Performance evaluation for the outsourcing of military base management services in the Republic of Korea using SERVQUAL and IPA

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Abstract

This study was conducted to evaluate the performance of a contracting-out project for military base management in response to recent defense reforms in the Republic of Korea that require military forces to concentrate on operations and combat missions. In this study, the service quality perspective via SERVQUAL was applied to the ROK defense sector for the first time, with the soldiers viewed as customers receiving a service. In addition, to improve the effectiveness of the contracted services, the importance-performance analysis framework was employed to identify the tasks that required urgent attention. We conducted a large-scale survey of 2,112 uniformed members within pilot project units. To avoid problems such as insincere responses or low response rates, we held interviews with the officers managing the units on the subject of the importance and purpose of the questionnaire. As a result, it was found that the outsourcing of cleaning services was the most successful initiative, while mowing/landscaping had the most urgent tasks for improvement, with some respondents believing that reliability and assurance should be improved.

Keywords Military management base service · Outsourcing · Evaluation · SERVQUAL · Important-performance analysis · Defense

1 Introduction

The Republic of Korea (ROK) military is considering providing contracted civilian services for field military base management to modernize its barracks culture while also focusing on combat missions. The purpose of this study was to evaluate the performance of the contracting out of military base management and to measure the satisfaction of the

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soldiers involved in a pilot project. The ROK military conducted the pilot project for military base management by focusing on three service areas: facility management, cleaning, and mowing/landscaping (Table 1).

The most effective strategy for evaluating the performance of a pilot project is to compare service performance before and after the project starts. However, in this project, it was not possible to measure the performance before starting the pilot project.

To overcome this problem, we used SERVQUAL for performance analysis. The dimensions of service quality in SERVQUAL are based on multi-item scales that are designed to measure customer expectations and perceptions and any gap between them (Tileng et al. 2013). The elements of SERVQUAL were used to develop the survey questionnaire while an importance-performance analysis (IPA) model was employed to measure service quality, not only in terms of the performance of individual items but also in terms of their importance to the overall satisfaction of the respondent (Syaifoelida et al. 2016). The experiences of the soldiers in the pilot project were collected using the SERVQUAL-based survey, with differences between perception and expectations recorded. Based on the measured performance, IPA was conducted to identify areas that need improvement in the contracting-out process.

2 Related research

Developed by Parasuraman et al. (1988), SERVQUAL is a service quality measurement tool that is widely used to evaluate service quality in companies and public institutions, incorporating five service dimensions: tangibles, reliability, responsiveness, assurance, and empathy (Brady et al. 2001; Cunningham et al. 2017; Ju et al. 2012; Lee et al. 2016; Mukhtar et al. 2013; Pansiri et al. 2010). In the framework of these dimensions, the quality of a service is measured as a result of an evaluation process, in which consumers' expectations and their perception of performance are compared (Yildiz 2011).

Since first proposed by Martilla et al. (1977), IPA has been widely used to analyze importance and performance (Aktas et al. 2007; Azzopardi et al. 2013; Blesic et al. 2014; Shieh et al. 2009, 2011; Wu et al. 2012). These methods have since been used to assess service quality in a number of studies. Izadi et al. (2017) created 32 questions that measured patient expectations and perception of performance for the IPA model. Yin (2016) analyzed the quality of telehealth services designed to monitor the vital signs of patients via mobile devices using SERVQUAL and IPA, while Kim et al. (2010) examined the characteristics of public transportation, including the commuting time, ease of access, and access time, to evaluate the quality of transportation services using SERVQUAL and IPA. Moon et al. (2010) also used SERVQUAL to assess the family welfare services provided by the Healthy Families Support Center and to identify effective management strategies based on

Table 1 Service areas covered by the pilot project for the outsourcing of military base management

Service area	Tasks
Facilities management	Electricity, waste supply, air-conditioning, and heating facility management, repairs, waterproofing, painting, and drainage inspection
Cleaning	Cleaning of the barracks and other facilities
Mowing/landscaping	Mowing and landscaping for supply and patrol routes

IPA. They measured the level of perceptions and expectations for 21 indicators across five dimensions for the Citizen Health and Family Support Center and analyzed the difference between perceptions and expectations using *t*-tests.

The design of SERVQUAL-based assessment has also been studied. Kim et al. (2016) investigated different combinations of SERVQUAL items and developed appropriate measurement items to assess the quality of a multicultural education training project, with IPA conducted based on the results. Han et al. (2012) also conducted a literature review and qualitative research on B2B service quality to determine the relevant quality factors and measurement items for SERVQUAL.

3 Research methodology

3.1 Research model

In this study, we surveyed the unit members involved in the pilot project. Before distributing the questionnaire, we visited the units to explain the purpose of the performance analysis to the officers in charge of facility management. The questionnaire was composed of perception and expectation items based on the concept of SERVQUAL. The questionnaire was then distributed to the units. After collecting the survey results, we analyzed the gap between the perception and expectation levels to understand the satisfaction of the unit members. Based on this, IPA was employed to identify what improvements were needed. Figure 1 summarizes the research process.

3.2 Creating the SERVQUAL items

SERVQUAL consists of five dimensions (reliability, tangibles, responsiveness, assurance, and empathy) and 22 items. We modified some items to take into account the characteristics of the ROK military force and the defense environment. To confirm the details of the questionnaire items, we conducted three focus group interviews with military officers. Table 2 presents the demographic information of the interviewees. The item for notification of accurate service delivery times (No. 7) was included in facility management only because it was believed to be unrelated to the other services. The SERVQUAL items utilized in this study are presented in Table 3.

Fig. 1 Research model for the present study

Table 2 Focus group interviewees' demographic information

Ilitary division	Officers
A division	40
B division	79
C ammunition depot	28

3.3 Survey process

We conducted a survey on the unit members involved in the pilot project for performance analysis of the contracted-out services. The questionnaire regarding facility management and cleaning were distributed to two divisions. In addition to these divisions, members of an ammunition depot unit received the questionnaire for mowing and landscaping. Table 4 summarizes the demographic information for the respondents.

4 Performance analysis

4.1 Factor analysis

The construct validity of the questionnaire was supported by the factor loading for each of the three services (Table 5): facility management (Kaiser–Meyer–Olkin [KMO] value of 0.975 and Bartlett's test of sphericity with $\chi^2 = 29097.95$ [$p = 0.000$]), cleaning (KMO value of 0.976 and Bartlett's test of sphericity with $\chi^2 = 28067.04$ [$p = 0.000$]), and mowing/landscaping (KMO value of 0.979 and Bartlett's test of sphericity with $\chi^2 = 32060.44$ [$p = 0.000$]). It was recommended the threshold value of KMO as 0.5 and Bartlett's test of sphericity is significant at less than 0.05 (Ramu et al. 2019). Pearson correlation was also conducted to evaluate convergence validity of the questionnaire (Wu et al. 2010).

Factor analysis was conducted based on principal components analysis with varimax rotation, eigenvalues exceeding 1, and a factor loading greater than 0.5. These items were classified into four dimensions, i.e., reliability, responsiveness, assurance and empathy, and tangibles. Factor analysis was not applied to tangibles because there was only one item. Tables 6, 7 and 8 present the results of the factor analysis for each service area with their Cronbach's α values.

4.2 Expectation and perception assessment for the three service areas

We measured the expectations and perceptions for the three service areas based on five SERVQUAL dimensions. Repeated sample *t*-tests were performed to test the statistical significance of any difference between the expectation and perception scores. As shown in Table 9, for facility management, the perception and expectations were distributed within a range of 3.861–4.049, with no significant differences except for item No. 9.

Next, cleaning performance was measured. As shown in Table 10, the service quality items exhibited high levels of perception (from 4.012 to 4.107). Unlike facilities management, significant differences were found between the expectations and perceptions.

Table 3 Details of the modified SERVQUAL items

SERVQUAL Dimensions		No.	Details for the Target ROK Military Units
Reliability	Reliable and accurate, able to implement services	1	The extent to which the company faithfully fulfills the promised contracted services, i.e., facility management, cleaning, and mowing/landscaping
		2	Attitudes of the contractor's employees and managers when there is a problem with the cleaning environment or the condition of the facilities
		3	Facility management, cleaning, and mowing/landscaping services are properly implemented first time
		4	The extent to which contracting-out services are provided at designated times
		5	The provision of work-related services, such as providing written work records
Tangibles	Physical facilities, equipment, appearance of employees, and visual satisfaction	6	The use of the best equipment for the job, including cleaning tools, repair tools, and lawnmowers
Responsiveness	Attitude towards helping customers and providing services	7	Notification of accurate service delivery times
		8	The provision of contracted-out services, such as prompt cleaning if necessary
		9	Voluntary efforts to assist users, such as providing clean and efficient facilities
Assurance	Efforts to instill users with confidence in employee services and attitudes	10	Responding quickly to user needs
		11	The level of courtesy and sincerity of the company's employees when dealing with the soldiers
		12	Knowledge regarding facilities, such as facility repair and weeding, and the ability to answer users' questions

Table 3 (continued)

SERVQUAL Dimensions	
Empathy	
Consideration and concern for the user (i.e., the customer)	No. Details for the Target ROK Military Units
	13 The degree to which the contractor managers and staff pay attention to the soldiers
	14 The degree to which the soldiers are provided with contracting-out services considering the time zone or convenience desired
	15 The degree to which the company takes the convenience of soldiers seriously
	16 The extent to which contractor's employees understand the requirements of the soldiers (e.g., cleanliness, good facility conditions)

Table 4 Demographic information for the respondents in the present study

Service area	Respondents participating in the survey					
	Military division	Total manpower	Subtotal	Officers	Noncommissioned officers	Soldiers
Facility management	A division	1,862	689	39 (5.7%)	92 (13.45)	558 (81.0%)
	B division		1,173	79 (6.7%)	147 (12.5%)	947 (80.7%)
Cleaning	A division	2,049	736	42 (5.7%)	98 (13.3%)	596 (81.0%)
	B division		1,313	86 (6.5%)	166 (12.6%)	1,061 (80.8%)
Mowing/landscaping	A division	2,122	681	40 (5.9%)	82 (12.0%)	559 (82.1%)
	B division		1,164	79 (6.8%)	150 (12.9%)	935 (80.3%)
	C ammunition depot		277	28 (10.1%)	47 (17.0%)	202 (72.9%)

Table 5 Construct validity of the questionnaire

Service area	KMO value	Bartlett's test of sphericity	<i>p</i> value
Facility management	0.975	29097.95	0.000
Cleaning	0.976	28067.04	0.000
Mowing and landscaping	0.979	32060.44	0.000

Table 6 Results of factor analysis for facility management

Extracted dimension	Item	Factor loading	Eigenvalue	Variance explained (%)	Cronbach's alpha
Reliability	1	0.781	3.774	25.163	0.937
	2	0.732			
	3	0.749			
	4	0.698			
	5	0.563			
Tangibles	6	–	–	–	–
Responsiveness	7	0.744	2.849	18.996	0.918
	8	0.627			
	9	0.614			
	10	0.583			
Assurance and empathy	13	0.708	5.797	38.645	0.947
	14	0.749			
	15	0.583			
	16	0.7			
	17	0.716			
	18	0.723			

Table 7 Results of factor analysis for cleaning

Extracted dimension	Item	Factor loading	Eigenvalue	Variance explained (%)	Cronbach's alpha
Reliability	1	0.737	4.552	35.02	0.937
	2	0.706			
	3	0.667			
	4	0.584			
	5	0.625			
Tangibles	6	—	—	—	—
Responsiveness	8	0.672	2.663	20.487	0.900
	9	0.732			
	10	0.678			
Assurance and empathy	13	0.754	3.691	28.393	0.942
	14	0.765			
	15	0.7			
	16	0.711			
	17	0.67			

Table 8 Results of factor analysis for mowing/landscaping

Extracted dimension	Item	Factor loading	Eigenvalue	Variance explained (%)	Cronbach's alpha
Reliability	1	0.747	5.003	35.737	0.936
	2	0.713			
	3	0.656			
	4	0.581			
	5	0.74			
Tangibles	6	—	—	—	—
Responsiveness	8	0.523	2.286	16.33	0.901
	9	0.714			
	10	0.689			
Assurance and empathy	13	0.693	4.312	30.799	0.946
	14	0.735			
	15	0.724			
	16	0.731			
	17	0.701			
	18	0.684			

As shown in Table 11, the perception level for mowing/landscaping ranged from 3.936 to 4.036 for the service quality items. It was confirmed that some items had significant differences between expectations and perceptions (items No. 2, No. 9, No. 10, No. 11, and No. 15).

Table 9 Comparison of expectation and perception levels by SERVQUAL item for facility management

Dimensions	Item no.	Number	Expectation level		Perception level		Gap (P-E)	<i>t</i>	Level of significance
			Mean	SD	Mean	SD			
Reliability	1	1896	3.987	0.835	4.005	0.846	0.018	1.113	0.266
	2	1896	3.948	0.879	3.976	0.879	0.028	1.595	0.111
	3	1896	4.002	0.850	4.010	0.846	0.008	0.463	0.643
	4	1896	4.011	0.860	4.011	0.870	0.000	0.000	1.000
	5	1896	3.948	0.877	3.954	0.896	0.006	0.354	0.723
Tangibles	6	1875	3.861	0.936	3.899	0.961	0.038	1.894	0.058
	7	1888	3.921	0.891	3.928	0.931	0.007	0.393	0.694
	8	1888	3.958	0.872	3.975	0.899	0.017	0.954	0.340
	9	1890	3.888	0.944	3.953	0.940	0.065	3.399	0.001
Responsiveness	10	1890	3.924	0.912	3.935	0.945	0.011	0.566	0.571
	11	1891	3.985	0.890	3.976	0.899	-0.009	-0.545	0.586
	12	1891	3.978	0.873	3.982	0.881	0.004	0.236	0.813
	13	1885	3.958	0.894	3.973	0.897	0.015	0.852	0.394
	14	1885	3.979	0.888	4.005	0.897	0.026	1.450	0.147
	15	1891	4.010	0.871	4.017	0.903	0.007	0.402	0.688
	16	1891	4.030	0.879	.049	0.880	0.019	1.107	0.269

Table 10 Comparison of expectation and perception levels by SERVQUAL item for cleaning

Dimensions	Item no.	Number	Expectation level		Perception level		Gap (P-E)	<i>t</i>	Level of significance
			Mean	SD	Mean	SD			
Reliability	1	2072	4.013	0.844	4.095	0.845	0.082	5.591	0.000*
	2	2072	3.954	0.874	4.046	0.864	0.092	5.639	0.000*
	3	2069	4.030	0.844	4.099	0.859	0.069	4.154	0.000*
	4	2067	4.023	0.845	4.107	0.859	0.084	5.048	0.000*
	5	2065	3.963	0.877	4.033	0.886	0.070	4.146	0.000*
Tangibles	6	2053	3.967	0.912	4.019	0.908	0.052	3.046	0.002*
Responsiveness	8	2067	3.994	0.865	4.069	0.858	0.075	4.473	0.000*
	9	2070	3.974	0.893	4.048	0.887	0.074	4.366	0.000*
	10	2067	3.969	0.890	4.058	0.885	0.089	5.179	0.000*
	11	2070	3.943	0.895	4.015	0.872	0.072	4.459	0.000*
Assurance and empathy	12	2071	3.962	0.885	4.012	0.891	0.050	2.931	0.003*
	13	2071	3.986	0.881	4.037	0.870	0.051	2.989	0.003*
	14	2065	4.008	0.878	4.070	0.883	0.062	3.760	0.000*
	15	2070	4.035	0.881	4.091	0.873	0.056	3.543	0.000*

* $p < 0.05$

In conclusion, it could be seen that perception levels for the cleaning service were relatively high compared to the other services and there were significant differences between expectations and perceptions for this service area.

Table 11 Comparison of expectation and perception levels by SERVQUAL item for mowing and landscaping

Dimensions	Item no.	Number	Expectation level		Perception level		Gap (P-E)	<i>t</i>	Level of significance
			Mean	SD	Mean	SD			
Reliability	1	2198	3.970	0.856	3.995	0.871	0.025	1.667	0.096
	2	2197	3.954	0.881	3.987	0.902	0.033	2.025	0.043*
	3	2197	3.999	0.852	4.029	0.877	0.030	1.943	0.052
	4	2196	3.998	0.865	4.029	0.880	0.031	1.903	0.057
	5	2194	3.983	0.865	3.991	0.901	0.008	0.516	0.606
Tangibles	6	2176	4.005	0.892	4.025	0.904	0.020	1.194	0.233
Responsiveness	8	2196	3.990	0.880	4.011	0.888	0.021	1.258	0.208
	9	2195	3.946	0.918	3.987	0.913	0.041	2.314	0.021*
	10	2196	3.958	0.889	3.996	0.907	0.038	2.317	0.021*
Assurance and empathy	11	2194	3.903	0.886	3.936	0.916	0.033	2.085	0.037*
	12	2192	3.953	0.867	3.964	0.888	0.011	0.683	0.495
	13	2193	3.961	0.888	3.992	0.911	0.031	1.835	0.067
	14	2190	3.997	0.905	3.988	0.873	−0.009	1.695	0.090
	15	2194	3.988	0.873	4.022	0.900	0.034	0.105	0.035*
	16	2193	4.027	0.900	4.036	0.898	0.009	0.600	0.548

* $p < 0.05$

5 Identification of required improvements

5.1 Using IPA

IPA measures the relationship between importance and performance (Izadi et al. 2017). Performance refers to customer perceptions about how a service is delivered by an enterprise, whereas importance is a manifestation of the relative value assigned by customers to a service (Yildiz 2011). By measuring importance and performance, the IPA model develops specific product relations based on attributes of technological priorities. These attributes can be organized into quadrants according to the average importance and performance (Syaifoelida et al. 2016). Figure 2 is divided into four quadrants, with the x-axis representing the importance of an attribute, which is a measure of its expectation, and the y-axis representing the performance level of an attribute, which is a measure of its perception. The items in the first quadrant represent high importance and performance items, meaning that an effort is required to maintain high standards. The items in the second quadrant are considered to be of low importance by the users, but their performance is good. Thus, maintaining the status quo for these items is desirable. The third quadrant represents items of low importance and poor performance; they could be improved, but it does not have to happen immediately. The fourth quadrant contains items with high importance but poor performance, thus they require urgent attention. In this study, we focused on the fourth quadrant to identify improvement requirements. IPA plots based on the average expectation and perception levels were performed for each service (facilities management, cleaning, and mowing/ landscaping).

Fig. 2 Generalized IPA quadrant layout

Fig. 3 Results of IPA for facility management

Fig. 4 Results of IPA for cleaning

5.2 Results of IPA

By utilizing the information summarized in Tables 6, 7 and 8, three IPA plots were drawn as Figs. 3, 4, and 5, respectively. Following the IPA plots for this study, it was found that 60.0% of the items in mowing/landscaping occupied the third and fourth quadrants, indicating the need for improvement. The other services had similar results (facility management: 56.3%; cleaning: 50.0%). For mowing/landscaping, two items were in quadrant 4, with the respondents requesting more systematic management such as maintaining records of the work as well as services delivered at the desired time. Table 12 summarizes the items for improvement highlighted by the IPA.

6 Conclusions and limitations

SERVQUAL and IPA were used as tools to evaluate the performance of pilot projects for the contracting-out of military base management services. We conducted a large-scale survey of 2,112 uniformed members regarding the projects. In order to deliver a large

Fig. 5 Results of IPA for mowing/landscaping

number of surveys without problems, we conducted focus group interviews with the officers managing the units to explain the importance and purpose of the questionnaire.

Based on factor analysis, the items in the three service areas were classified into four dimensions: reliability, tangibles, responsiveness, and assurance/empathy. It was found that performance was highest for cleaning services. Therefore, it can be concluded that the outsourcing of cleaning services was the most successful initiative. On the other hand, mowing/landscaping had the most urgent tasks for improvement, with some respondents believing that reliability and assurance should be improved. It seems that members of the unit expected the facilities to be well managed.

This study is significant in that it introduced a service quality perspective to the ROK defense sector in the measurement of service quality. We approached the soldiers as if they were customers receiving a service. Another important contribution of this study is the use of IPA methodology to determine which services in the pilot program should be improved. This would enhance the efficiency of the utilization of private resources in the defense sector.

However, there are some limitations in the study. First, considering that this is an evaluation for actual policy implementation, it is necessary to analyze its cost-effectiveness in future research. Second, there was a lack of discrimination in some response results. For facility management in particular, the differences between perceptions and expectations were small. Future research thus requires more sophisticated survey questions to more clearly distinguish gaps in service quality.

Table 12 Summary of the items that require improvement (fourth quadrant)

Service area	Details	Expectation level (E)	Percep- tion level (P)
Facility management	The level of courtesy and sincerity of the company's employees when dealing with soldiers	3.985	3.976
	Service attitude of the contractor's employees		
Mowing/landscaping	Providing work-related services, such as written work records	3.983	3.991
	Maintain records of the work conducted		
	The degree to which the soldiers are provided with contracting-out services considering the time zone or convenience desired	3.997	3.988
	Service at the desired time		

Compliance with ethical standards

Conflict of interest The authors have no relevant financial or non-financial interests to disclose.

Ethical approval We have complied with ethical standards in conducting this study.

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