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Evaluating service performance at a community health center: Promethee and Lean Service methodologies

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ABSTRACT

Puskesmas XYZ, situated in Cilegon City, serves one or multiple sub-districts as a primary healthcare facility, boasting a commendable performance rating of 3.66. To elevate service quality, the Mayor of Cilegon has suggested transitioning to the Regional Public Service Agency system, granting the health center operational autonomy apart from local government dependencies. Despite its laudable performance, Puskesmas XYZ requires enhancements to adopt the BLUD system, as indicated in Cilegon's 2020 Public Service Assessment Report. The report highlights six areas necessitating improvement: service policies, professional human resources, information systems, facilities, and infrastructure, as well as consultation and complaint mechanisms. This study aims to assess and prioritize improvement strategies using the Servperf model and PROMETHEE method. PROMETHEE calculations identified 10 alternatives with negative net flow: E4, RS2, TA3, E3, E5, AS2, RS3, AS1, RS4, and E1. Moreover, the process definition mapping identified 5 alternatives with activity flows across administration, general polyclinic, and pharmacy sections. This breakdown includes 11 activities as VA, 7 as NVA, and 2 as NNVA. Additionally, a root cause analysis (RCA) employing the 5 Whys method was conducted to identify issues and propose viable enhancements for Puskesmas XYZ. These measures aim to empower the health center, fortify its services, rectify weaknesses, and ultimately bolster healthcare provisions for the community.

1. Introduction

The development of Cilegon City can be illustrated, among other things, in the realm of social and public welfare, particularly in the field of healthcare. The issue concerning public health revolves around residents experiencing health complaints and having outpatient care at healthcare facilities in Cilegon City, which saw an increase of 29.01% from 2021 to 2022. Hence, healthcare facilities are a crucial necessity for the community [1].

A Community Health Center (Puskesmas) is a facility responsible for providing health services, encompassing promotive, curative, preventive, and rehabilitative efforts within a related region [2], [3]. Puskesmas XYZ is one of the health centers located in Cilegon City, with the role of serving the community within one or multiple sub-districts. Currently, Puskesmas XYZ falls under the category of UPTD (Regional Technical Implementation Unit), operating in a professional capacity with accountability to the Head of the Department, serving a functional role, and acting as a Primary Healthcare Facility (FKTP) in Cilegon City.

To enhance the quality of services within the community health center, the Mayor of Cilegon has proposed a transformation of the facility from a Regional Technical Implementation Unit (UPTD) into a Regional Public Service Agency (BLUD) system. BLUD represents the implementation of a system by technical units or regional bodies that deliver services to the public while possessing flexibility in financial management, thereby reducing the reliance on the local government [4]. However, there are several community health centers that are not yet equipped to transition into BLUD, with Puskesmas XYZ being one of them.

The results of the assessment conducted in 2020 on Puskesmas XYZ reflect a rating with an index score of 3.66, signifying a "good" category. In terms of meeting the types of services as per service standards, the compliance rate stands at 60%, necessitating further steps to achieve 100% compliance. Moreover, the process of questionnaire completion has not yet comprehensively involved service users, necessitating evaluation to improve aspects of facilities, infrastructure, and equipment [5]. Therefore, continuous improvement is necessary in these aspects,

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aligning to support a more mature preparation for the comprehensive implementation of the BLUD system at Puskesmas XYZ.

Quality represents the description and characteristics of a service that demonstrate its capability to satisfy customer needs [2]. The quality qualification is formed through the assessment of customer service satisfaction. Patient complaints at Puskesmas XYZ regarding its services indicate the necessity for improvement in aspects of the healthcare service.

The research's scope for determining improvement actions at Puskesmas XYZ encompasses administration, general clinic, and pharmacy sections. This is due to the consistent patient influx in the general clinic activities compared to other clinics, as well as addressing general health complaints. The determination of improvement actions for healthcare services at Puskesmas XYZ is based on the foundation of measuring service quality, utilizing the service performance (servperf) model in this study.

Service performance is a scale for measuring service quality derived from the service quality theory (servqual), hence the measurement dimensions used remain the same. However, the differentiation in the servperf model lies in its focus on assessing real performance or the performance of services directly received by customers [6]. The measurement of servperf encompasses 5 dimensions: tangibles, reliability, responsiveness, assurance, and empathy.

Data processing is conducted to determine the ranking of alternatives derived from service performance attributes, with the goal of identifying priority alternative improvements to enhance the quality of patient services using the Preference Ranking Organization Method for Enrichment Evaluation (PROMETHEE) method. The PROMETHEE method is a decision-making approach involving multiple criteria. The determination is based on the complete ranking or ordering of alternatives, considering their net flow values. Positive net flow values signify strengths or advantages among alternatives, whereas negative values indicate weaknesses [7], [8].

Following the ranking of alternatives based on net flow, where negative values indicate alternatives requiring improvements, process mapping is carried out to assess the value-added aspects such as Value Added (VA), Non-Value Added (NVA), and Necessary Non-Value Added (NNVA) activities, utilizing lean service principles. Lean Service constitutes a collection of methods designed to enhance performance in terms of reducing wait times, minimizing costs, and eliminating wasteful practices to optimize service quality [9].

The identification process reveals activities falling within the NVA and NNVA categories. This is followed by proposing improvements using the root cause analysis (RCA) 5 Whys method. RCA is a structured approach for identifying various factors influencing one or more events, serving as a step in corrective actions [10].

2. Material and method

2.1. Service quality

The quality of service is the level of effort in fulfilling customer needs to receive a product or service with the expected excellence anticipated by consumers in fulfilling desires [11], [12], [13]. These efforts are carried out by companies or organizations with the aim of sustaining themselves in the market and gaining customer trust that can lead to future customer loyalty. Services with good quality will eventually result in customer satisfaction [14].

2.2. Customer satisfaction

Customer satisfaction is an assessment that originates from comparing actual performance with the needs, desires, and expectations of consumers that can be fulfilled, thus impacting repeat purchases of offered products or services [15]. Companies or institutions periodically measure the level of customer satisfaction to retain existing customers, increase the addition of new customers, and improve aspects with suboptimal performance values.

2.3. Service performance

The development of models to measure service quality, widely used, originates from the service quality dimensions (ServQual) proposed by Parasuraman et al. in 1988 [16]. The ServQual measurement considers the gap between customer expectations and the actual performance received. However, there is an opposing viewpoint from Cronin and Taylor in 1992, suggesting a modification to the model to consider actual performance as the sole determining factor [17].

This model is known as Service Performance (ServPerf). Service Performance (ServPerf) is a measurement method regarding the quality of a service through service quality attributes, developed by Cronin and Taylor in 1992 and 1994 [18]. The dimensions included in the ServPerf model are as follows [19]: Tangibles, Reliability, Responsiveness, Assurance, and Empathy.

2.4. Population and sample

The process of quantitative research includes one stage which is determining the population and sample. Population represents the entire possible data related to the object within the scope of the research, and it is divided into two categories: infinite population (which cannot be precisely determined) and finite population (which can be exactly determined) [20], [21]. The determination of a sample is necessary to make the research effective and efficient. A sample is a portion that represents the population, considering aspects relevant to the research. These considerations can be referred to as sample criteria that are considered for their meticulousness with the standard error of

estimate. The determination of the sample is carried out through calculations using the Slovin formula in Eq. (1).

$$n = \frac{N}{1+N\,(e^2)} \tag{1}$$

2.5. Validity and reliability

Validity is an index that indicates whether the measurement instrument used is appropriate for measuring the specific aspect being measured. Validity testing is crucial to ensure that the questions used do not produce data that deviate from the intended purpose [20]. Validity testing can utilize Pearson correlation, as follows:

$$r_{xy} = \frac{n\sum_{j=1}^{n} x_{ij}y_{j} - (\sum_{j=1}^{n} x_{ij})(\sum_{j=1}^{n} y_{ij})}{\sqrt{n\sum_{j=1}^{n} x^2_{ij} - (\sum_{j=1}^{n} x_{ij})^2}\sqrt{n\sum_{j=1}^{n} y^2_{ij} - (\sum_{j=1}^{n} y_{ij})^2}} \tag{2}$$

An instrument or question item can be considered valid or significantly correlated with the total score when the calculated value (r-value) is greater than the table value (t-value). After conducting validity testing and obtaining valid values, the next step involves testing the instrument's reliability. Reliability is an index that indicates the level of confidence or consistency of a measurement instrument. Reliability testing employs Cronbach's alpha (α) using the formula in Eq. (3) [20].

$$\alpha = \frac{k}{k-1}\frac{s^2_t - \sum_{j=1}^{k} s^2_j}{s_t^2} \tag{3}$$

It can be considered reliable if the Cronbach's alpha (α) value is > 0.7. If the value of Cronbach's alpha is < 0.7, it is necessary to improve or eliminate statement items with low correlation values [22].

2.6. Promethee

The PROMETHEE method is a part of the Multi-Criteria Decision Making (MCDM) method where determination or ranking occurs in an analysis with multiple criteria [10]. The steps involved in the implementation of the PROMETHEE method are as follows [7], [8]:

1. Determination of several alternatives.
2. Determination of criteria.
3. Rating the suitability of each alternative.
4. Calculation of preference values.

$$d = f(a) - f(b) \tag{4}$$

PROMETHEE has 6 types of preferences [23]:

a. Preferensi Tipe I (Usual Criterian)

$$H(d) = \begin{cases} 0 \text{ if } d \le 0 \\ 1 \text{ if } d > 0 \end{cases} \tag{5}$$

a. Preferensi Tipe II (Quasi Criterian)

$$H(d) = \begin{cases} 0 \text{ if } d \le q \\ 1 \text{ if } d > q \end{cases} \tag{6}$$

b. Preferensi Tipe III (V – Shape)

$$H(d) = \begin{cases} 0 \text{ if } d \le 0 \\ \frac{d}{p} \text{ if } 0 \le d \le p \\ 1 \text{ if } d > p \end{cases} \tag{7}$$

c. Preferensi Tipe IV (Level Criterian)

$$H(d) = \begin{cases} 0 \text{ if } d \le q \\ 0{,}5 \text{ if } 0 \le d \le p \\ 1 \text{ if } d > p \end{cases} \tag{8}$$

d. Preferensi Tipe V (Linear Criterian)

$$H(d) = \begin{cases} 0 \text{ if } d \le 0 \\ \frac{d-q}{p-q} \text{ if } q \le d \le p \\ 1 \text{ if } d > p \end{cases} \tag{9}$$

f. Preferensi Tipe VI (Gaussian Criterian)

$$H(d) = \begin{cases} 0 \text{ if } d \le 0 \\ 1 - e^{-\frac{a^2}{2a^2}} \text{ if } d > 0 \end{cases} \tag{10}$$

2.7. Lean service

Lean is a periodic action carried out to eliminate waste and enhance the value or added value in a service or product, aiming to meet customer desires and needs [24]. Lean service involves actions that create value in activities, eliminate waste in the service process, and create a flow of added value. One of the stages involves identifying types of actions or activities within the service process, including [25]:

1. Value Added (VA). Activities that provide added value.
2. Necessary but Non-Value Added (NNVA). Activities that do not add value to the process flow but are unavoidable in execution.
3. Non-Value Added. Activities tflowsdo not add value to the process flow.

2.8. Root cause analysis

Root Cause Analysis (RCA) is an action or tool aimed at identifying the causes of a problem occurring within a system or process. Another goal is to identify solutions to prevent recurring losses in the future [26]. There are several RCA methods that can be used, including Pareto analysis, fishbone diagram, 5 whys, Six Sigma, and Failure Mode Effect Analysis (FMEA) [10].

3. Results and discussions

Respondents are determined based on the sample size from a population, where the population refers to the number of patients in the November visits, totaling 348 individuals. Sample determination utilizes the purposive sampling technique and the Slovin formula calculation with a margin of error tolerance of 5% or 0.05, producing the number of samples is 178. The characteristics of the respondents are divided into gender, age, education, and occupation, as shown in Fig. 1-4.

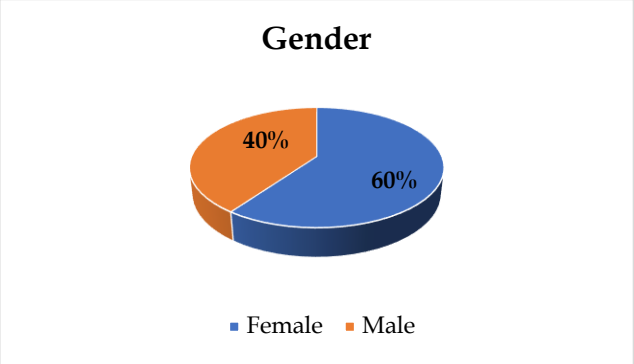

Figure 1. Respondent's gender

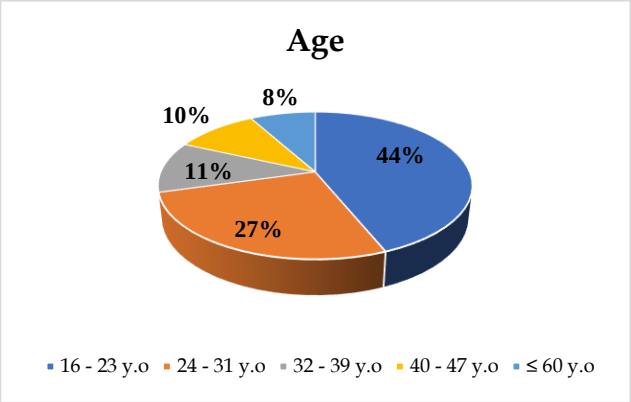

Figure 2. Respondent's age

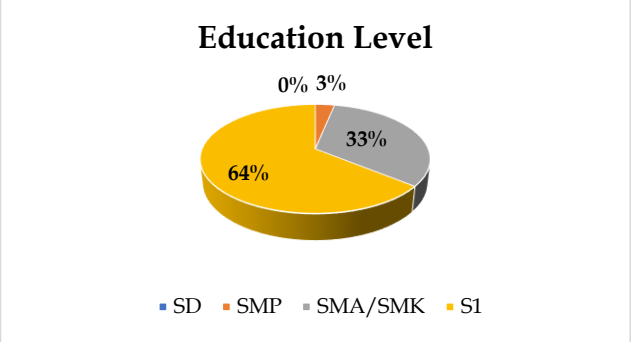

Figure 3. Respondent's education level

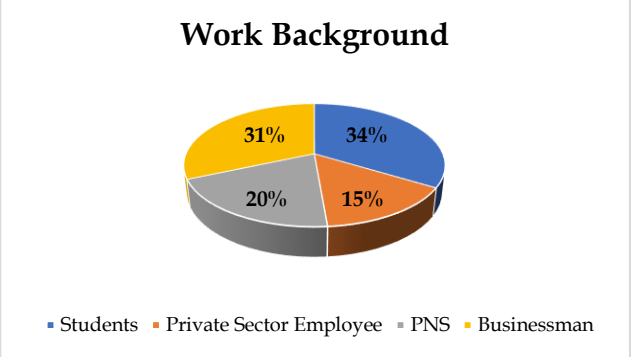

Figure 4. Respondent's work background

The results show that there are more female respondents than male respondents in Fig. 1 with a total value of 60% female respondents and 40% male respondents. In terms of age in Fig. 2, show that 44% of the respondents were 16-23 years old, 27% of the respondents were 24-31 years old, 11% of the respondents were 32-39 years old, 10% of the respondents were 40-47 years old, and 8% of the respondents were ≤ 60 years old.

Table 1.
Validity test results

Attribute	R-count	R-table	Conclusion
TA1	0,588	0,361	Valid
TA2	0,621	0,361	Valid
TA3	0,543	0,361	Valid
TA4	0,607	0,361	Valid
RE1	0,612	0,361	Valid
RE2	0,791	0,361	Valid
RE3	0,685	0,361	Valid
RE4	0,692	0,361	Valid
RE5	0,616	0,361	Valid
RS1	0,816	0,361	Valid
RS2	0,745	0,361	Valid
RS3	0,614	0,361	Valid
RS4	0,726	0,361	Valid
AS1	0,646	0,361	Valid
AS2	0,760	0,361	Valid
AS3	0,656	0,361	Valid
AS4	0,742	0,361	Valid

Based on Fig. 3, we can know the data based on education level with a total value 64% of the respondents were bachelor graduate (S1), 33% of the respondents were high school graduates, and 3% of the respondents were junior high school graduates. Last, Fig. 4 about respondents work background there are 34% of the respondents were bachelor's degree students, 31% of the respondents were private sector employees, 20% of the respondents were PNS, and 15% of the respondents were businessman.

The results of testing the validity of the 22 attributes of the questionnaire used IBM SPSS Statistics 26 software the results of testing 30 respondents. Determination of results or validity decisions are based on value $r_{value} > r_{table}$ then the result is valid, obtained r_{tabel} value of 0,3610 for df = 30 – 2 = 28; α = 0,05. From the results in Table 1, it can be concluded that all atributes are valid. Then proceed with reliability testing using IBM SPSS Statistics 26 shown in Table 2. Based on SPSS calculation, it is known that the Cronbach's Alpha value is 0.94 which shows Cronbach's Alpha (0.94) > 0.7. So that the attributes or all statement items are said to be reliable.

Next, we will perform data processing with the PROMETHEE method.

1. Determination of several alternatives. The alternatives are obtained from the service performance attributes presented in Table 2.
2. Determination of criteria. The criteria for selecting alternatives include 5 assessment groups with a value of 1-5 as seen in the questionnaire for processing in PROMETHEE, as shown in Table 3.
3. Rating the suitability of each alternative. The calculation of the alternative suitability rating is shown in Table 4.
4. Calculation of preference values. In this calculation using preference type I or usual criterian (see Table 4, then the values are converted using Eq. (5), and the calculation results are presented in Table 5.

Table 2.
XYZ community health center service improvement alternatives

Alternative	Notation
The health center has adequate and properly functioning medical equipment.	TA1
The location is easily accessible and equipped with public facilities such as parking space, prayer room, and restroom.	TA2
The health center's staff are dressed appropriately and neatly.	TA3
The health center has clean, healthy, and comfortable waiting and service rooms.	TA4
When the Health Center promises to do something within a specific timeframe, it is carried out.	RE1
When patients have complaints, the health Center shows sympathy and reassurance.	RE2
The health Center can be relied upon.	RE3
The health Center provides services according to the promised time.	RE4
The health Center keeps accurate records of data.	RE5
The health Center informs the patient precisely about the timing of the service being conducted.	RS1
Patients receive actions or services promptly from the health Center staff.	RS2
Health Center staff are always ready to assist patients.	RS3
Health Center staff are quick to respond to patient requests immediately.	RS4
Patients can trust the Health Center staff.	AS1
Patients feel safe during interactions with the Health Center staff.	AS2
Health Center staff behave politely.	AS3
Health Center staff receive sufficient support from the Health Center to perform their tasks.	AS4
The Health Center provides individual attention to patients.	E1
Health Center staff provide personalized attention.	E2
Health Center staff are aware of the patients' needs.	E3
The Health Center prioritizes the best interests of patients.	E4
The Health Center operates from 08:00 AM to 02:00 PM.	E5

Table 3.
Criteria for alternative selection

Criteria		Grade
A1	Strongly Disagree	1
A2	Disagree	2
A3	Neutral	3
A4	Agree	4
A5	Strongly Agree	5

Table 4.
Compatibility rating data for each alternative on each criterian

	Criteria	A1	A2	A3	A4	A5
Alternative	TA1	0	4	27	71	85
	TA2	1	6	22	43	115
	TA3	0	0	15	84	88
	TA4	0	2	22	78	85
	RE1	0	1	32	76	78
	RE2	0	0	28	36	123
	RE3	0	5	16	78	88
	RE4	1	1	27	74	84
	RE5	0	1	24	65	97
	RS1	42	92	24	27	2
	RS2	110	27	17	29	4
	RS3	87	50	10	32	8
	RS4	74	61	13	32	7
	AS1	0	0	24	111	52
	AS2	0	1	23	42	121
	AS3	0	2	18	85	82
	AS4	0	2	21	78	86
	E1	21	116	17	30	3
	E2	114	20	25	22	6
	E3	101	36	10	34	6
	E4	50	89	10	31	7
	E5	58	83	5	34	7

Table 5.
TA1 alternative preference value

	TA1				
TA2	-1	-2	5	28	-30
TA3	0	4	12	-13	-3
TA4	0	2	5	-7	0
RE1	0	3	-5	-5	7
RE2	0	4	-1	35	-38
RE3	0	-1	11	-7	-3
RE4	-1	3	0	-3	1
RE5	0	3	3	6	-12
RS1	-42	-88	3	44	83
RS2	-110	-23	10	42	81
RS3	-87	-46	17	39	77
RS4	-74	-57	14	39	78
AS1	0	4	3	-40	33
AS2	0	3	4	29	-36
AS3	0	2	9	-14	3
AS4	0	2	6	-7	-1
E1	-21	-112	10	41	82
E2	-114	-16	2	49	79
E3	-101	-32	17	37	79
E4	-50	-85	17	40	78
E5	-58	-79	22	37	78

Table 6.
Conversion TA1 alternative preference value

	TA1					RESULT
TA2	0	0	1	1	0	0,4
TA3	0	1	1	0	0	0,4
TA4	0	1	1	0	0	0,4
RE1	0	1	0	0	1	0,4
RE2	0	1	0	1	0	0,4
RE3	0	0	1	0	0	0,2
RE4	0	1	0	0	1	0,4
RE5	0	1	1	1	0	0,6
RS1	0	0	1	1	1	0,6
RS2	0	0	1	1	1	0,6
RS3	0	0	1	1	1	0,6
RS4	0	0	1	1	1	0,6
AS1	0	1	1	0	1	0,6
AS2	0	1	1	1	0	0,6
AS3	0	1	1	0	1	0,6
AS4	0	1	1	0	0	0,4
E1	0	0	1	1	1	0,6
E2	0	0	1	1	1	0,6
E3	0	0	1	1	1	0,6
E4	0	0	1	1	1	0,6
E5	0	0	1	1	1	0,6

5. Calculating preference index. Transfer values by transpose to find out index preferences.
6.
7. Calculating PROMETHEE I

PROMETHEE I calculates the value of the leaving low and entering flow. The leaving flow value is considered as the strength value of alternative, it shown in Table 7. The entering flow value is considered as the weakness value of alternative, it shown in Table 8.

8. Calculating PROMETHEE II

In promethee II, it calculates the complete ranking or net flow, shown in Table 9.

Table 7.
Leaving flow

Leaving Flow	
TA1	0,5143
TA2	0,581
TA3	0,3714
TA4	0,4381
RE1	0,4571
RE2	0,4667
RE3	0,4571
RE4	0,5429
RE5	0,4381
RS1	0,4667
RS2	0,4286
RS3	0,4476
RS4	0,4571

Leaving Flow	
AS1	0,4095
AS2	0,4286
AS3	0,4381
AS4	0,4476
E1	0,4286
E2	0,5143
E3	0,4286
E4	0,419
E5	0,4381

Table 8.
Entering flow

Entering Flow	
TA1	0,3714
TA2	0,3714
TA3	0,4762
TA4	0,3905
RE1	0,4
RE2	0,4381
RE3	0,381
RE4	0,3714
RE5	0,4381
RS1	0,4571
RS2	0,5619
RS3	0,5143
RS4	0,5048

Entering Flow	
AS1	0,4571
AS2	0,5048
AS3	0,3714
AS4	0,4286
E1	0,4762
E2	0,4857
E3	0,5333
E4	0,5524
E5	0,5333

Table 9.
Net flow

Net Flow	
TA1	0,1429
TA2	0,2095
TA3	-0,1048
TA4	0,0476
RE1	0,0571
RE2	0,0286
RE3	0,0762
RE4	0,1714
RE5	0
RS1	0,0095
RS2	-0,1333
RS3	-0,0667
RS4	-0,0476

Net Flow	
AS1	-0,0476
AS2	-0,0762
AS3	0,0667
AS4	0,019
E1	-0,0476
E2	0,0286
E3	-0,1048
E4	-0,1333
E5	-0,0952

Table 10.
Alternatives ranking

Alternative	Net Flow	Ranking
TA2	0,2095	1
RE4	0,1714	2
TA1	0,1429	3
RE3	0,0762	4
AS3	0,0667	5
RE1	0,0571	6
TA4	0,0476	7
E2	0,0286	8
RE2	0,0286	9
AS4	0,0190	10
RS1	0,0095	11
RE5	0,0000	12
E1	-0,0476	13
RS4	-0,0476	14
AS1	-0,0476	15
RS3	-0,0667	16
AS2	-0,0762	17
E5	-0,0952	18
E3	-0,1048	19
TA3	-0,1048	20
RS2	-0,1333	21
E4	-0,1333	22

Table 11.
Definition of improve process selection

No	Alternative Statements	Code	Waste Source	Reason for Low Performance
1	The health center prioritizes the best interests of the patients.	E4	Administrative Section	The existence of specific priorities for certain segments of the population during medical visits at the health center.
			General Clinic	
2	Patients receive actions or services promptly from the health center staff.	RS2	Administrative Section	Patients do not immediately receive a call to the general clinic section.
			General Clinic	Registration files are provided manually.
3	Health center staff are dressed politely and neatly.	TA3	Administrative Section	The dressing manner is not in accordance with regulations and is not tidy enough.
4	Health center staff are aware of the patients' needs.	E3	Administrative Section	Influence on the level of education regarding understanding in addressing patient complaints.
5	The health center operates from 08:00 AM to 02:00 PM.	E5	All Sections	a. Inconsistency in the health center's operations that start later than 08:00 AM. b. The health center closes before 02:00 PM.
6	Patients feel safe during interactions with the health ce	AS2	Administrative Section	Lack of supervision and attention from the health center staff.
			General Clinic	
7	Health center staff are always willing to assist patients.	RS3	Administrative Section	Health center staff are not on standby or approaching patients to inquire about their needs.
8	Patients can trust the health center staff.	AS1	Administrative Section	The delivery of information to patients is not accurate.
			General Clinic	Sudden changes in practice schedules communicated to patients.
9	Health center staff are responsive in promptly responding to patient requests.	RS4	Administrative Section	Staff engaging in activities outside of their job responsibilities.
			Pharmacy	The long waiting time for medication.
10	The health center provides individual attention to patients.	E1	Administrative Section	Lack of supervision and attention from the health center staff.

9. Creating Alternative Ranking

Ranking is based on the largest net flow value to the smallest net flow value, as seen in Table 10. Process definition was carried out to understand the physical flow and information flow of the process for the 10 alternatives with negative net flow values to initiate corrective actions. Process definitions are outlined in Table 11. From the definition of the process, the selection of processes that have activity or activity flows, 5 alternatives are obtained that will identify added value activities, including RS2, E5, RS3, AS1, and RS4.

Table 12.
Identification of VA, NVA, and NNVA

No	Code	Alternative Statements	Waste Source	VA	NNVA	NVA
1	RS2	Patients receive care or services promptly from the health center staff.	Administrative Section	Recording patient registration and administrative fees.	The relocation of the registration and payment desk.	Administering treatment to patients who are not called immediately after registration.
			General Clinic	a. Conducting examinations. b. Calling patients for examination with the doctor.	Employees repeatedly provide registration papers to each clinic, resulting in a pile-up of files.	
2	E5	The health center operates from 08:00 AM to 02:00 PM.	All Sections	The operational or activities of the health center are from 08:00 AM to 02:00 PM.		The operational start time is later than 08:00 AM, and the health center closes before 02:00 PM.
3	RS3	Health center staff are always willing to assist patients.	Administrative Section	Answering questions from patients.		Health center staff are not on standby or paying attention to patients.
4	AS1	Patients can trust the health center staff.	Administrative Section	Asking patients about their complaints for clinic referrals.		There are errors in conveying information.
			General Clinic	a. The doctor examines the patient. b. The doctor records the prescription.		Sudden delays in examination time for patients.
5	RS4	Health center staff are responsive in promptly responding to patient requests.	Administrative Section	a. Providing queue numbers. b. Conducting patient data collection.		Employees chatting with other employees and appearing busy playing with their phones.
			Pharmacy	a. Taking the prescription paper from the patient. b. Preparing the medication according to the doctor's prescription. c. Providing the medication to the patient as per the prescription.		Discrepancy in the information regarding the waiting time at the pharmacy section for providing prescription medication.

Classification of value-added activities consists of VA, NVA, and NNVA. In the next stage, corrective actions are proposed to reduce or eliminate NVA and NNVA. The mapping of the classification of value-added activities from the 5 alternatives can be seen in Table 12.

Based on mapping value-added activities for the 5 alternatives, 1 activity falls under the NNVA category, and 4 activities fall under the NVA category. In the general Clinic section, 1 activity is categorized as NNVA, and 2 activities are classified as NVA, while in the pharmacy section, 1 activity is classified as NVA.

10. The results of the proposed attribute improvement using the RCA (Root Cause Analysis) 5 Whys method.

In this study, the 5 Whys method was employed for the identification process until obtaining proposed improvements that can be implemented by Puskesmas XYZ. The proposed improvement for the administrative section regarding activities categorized as NNVA involves issues related to the relocation of the registration and payment data desk. The suggestion includes upgrading the entire data recording system to comprehensive computerization to integrate it with the administrative section and relevant clinics.

The 4 activities categorized as NVA that occur in the administrative section include the administration of procedures received more than 30 minutes after registration, resulting in a lengthy process. The proposed improvement involves conducting evaluations and coordinating the performance of each employee in accordance with service performance regulations. The proposed improvement for the general clinic section regarding NNVA activities, such as employees repeatedly providing registration forms to each clinic resulting in a stack of documents, suggests a layout change with a dedicated area for waiting and examination call-ups, and separate counters for each clinic. There are two NVA categorized activities, including the inconsistency in the operational hours of the health center starting after 08:00 AM and closing before 02:00 PM. Additionally, there is a delay in examining patients who arrive unexpectedly. The suggested improvements include controlling and coordinating the performance of doctors to address issues related to commitment and motivation in serving patients. It also involves coordinating service standards among staff and enforcing sanctions for any violations in line with work commitments. The proposed improvement for the pharmacy section, which has one

NVA categorized activity - the discrepancy in information about the waiting time for the pharmacy to dispense prescribed medications - suggests implementing changes. This includes adding counters to reduce patient queue congestion from various clinics, coordinating operational standards within the pharmacy concerning stock renewal displayed, and introducing periodic controlling measures.

4. Conclusions

Based on the PROMETHEE method calculations, 10 alternatives with negative net flows were obtained, including E4, RS2, TA3, E3, E5, AS2, RS3, AS1, RS4, and E1. Process definition mapping was carried out to determine alternatives with activity streams, resulting in 5 alternatives with a total activity classification in administrative, general clinic, and pharmacy sections. These consisted of 13 Value-Added (VA), 7 Non-Value-Added (NVA), and 2 Non-Necessary Value-Added (NNVA) category activities. Based on these findings, proposed improvements can be derived for implementation by Puskesmas XYZ, because of brainstorming sessions with the health center using the 5 Whys root cause analysis method.

Declaration statement

Evi Febianti: Conceptualization, Methodology, Software and Resources, Supervision. **Shanti Kirana Anggraeni**: Supervision, Visualization, Investigation. **Alya Rahmayani Zhen**: Writing-Original Draft, Data Processing, Editing. **Nuraida Wahyuni**: Supervision.

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Data availability statement

The data that support the findings of this study are available from the corresponding author, [EF], upon reasonable request.

References

[1] BPS, "Kota Cilegon Dalam Angka 2023," 2023.

[2] N. H. Ulumiyah, "Meningkatkan Mutu Pelayanan Kesehatan Dengan Penerapan Upaya Keselamatan Pasien Di Puskesmas," *J. Adm. Kesehat. Indones.*, vol. 6, no. 2, 2018, doi: 10.20473/jaki.v6i2.2018.149-155.

[3] J. P. Shela, "Penerapan Kesehatan Dan Keselamatan Kerja Guna Meningkatkan Mutu Pelayanan Di Puskesmas," *Shelajunita01@gmail.com*, 2021.

[4] "Peraturan Menteri dalam Negeri Republik Indonesia Nomor 79 Tahun 2018 Tentang Badan Layanan Umum Daerah," 2018.

[5] D. Hamid, Abdul; Fuad, Anis, "Laporan Kompetisi Pelayanan Publik Kota Cilegon," 2020.

[6] J. J. Cronin and S. A. Taylor, "Measuring Service Quality: A Reexamination and Extension," *J. Mark.*, vol. 56, no. 3, 1992, doi: 10.2307/1252296.

[7] I. Iqbal and R. Juliansyah, "Sistem Pendukung Keputusan Seleksi Penerimaan Karyawan Rumah Sakit Bmc Dengan Menggunakan Metode Promethee," *J. TIKA*, vol. 8, no. 1, 2023, doi: 10.51179/tika.v8i1.1936.

[8] M. A. Nuur Hafidz and M. Murinto, "Sistem Pendukung Keputusan Menggunaka Metode Promethee (Studi Kasus: Cathead Apparel)," *JSTIE (Jurnal Sarj. Tek. Inform.*, vol. 9, no. 3, 2021, doi: 10.12928/jstie.v9i3.20332.

[9] M. K. Mollah, M. Munir, A. W. Sari, J. T. Industri, T. Adhi, and T. Surabaya, "Peningkatan Kualitas Pelayanan Dengan Metode Pendekatan Lean Service di Perusahaan Jasa Transportasi (Studi Kasus: PT. KAI Daop 8 Surabaya)," *Pros. Semin. Nas. Sains dan Teknol. Terap.*, 2018.

[10] Y. E. Ateng, V. E., Rahmawati, R., dan Prawatya, "Usulan Perbaikan Sistem K3 Menggunakan Metode FMEA Dan RCA Pada PT.XYZ," *J. TIN Univ. Tanjungpura*, vol. 5, no. 1, 2021.

[11] W. Kuntoro and W. Istiono, "Kepuasan Pasien Terhadap Kualitas Pelayanan di Tempat Pendaftaran Pasien," *J. Kesehat. vokasional*, vol. 2, no. 1, 2017.

[12] S. Ayudia, B. Nadeak, and D. J. Suyaman, "Evaluasi Mutu Pelayanan Puskesmas Terakreditasi Berdasarkan Indeks Kepuasan Masyarakat Di Kabupaten Karawang," *Syntax Lit. ; J. Ilm. Indones.*, vol. 6, no. 6, 2021, doi: 10.36418/syntax-literate.v6i6.2340.

[13] A. S. Bagaskara and W. Utari, "Pengaruh Kualitas Pelayanan Inti Dan Kualitas Pelayanan Periferal Terhadap Kepuasan Pelanggan Dan Loyalitas Pelanggan Pada Laboratorium Klinik Grha Prodia Surabaya," *J. Manajerial Bisnis*, vol. 6, no. 2, 2023, doi: 10.37504/jmb.v6i2.494.

[14] J. B. Santoso, "Pengaruh Kualitas Produk, Kualitas Pelayanan, dan Harga terhadap Kepuasan dan Loyalitas Konsumen," *J. Akunt. dan Manaj.*, vol. 16, no. 01, 2019, doi: 10.36406/jam.v16i01.271.

[15] Ji. Nafisa and I. M. Sukresna, "'Analisis Pengaruh Kualitas Layanan, Harapan Kinerja Dan Citra Perusahaan Terhadap Loyalitas Pelanggan Melalui Kepuasan Pelanggan Sebagai Variabel Intervening (Studi Pada Rumah Sakit Islam Sultan Agung Semarang)'" *Diponegoro J. Manag.*, vol. 7, no. 3, 2018.

[16] A. Parasuraman, L. L. Berry, and V. A. Zeithaml, "SERVQUAL: a multiple-item scale for measuring customer perceptions of service quality and its implications for future," *J. Retail.*, vol. 64, no. 1, 1988.

[17] D. N. B. Kusyana and K. A. Pratiwi, "Skala Pengukuran Kualitas Layanan: Sebuah Kajian Literatur," *WIDYA*

Manaj., vol. 1, no. 2, 2019, doi: 10.32795/widyamanajemen.v1i2.354.

[18] R. N. Sari, M. C. P. A. Islami, I. Nugraha, Y. C. Winursito, and S. Dewi, "Analisis Kepuasan Pelanggan Terhadap Kualitas Pelayanan di PT. X.," *JUMINTEN*, vol. 3, no. 2, 2022, doi: 10.33005/juminten.v3i2.328.

[19] admin admin, N. Anggayani, and R. Osin, "Pengaruh Service Performance Terhadap Nilai Sekolah Kepuasan Dan Loyalitas Pelajar Pada Smk Pariwisata Triatma Jaya Tabanan," *J. Manaj. Pelayanan Hotel*, vol. 3, no. 1, 2020, doi: 10.37484/manajemen_pelayanan_hotel.v1i1.31.

[20] Sugiyono, *Metodologi Penelitian Bisnis: Pendekatan Kuantitatif, Kualitatif, Kombinasi, dan R&D*. 2017.

[21] W. Paper, K. C. Guzman, N. Oktarina, and Sugiyono, "Metodologi Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif dan R&D, (Bandung: Alfabeta, 2008)," *Econ. Educ. Anal. J.*, vol. 7, no. 1, 2018.

[22] F. D. P. Anggraini, A. Aprianti, V. A. V. Setyawati, and A. A. Hartanto, "Pembelajaran Statistika Menggunakan Software SPSS untuk Uji Validitas dan Reliabilitas," *J. Basicedu*, vol. 6, no. 4, 2022, doi: 10.31004/basicedu.v6i4.3206.

[23] R. A. da Cunha, L. A. D. Rangel, C. A. Rudolf, and L. dos Santos, "A decision support approach employing the PROMETHEE method and risk factors for critical supply assessment in large-scale projects," *Operations Research Perspectives*, vol. 9. 2022. doi: 10.1016/j.orp.2022.100238.

[24] B. R. Budiarto and B. Santoso, "Analisis Kualitas Pelayanan Terhadap Konsumen Menggunakan Metode Service Performance, Lean Service, Dan Importance Performance Analisys," *JUMINTEN*, vol. 1, no. 2, 2020, doi: 10.33005/juminten.v1i2.93.

[25] A. A. Abdallah, "Healthcare Engineering: A Lean Management Approach," *J. Healthc. Eng.*, vol. 2020, 2020, doi: 10.1155/2020/8875902.