0	0	0	0	0.41	0.41	0.41	0.82	
	C:	FC:	Lack of training	14	40	0	0	0	0.35	0	0.35	0	0.35	0.35	0.70	1.05	13.8
		AC:	Customer Support	12		0	0	0	0.30	0	0.3	0	0.3	0.30	0.60	0.90	
		SDC:	Food service	9		0	0	0	0	0.23	0.23	0	0.23	0.23	0.46	0.69	
		SL:	Slow service	5		0	0	0	0	0.13	0.13	0	0.13	0.13	0.26	0.39	
	CS:	MMC:	Room furniture bad conditions	6	11	0.55	0	0	0	0	0	0.55	0.55	0.55	1.10	1.65	
		ECA:	Comfortable space for animals	3		0.27	0	0	0	0	0	0.27	0.27	0.27	0.54	0.81	
		NII:	Do not let facilities uses for people without check	2		0	0	0.18	0	0	0	0	0.18	0.18	0.18	0.36	
	MA:	NUD:	Do not use disposables	7	7	0	0	0.64	0	0	0.64	0	0.64	0.64	1.28	1.92	
Expectativas (lo que debe ofrecer)	NS:	CTR:	Close restaurant later	7	47	0	0	0	0	0.15	0	0	0.15	0.15	0.15	0.30	
		PUB:	Advertising / Marketing	7		0.15	0	0	0	0	0	0.15	0	0.15	0.15	0.30	
		FDI:	Lack of inventories	4		0	0	0	0	0.09	0.09	0	0.09	0.09	0.18	0.27	
		EB:	First aid kit	4		0	0.09	0	0	0	0	0	0.09	0.09	0.09	0.18	
		FCS:	Lack of customer comfort	4		0.09	0	0	0	0	0.09	0	0.09	0.09	0.18	0.27	2.36
		AI:	Lighting in the facilities	4		0.09	0	0	0	0	0	0.09	0	0.09	0.09	0.18	
		MP:	More staff	3		0	0.06	0	0	0	0.06	0	0.06	0.06	0.12	0.18	
		PD:	Breakfast packages	3		0	0.06	0	0	0	0	0	0.06	0.06	0.06	0.12	
		IE:	Lighting upon entering	3		0	0	0.06	0	0	0	0.06	0	0.06	0.06	0.12	
		PS:	Solar panels	3		0.06	0	0	0	0	0	0.06	0	0.06	0.06	0.12	
		FDS:	Lack of supervision	2		0	0	0	0.04	0	0.04	0.04	0.04	0.04	0.12	0.16	
		SL:	Laundry services	2		0.04	0	0	0	0	0	0.04	0.04	0.04	0.08	0.12	
		CFJ:	Compost to fertilize gardens	1		0.02	0	0	0	0	0	0.02	0	0.02	0.02	0.04	
			Frequency	187		2.27	0.21	1.88	0.69	0.59	2.93	2.28	5.27	5.64	10.48	16.12	

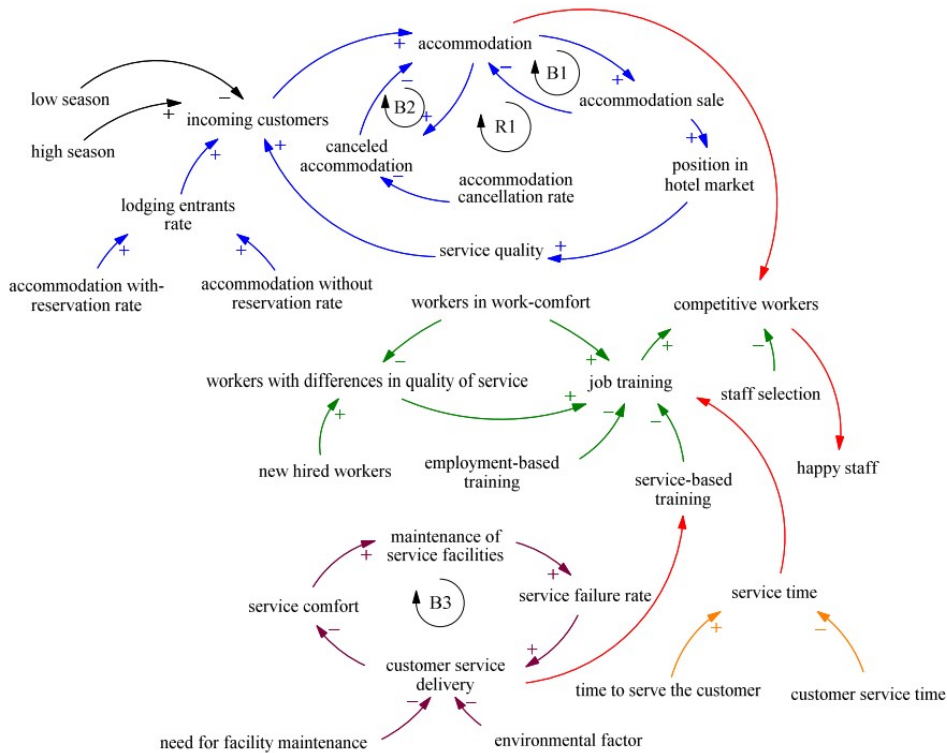Table 1. Impact of costumer opinions at the Hotel

Figure 5. Interrelation of causal events oriented to the positioning of the hotel

Level variables	Second level variables		Causal relationship	Impact on the study variables	SERVQUAL dimensions
ES: Service delivery	MI: CDS: TFS: TNS: FA:	Maintenance of falities Service comfort Service Failure Rate Rate of need for services Environmental factor		Service delivery (ES) considers the perceptions of the service offered and the expectations of what the hotel should be offering.	Tangibles Assurance Reliability Empathy Responsiveness
TS: Time of the service	TTA: TTS:	Rate of time to be served Rate of time it takes to provide service		The time of the service (TS) considers the time that the client waits to be attended, plus the time it takes for the service to be delivered.	Responsiveness Empathy
T: Employees	CT: TC: DTC: TCD: CFP: CFS: NT:	Worker Training Quality workers Difference of quality workers Desired quality workers Job-based training Service-based training Need for workers		The competence of the employees (T) is decisive to deliver the service committed and meet the expectations of the client.	Reliability Assurance Empathy Responsiveness
H: Lodging	TIH: THR: THS: IH: CH: TCH: VH: PH: CS:	Lodging Rate Lodging rate with reservation Lodging rate without reservation Hosting quantity Accommodation-Canceling Accommodation-Canceling Rate Hosting Sales Hotel Position Rate Quality of service	*(causal loop diagram: H, VH, IH, CH, TCH, PH, CS, TIH, THS, THR)*	The lodging (H) considers the facilities and warmth of the room. The number of servers (T) must be balanced with the customer's service needs and expectations.	Tangibles Assurance Responsiveness
TH: Seasons of lodging	TB: TA:	Low-season High-season		The seasons of lodging (TH) are own to define specific strategies of service that cover expectations of the client	Reliability Assurance Responsiveness

Table 2. Causal relationships oriented to SQ by level variables

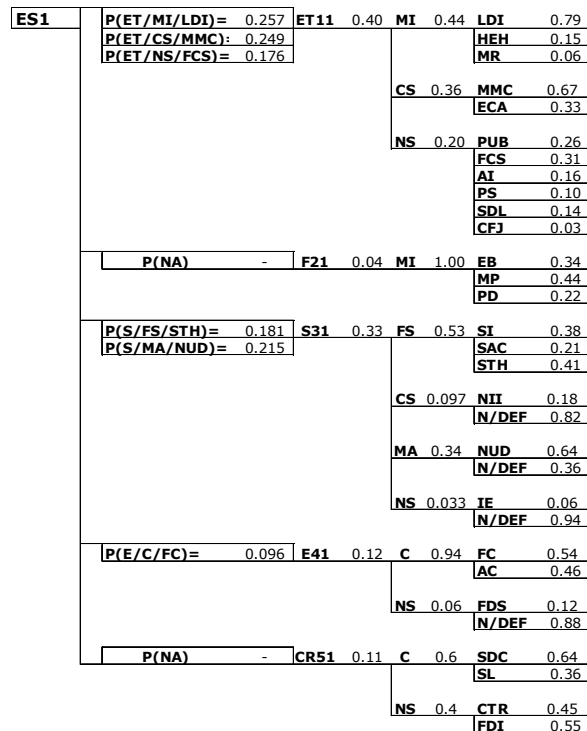| ES1							
	P(ET/MI/LDI)=	0.257	ET11 0.40	MI 0.44	LDI	0.79
	P(ET/CS/MMC):	0.249			HEH	0.15
	P(ET/NS/FCS)=	0.176			MR	0.06
				CS 0.36	MMC	0.67
					ECA	0.33
				NS 0.20	PUB	0.26
					FCS	0.31
					AI	0.16
					PS	0.10
					SDL	0.14
					CFJ	0.03
	P(NA)	-	F21 0.04	MI 1.00	EB	0.34
					MP	0.44
					PD	0.22
	P(S/FS/STH)=	0.181	S31 0.33	FS 0.53	SI	0.38
	P(S/MA/NUD)=	0.215			SAC	0.21
					STH	0.41
				CS 0.097	NII	0.18
					N/DEF	0.82
				MA 0.34	NUD	0.64
					N/DEF	0.36
				NS 0.033	IE	0.06
					N/DEF	0.94
	P(E/C/FC)=	0.096	E41 0.12	C 0.94	FC	0.54
					AC	0.46
				NS 0.06	FDS	0.12
					N/DEF	0.88
	P(NA)	-	CR51 0.11	C 0.6	SDC	0.64
					SL	0.36
				NS 0.4	CTR	0.45
					FDI	0.55

Figure 6. Causal diagram with probabilities for the level variable "Customer Service (CS)"

As a result of the treatment of the level variables, the following results are obtained: the level variable "Service Delivery (ES)" influences the dimensions: "ET" with a value of 68.2%, "S" with 39.61%, and "E" with 9.6%. These results coincide with (Padma & Ahn, 2020) who point out the relevance of the tangible elements.

Similarly, (as can be seen in Figure 4) with the support of conditional probability, questions related to the SQ that are of interest to the company can be answered, not only by individual levels, but also between different levels of information. These levels consist of SERVQUAL scale / Study variables / service factor (as shown in example 1: What is the probability that the cleanliness of the hotel facilities area a source of guest complaint?)

$$P(ET/MI/LDI) = \frac{P(ET \cap MI \cap LDI)}{(P(ET) * P(MI/ET) + P(MI) * P(LDI/MI))}$$

$$P(ET/MI/LDI) = \frac{P(0.40 \cap 0.44 \cap 0.79)}{0.40 * (0.44) + 0.44 * (0.79)} = \frac{0.139}{0.54} = 0.257 \approx 25.7\%$$

(16)

where:

ET, are tangible elements in on the scale of the SERVQUAL model.

MI, refers to the maintenance of facilities.

LDI, refers to the cleanliness of the facilities.

In this sense, Figures 7 and 8 describes an Objective Tree built by the managers and staff of the Ecotourism Hotel service areas based on two basic questions: what is the activity for? and how is the activity carried out? The first question is read in ascending form in the diagram, while the second question is read in descending order. For example, look at Figure 5, Section 1 in the dotted circle: "Increase customer satisfaction (upward reading) for what? To reduce customer complaints". Then follows, "Reduce customer complaints (downward reading) how? Increasing customer satisfaction". And so, it is at all levels. Finally, each of these activities, individually or in groups, define the blueprints for the design of strategic plans.
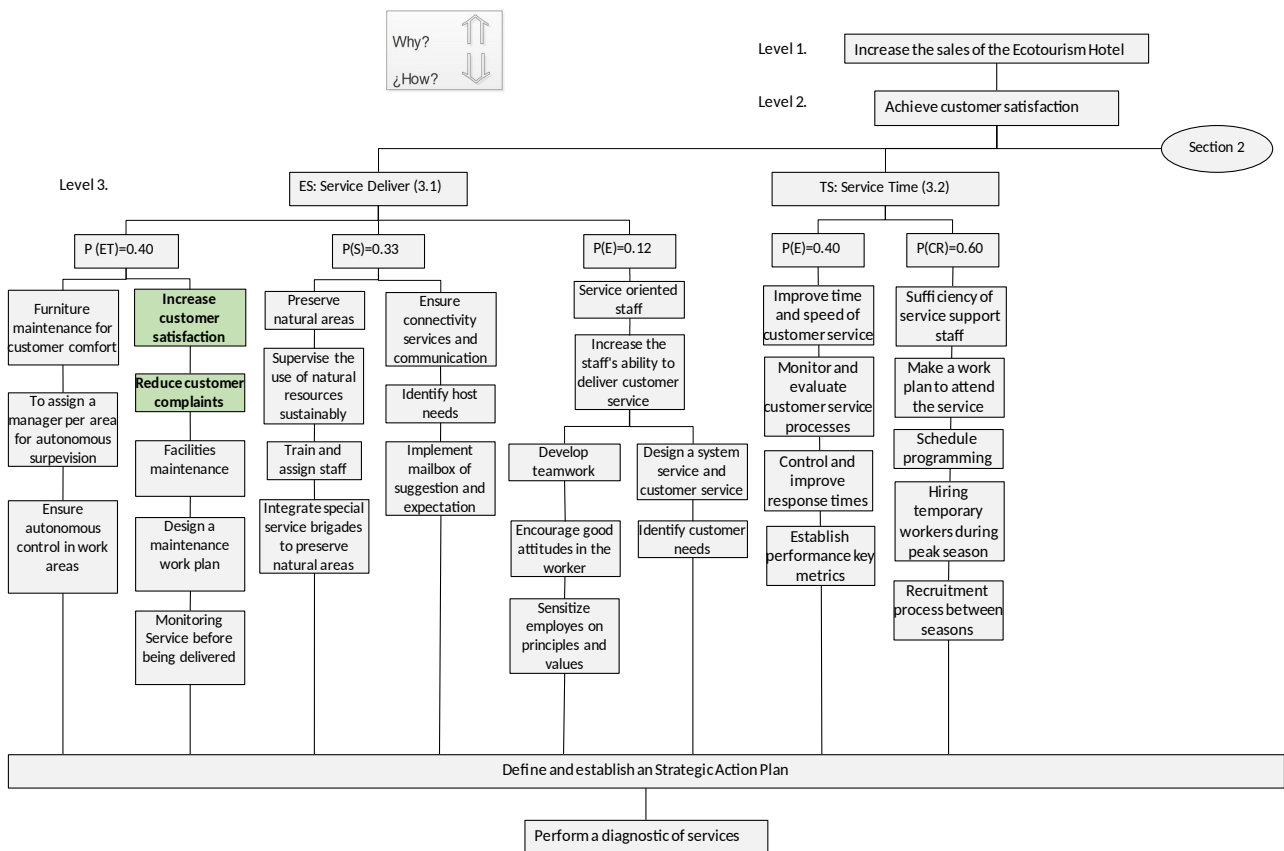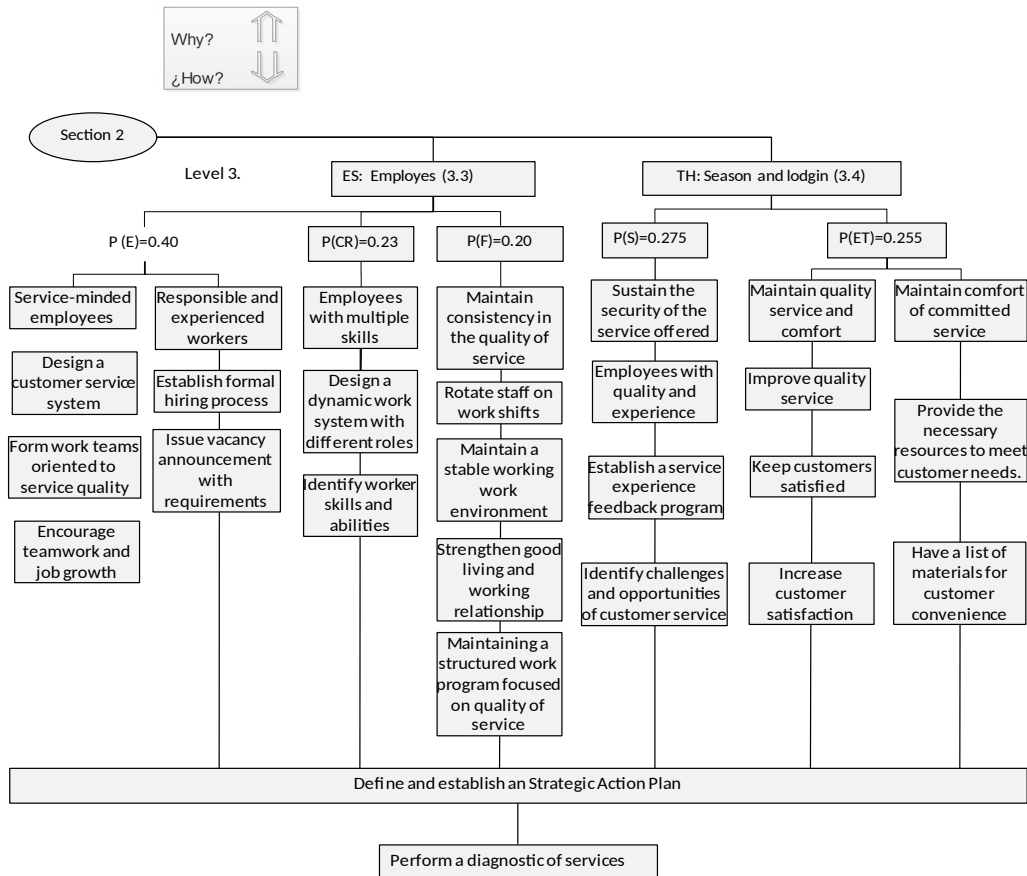

Figure 7. Objective tree (section 1)

Figure 8. Objective tree (section 2)

There exists ample literature regarding the study of service quality that principally employs the models SERVPERF or SERVQUAL. Nevertheless, the use of System Causal Diagrams and Dynamic Systems offers the opportunity to see firsthand the interrelation between the dimensions (Octabriyantiningtyas et al., 2019b) as well as the inclusion of the endogenous and exogenous variables of the SQ (Octabriyantiningtyas et al., 2019b). This also includes the probabilities of strategy designs.

The measurement of quality from the traditional models has allowed the obtaining of a descriptive vision with respect to customer satisfaction. This also includes developing strategies to improve the same customer satisfaction (CS). However, it should be noted that the SQ has subjective external system variables that should be considered in the measurement of CS, which is a challenge that succeeds from the perspective of complex systems (Octabriyantiningtyas et al., 2019b). The model presented was oriented to variables directly related to the provision of the service. However, this work serves as a basis for integrating environmental practices into the future, which is a determining variable in the performance of companies (Perramon, Oliveras-Villanueva & Llach, 2022).

5. Conclusions

From the studies reviewed in this article, we have observed that they generally have the scope to estimate causal relationships between events that have intervened in a problem of service failure. This research explored the benefit of integrating the Causal Analysis Tool harmonized with the Objective Tree as an approach to identify service strategies when a CS level is not delivered. These This tools integration describes a complete system perspective, including its elements, relationships, and CS effects.

While the causal analysis helped to identify the relationship between the causal events of customer service, the Objectives Tree helped to identify first, second and third level objectives. This means that, individually or in groups, it helps define objective strategies for the design of action plans.

The integration of these tools from this study approach exposes the complexity of clarifying optimal strategies to address a problem related to the SQ. (This research can be extended to explore the use of hierarchical methods before the target tree, thus simplifying its structure).

Declaration of Conflicting Interests

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