

PROPOSAL FOR THE MANAGEMENT OF THE CUSTOMER SERVICE OF THE “VASO DE LECHE” NATIONAL PROGRAM IN ONE DISTRICT IN LIMA UNDER THE DMAIC QUALITY METHODOLOGY APPROACH

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Abstract

In Peru, one of the most important problems is the high rate of malnutrition of the population related to a low socio-economic level. For this reason, in 1985 the “Vaso de Leche” (Glass of Milk) program was created. However, it has had cases of mismanagement and inefficiency throughout its history. The objective of this article is to define the most convenient improvement proposals under the DMAIC methodology to optimize the “Vaso de Leche” program in one district in Lima from the customer service point of view. An exploration was carried out through interviews and the SERVQUAL questionnaire was applied. With the information obtained, points of improvement were defined, and a root cause analysis was carried out to conclude improvement proposals that were validated using the Delphi method with experts and stakeholders. The chosen proposals were aligned to the perceptions and expectations of the users and focused on the improvement of the communication channels and health monitoring. It was concluded that the application of these techniques is appropriate for these types of studies.

Keywords: DMAIC, SERVQUAL, social programs, malnutrition, childhood, Delphi Method, Root Cause Analysis, Six Sigma

1. INTRODUCTION

In Peru, more than one million children have fallen into poverty during 2020 as a consequence of Covid-19 [1]. Unfortunately, poor socioeconomic status in this country is associated with illnesses caused by poor nutrition [2]. In this context, the “Vaso de Leche” (Glass of Milk), a Peruvian social food program created in 1985 for the urban population of low socioeconomic sectors, becomes more important. The main objective of this organization is to provide beneficiaries with a free daily milk ration in support of vulnerable populations [3].

The National Program “Vaso de Leche” has not been exempted from cases of inefficiency over the years. Therefore, research has been carried out with the aim of optimizing the program. For example, Valladares [4] proposed the use of simultaneous control with artificial intelligence to mitigate irregularities and Ypanaque [3] proposed strengthening the program in the Municipality of Pícsi through a strategic model.

This research addressed the case of the “Vaso de Leche” program in one district in Lima, Peru with the aim of generating proposals to provide a better quality of care to the beneficiary. For this, the DMAIC methodology was applied, since it provides a structured approach to quality improvements, allows improvement sustainability and can be applied to any continuous improvement research framework, regardless of the type of organization or industry [5].

The DMAIC quality methodology is divided into 5 steps for its application: Define, Measure, Analyse, Improve and Control. Being part of the Six Sigma philosophy, it applies similar techniques such as Pareto Analysis, Cause-Effect Diagrams, among others [6].

DMAIC is a broad-spectrum process improvement methodology. It was used, for example, by Silver et al. [7] in a project to promote home dialysis. On the other hand, Delahoz-Dominguez et al. [8] evaluated with it the quality of service in a university document service center and Arcidiacono and Pieroni [9] optimized the provision of services and the Quality of Experience (QoE) in a hospital. While it is true that DMAIC has a wide field of application, as Glickman et al. [10] mentioned, there are common and

determining elements such as culture and organizational design, incentive structures, commitment of senior managers and use of information technologies.

Likewise, the questionnaire used in this research followed the SERVQUAL format, which is a structure that has been used successfully in measuring service quality in a variety of organizations. For example, Orlandoni et al. [11] analyzed the perception of the quality of health services in a care hospital and Causado-Rodriguez et al. [12] applied it in a project to improve a restaurant in Colombia.

2. MATERIALS AND METHODS

For this research, a case study was carried out with a qualitative approach and a descriptive exploratory scope and proactive intention. For each stage of the DMAIC methodology, techniques and instruments detailed in Table 1 were applied.

DMAIC Stage	Technique	Instrument
1. Define (D)	Interview	Interview
2. Measure (M)	Survey of expectations and perceptions	SERVQUAL Questionnaire
3. Analyze (A)	Identification of root-causes	Ishikawa diagram
4. Improve (I)	Selection of the solutions to be implemented (Ranking of Factors)	Confrontation Matrix of the solution alternatives
	Preparation of the execution plan of the selected proposals	Costing by activities
5. Control (C)	Validation	Delphi Method

Table 1. Techniques and instruments used according to the DMAIC stage

In order to know the expectations and perceptions of the users, a survey was carried out with a confidence level of 97% and a sampling error of 3% to 342 beneficiaries of the “Vaso de Leche” program in one district in Lima with a population of 485 people. The sample was calculated with simple random probabilistic sampling. The dimensions and indicators of the SERVQUAL questionnaire are shown in Table 2.

Dimensions	Indicators
Reliability	Level of satisfaction with the waiting time for the start of care.
	Level of satisfaction with beneficiary-program communication.
	Level of satisfaction with the availability of nutritional products.
Responsiveness	Level of satisfaction with the speed of food delivery.
	Level of satisfaction with the speed of enrollment in the program.
	Level of satisfaction with the ease of finding the premises.
Assurance	Level of satisfaction with the degree of benefit to health.
	Level of satisfaction with the monitoring of health status.

Empathy	Level of satisfaction with the treatment of volunteers.
	Level of satisfaction with the treatment of volunteers in the face of inconveniences.
Tangible	Level of satisfaction with the orientation of the workers of the municipality.
	Level of satisfaction with the cleanliness of the premises and the instruments.
Tangible	Level of satisfaction with the cleanliness of the volunteers.

Table 2. Dimensions and indicators used

With the results obtained from the survey, improvements were proposed, and the best ones were selected with a Confrontation Matrix. Table 3 shows the factors that were considered.

Factor	Measurement	Highest score	Importance
Cost (C)	Budget required for each proposal.	Solution with the lowest implementation cost.	Most important factor.
Time (T)	Schedule required for each proposal.	Solution with the least implementation time.	Equal importance as the Impact factor (I).
Impact (I)	Number of root causes covered by each proposal.	Solution with the highest number of root causes solved.	Same importance as the Time factor (T).

Table 3. Factors used in the Confrontation Matrix

The proposals were rated on a scale from 0 to 4 according to the criteria presented in Table 4.

Factor	Rating		
	0	2	4
Cost (C)	\$ [400 +]	\$ [399 – 270]	\$ [269 - 0]
Time (T)	[10 +] days	[9 – 6] days	[5 – 0] days
Impact (I)	1 root cause	2 or 3 root causes	4 or more root causes

Table 4. Rating by factors

The chosen improvements were validated with the Delphi method. A survey was applied to a panel of 10 experts, whose composition is detailed in Table 5.

Experts	Composition
Personnel related to the “Vaso de Leche” Program	20%
Experts in the methodologies applied in the project	40%
People with experience in programs of social assistance outside the organization	40%

Table 5. Composition of the panel of experts

For the validation process, five yes/no questions were asked corresponding to five dimensions detailed in Table 6.

Dimension	Question
Usability	Do you consider that the proposals are easy to understand?
Portability	Do you consider that the proposals could be used in other similar organizations?
Administrative	Do you consider that the proposals are easy to manage by managing expenses and operating costs?
Functionality	Do you think that the proposals could be useful for the program?
Maintainability	Do you consider that the proposals are easy to maintain over time?

Table 6. Dimensions and questions asked in the proposal validation process

3. RESULTS

3.1. Define (D)

To define the environment, an interview was conducted with program personnel. Points to improve were determined, such as the lack of control in the nutritional impact and the low budget allocated for the growing number of beneficiaries.

3.2. Measure (M)

With the results of the SERVQUAL survey, the sociodemographic profile of the beneficiaries detailed in Table 7 was elaborated.

Variables	Age	Sex	Type of beneficiary
Categories (%)	[0 - 6] 35%	Female 58%	Child from 0 to 6 years old 34%
	[7 - 13] 42%		Breastfeeding mother 0.5%
	[14 - 24] 1%		Pregnant mother 0.5%
	[25 - 59] 2%	Male 42%	Child from 7 to 13 years old 42%
	[60 - 64] 1%		Elderly 20%
	[65 +] 19%		Disabled person 3%

Table 7. Sociodemographic profile of the beneficiaries

Additionally, deficits in the service were identified when expectations exceeded perceptions. As shown in Table 8, the Assurance and Reliability dimensions were the most critical.

Dimensions	Expected value (E)	Perceived value (P)	Gap (P-E)
Reliability	4.38	3.86	-0.52
Responsiveness	4.94	4.58	-0.36
Assurance	4.40	3.54	-0.86
Empathy	4.95	4.63	-0.32

Tangible	4.42	4.94	0.52
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Table 8. Gaps by dimensions

Then, the questions corresponding to the dimensions of Assurance and Reliability were analyzed. As seen in Table 9, it was concluded that questions 2 and 8 were the most critical.

Question	E	P	Gap (P-E)
1. Level of satisfaction with the waiting time for the start of care	4.12	3.72	-0.40
2. Level of satisfaction with beneficiary-program communication	4.08	2.86	-1.22
3. Level of satisfaction with the availability of nutritional products	4.95	4.99	0.04
7. Level of satisfaction with the degree of benefit to the health	4.96	4.15	-0.81
8. Level of satisfaction with the monitoring of health status	3.84	2.94	-0.90

Table 9. Gaps by questions of more critical dimensions

3.3. Analyze (A)

Ishikawa diagrams were prepared for the two most critical improvement points and the main root causes were found as shown in Figures 1 and 2.

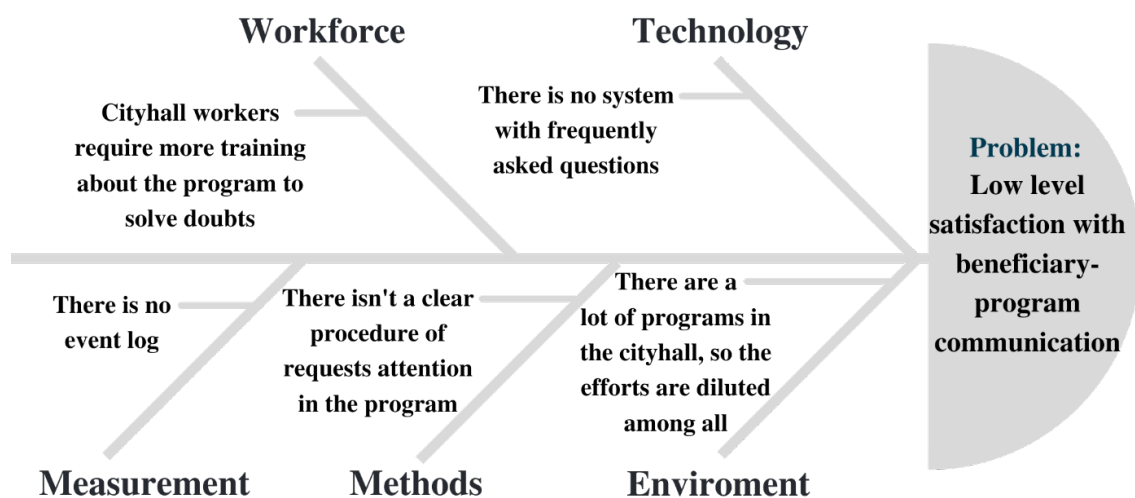


Fig. 1. Ishikawa diagram for question 2

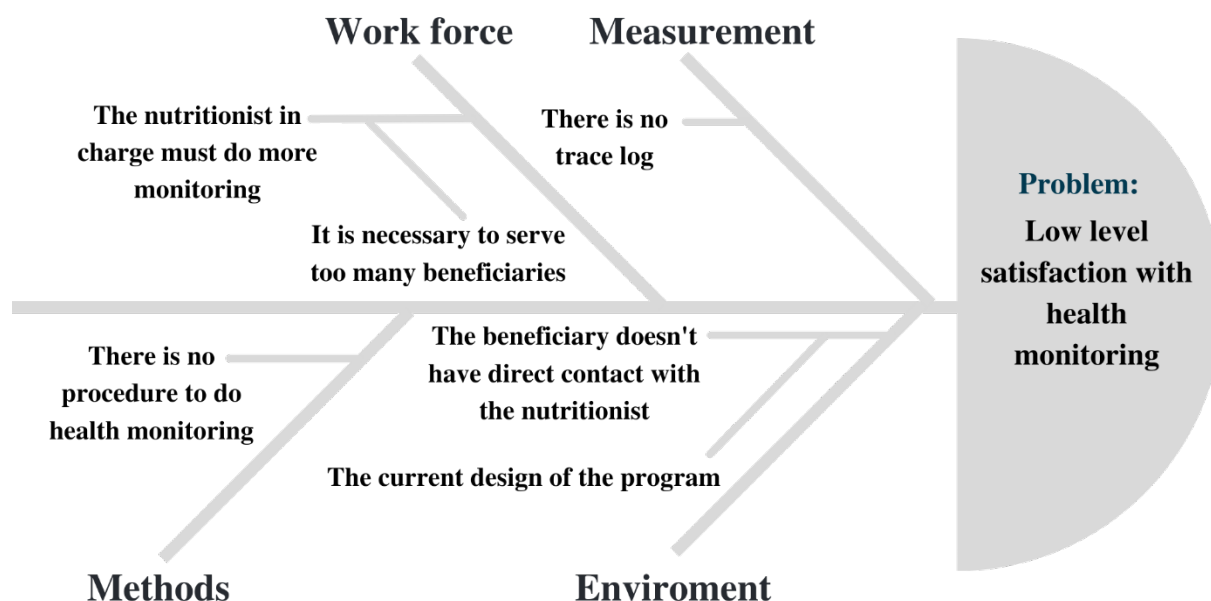


Fig. 2. Ishikawa diagram for question 8

3.4. Improve (I)

With the Ishikawa diagrams, three possible proposals were developed. They are detailed in Table 10.

Proposal	Description	Data
1. Help System	System with frequently asked questions section, basic program guide and database with incident history and case tracking.	Cost: \$326 Time: 8 days Impact: 4 causes
2. Health Monitoring Form	Check list with symptoms that will be filled out periodically and will launch an alert notifying the nutrition staff when it is serious.	Cost: \$230 Time: 9 days Impact: 4 causes
3. Elaboration of Standard Procedures	Carry out a study of the current procedure for dealing with queries and prepare a standard procedure with the dissemination of a guide to all personnel.	Cost: \$337 Time: 14 days Impact: 1 cause

Table 10. Solution proposals

As shown in Table 11, with the Ranking of Factors, proposals 1 and 2, Help System and Health Monitoring Form, were identified as the most relevant. The total improvement project, which includes both selected proposals, has a duration of 9 days and a cost of \$556.

Matching						Table Ranking of factors					
						Proposal 1		Proposal 2		Proposal 3	
Factor	C	T	I	Count	Weight	Rating	Points	Rating	Points	Rating	Points
C		1	1	2	0.50	2	1.00	4	2.00	2	1.00
T	0		1	1	0.25	2	0.50	2	0.50	0	0.00
I	0	1		1	0.25	4	1.00	4	1.00	0	0.00
Total				4	1.00		2.50		3.50		1.00

Table 11. Ranking of Factors

3.5. Control (C)

The panel of 10 experts reached the following conclusions.

90% considered that the proposals were easy to understand.

100% considered that the proposals could be used in other similar organizations.

80% considered that the proposals were easy to manage by managing expenses and operating costs.

100% considered that the proposals could be useful for the program.

60% considered that the proposals were easy to maintain over time.

Moreover, it was recommended to implement permanent motivation, develop an app; prepare communication, control, and reaction plans, prepare proposals to be applied at the national level and work together with the Ministry of Health to implement data related to the most common diseases.

4. DISCUSSION

Countries have the need to produce a healthy and well-educated adult population that can participate in a productive society [13]. In this sense, proper nutrition plays a very important role. Science indicates that investments in reducing adversity during early childhood strengthen the foundations of physical and mental health [14] [15]. However, currently persistent economic disparities in health status are considered a morbidity of millennials [16]. Therefore, an improvement should be sought in the following generations.

Residents of disadvantaged neighborhoods fare substantially worse in health and socioeconomic outcomes than those with wealthier neighbors [17], as low socioeconomic status is generally associated with poor access to health care [18]. Therefore, during the last four decades, different Peruvian governments have implemented food programs with the aim of helping poor families to eradicate food insecurity and hunger [19].

These types of programs are generally considered by economists to be the most efficient way to reduce poverty and inequality [20]. However, there is still concern that there is a differential impact regarding health outcomes according to socioeconomic status [21][22]. There is evidence that in countries that provide less generous social support, groups of lower socioeconomic status also faced less favorable access to health care [23]. Therefore, an additional point to implement in future actions could be Multi-partner Governance, described by Emerson et al. [24] as governance that can include partnerships between the state, the private sector, civil society and the community.

In this study, deficiencies were found in the service perceived by the beneficiaries in the dimensions of Assurance and Reliability with the SERVQUAL questionnaire. With this, root causes were found, and

relevant solutions were proposed to improve the service of the “Vaso de Leche” program in one district in Lima. All this followed the DMAIC quality procedure.

In relation to the quality methodology used, the relevance of combining service quality concepts with Six Sigma metrics was demonstrated, as Delahoz-Dominguez et al. [8] did. Furthermore, the importance of participation in the proposed improvements of experts and stakeholders was verified, as mentioned by Silver et al. [7] during stage 5. Finally, consider organizational culture and design as indicated by Glickman et al. [10], in addition to the use of IT tools as mentioned by Arcidiacono and Pieroni [9], proved to be a great help in projects to improve the customer experience.

On the other hand, in relation to the application of SERVQUAL, it was found that the results analysis methodology carried out by Causado-Rodriguez et al. [12] is valid. Finally, in relation to the “Vaso de Leche”, as indicated by Ypanaque [3], it is important to reorganize the processes of the municipality with information systems and the support of the Ministry of Health in the nutritional evaluation of the beneficiaries.

The objective of this research was to propose improvements to the quality of the service provided. However, applying them and verifying their effectiveness in a real context is an important topic for future research. The fundamental contribution of this article is the use of engineering tools for the improvement of social programs. These are easy-to-understood and simple-to-apply tools that, as was verified in the study, manage to achieve significant improvements for the beneficiary, without the need of a large investment of time or money.

5. CONCLUSIONS

The application of the DMAIC methodology made it possible to clearly organize the steps to follow for the development of improvements. The fundamental contribution of this research is the use of a customer service tool, such as SERVQUAL, as input for a quality improvement project in which tools specific to the subject are used, such as Ishikawa Diagrams or the DMAIC procedure itself. All this in contrast to previous studies that show applications of these techniques, but not simultaneously.

Likewise, placing the expectations and perceptions of the beneficiary at the center of the improvements is another novel aspect, since in a social program, unlike a business improvement, the final objective is not to increase profits or reduce costs, but to provide a service that provides the assistance required by the beneficiary.

Finally, the simplicity of the use of these methodologies and tools makes them very attractive for their application in any other social program, regardless of the context in which it is developed, since the first step, Define, allows the improvements to be placed. It is recommended, in case of reaching a real implementation phase, to carry out a periodic collection of data on beneficiary satisfaction to monitor them and repeat the cycle with the aim of maintaining continuous improvement.

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