

Customer Satisfaction Index (CSI) and Importance Performance Analysis (IPA) Methods for Intermediate Public Transport System in Imphal, Manipur

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Abstract

Intermediate Public Transport (IPT) system plays an important role in the overall efficient and effective operation of a transportation system in a city area. Efficient operation of the IPT is a key factor for the improvement of living conditions of the public. The exploration of service quality of IPT is necessary to provide a better service and improving the economic condition of the state. In this paper, Customer Satisfaction Index (CSI) and Importance Performance Analysis (IPA) methods has been discussed to determine the level of satisfaction of IPT (Auto/Shared Auto/E-rickshaw) commuters in the capital city of Manipur state. A questionnaire survey was conducted regarding the customer level of satisfaction in various wards in the Imphal Municipality area. From the study it was observed that CSI is half of the total IPT commuters which indicate unsatisfactory for the present condition. The study using the IPT method also shows that four attributes are in the top priority, three attributes are to be maintained, eight attributes have low priority, and six attributes have excess priority.

Keywords: Customer Satisfaction Index (CSI), Importance Performance Analysis (IPA), Service quality

1. Introduction

Intermediate Public transport (IPT) system fills the gap between public transport (bus and etc) and private vehicles. IPT provides greater accessibility by its flexibility, connectivity, availability on demand, comfort and operate easily through the narrow streets where buses and other public transport system can't operate. IPT caters a large portion of urban travel demand as an alternative public transport in the absence of an organized transit system. IPT has the potential of providing clean mobility, low emission and improved safety with continuous monitoring of performance and upgrading technology [1]. In Imphal IPT are normally used as main mode of transportation for workplace, school, college and daily commuters. The various forms of IPT services in Imphal are auto, shared auto, e-rickshaw, cycle rickshaw, tata magic, taxi, maruti van. Among all the

IPT transit, auto rickshaw are used at the highest percentage for daily commuters with respect to all the modes [2]. IPT in imphal operates in both fixed route and flexible schedule. In Imphal operation of Intermediate Public Transport system is under the exclusive management of private Operators which is defined as a characteristic model with lack of healthy competition besides compromising public safety & comforts, etc. To improve the service quality without customizing habitual travellers and satisfying commuters, transit agencies must take up performance measure. Attempt has been made in some studies to measure customer satisfaction of transit using Customer Satisfaction Index and Importance Performance analysis methods. Transit users satisfaction studied has been studied in several features. [3] The purpose of study aims to

identify the service quality based on a few elements needed to develop customer satisfaction among electrical bus users in Bandar Pengerang by adopting the Customer Satisfaction Index analysis. The main elements to measure are affordability, safety, comfort, and accessibility of the customers to the electric buses. Importance performance Analysis (IPA) introduced by Martilla and James in 1977 demonstrate satisfaction measurement and efficient resource allocation with appropriate format, [4] methods aims to measure the relationship between consumer perceptions and priorities for improving product/service quality which is also known as quadrant analysis. This paper aims to determine the level of satisfaction of IPT system using Customer Satisfaction Index (CSI) and Importance Performance Analysis (IPA) methods. Customer Satisfaction Index (CSI) is used to determine the level of user satisfaction for commuters that considered the importance of the measured attributes [5]. In this study 21 attributes for measuring service quality are defined. The methods are in the form of a questionnaire that uses a Likert scale as shown in Table 2 on a three levels of satisfaction/unsatisfaction. The implementation of CSI can provide measurement results related to customer satisfaction and can be a reference and input for improvements and targets that will be achieved in the future [6]. Importance Performance Analysis (IPA) is used to determine the level of consumer satisfaction, what things need to be improved and what needs to be maintained based on data generated from respondents which will be the basis for improving and increasing user satisfaction. The level of satisfaction obtained by comparing the implementation performance score with the importance score so that a priority scale will be obtained that will be used in handling. The IPA was measured using the Likert scale to determine the importance level score and the satisfaction/performance level score of the respondent's answers with a 10-level measurement scale [7]. The measurement of customer satisfaction levels will be mapped in a graphic method which is showed in a two-dimensional coordinate system, the

average values of importance and performance of different services attributes, which are calculated in relation to one another, mainly in the area divided into four quadrants [8]. The exploration of service quality of IPT system is necessary to provide a better service in future. In this paper customer satisfaction of auto/shared auto and e-rickshaw commuters were analyse using Customer Satisfaction Index (CSI) and Importance Performance analysis (IPA) methods based on commuters view towards service route and characteristics, service reliability, comfort, cleanliness, fare, information, safety and security, customer services and environmental protection provided by IPT system operating in Imphal city. [11]

1.1 Objectives of the study

To analyze the satisfaction level of the IPT commuters using Customer Satisfaction Index (CSI) and Importance Performance Analysis (IPA) methods in auto, shared auto and e-rickshaw for various ward in Imphal Municipality. To suggest some measure to improve the service quality in auto, shared auto e-rickshaw and other IPT service for various ward in Imphal Municipality.

1.2 Needs for the study

- In Imphal, lack of compatible Public Transport result in rapid growth of personalized vehicles coupled with phasing out of old/polluted private & public transport system. The introduction of Intermediate Public Transport vehicles mostly diesel driven shared auto/ auto rickshaw and e-rickshaw operating under the Contract Carriage Permits (Temp).
- IPT system like auto, shared auto and e-rickshaw serves higher level of service for IPT daily commuters. Hence proper improvements are required among the IPT services for better satisfaction of the commuter.
- In this paper we analyse Customer satisfaction index and Importance Performance Analysis methods to improve IPT System Corporation in Imphal city. [14]

2. Methodology

A systematic and suitable methodology was adopted for the study to achieve the objective as mentioned above. Imphal city is selected for the study considering the ill health and unsystematic IPT services presently use by the commuters. The public transport system in Imphal city is in miserable condition and larger number of commuter use IPT services as a main source of transport system. The study use Customer Satisfaction Index (CSI) and Importance Performance Analysis (IPA) methods to determine the level of customer satisfaction for all attributes.

2.1 Study Area

Under the scheme of Minister of Housing and Urban Affairs (MOHUA) the Imphal city was selected to be developed as smart city of the country in the year 2016. Hence the present city will be highly benefited for the successful implementation of the scheme. Imphal is the capital city of Manipur with its longitude $93^{\circ}57'E$ and latitude $24^{\circ}50'N$. The state has the setbacks of rapid urbanization, urban sprawl, economic growth, political activities, administrative measures and commercial activities of the State. It has a unique feature of topographical location, being surrounded by other Districts having connected by radial roads of different classifications like National Highways, State Highways, other District Roads and other major Corridors etc. The State has a very poor road communication facility. Highways or roads are regarded as arteries and veins of a State which are essential for its overall growth. The study was conducted on Imphal municipal area where commuter travels on daily basis. There are 37 wards in Imphal municipal area as shown in Figure 1. IPT vehicle type in Imphal are –car, 2-wheeler, bus, LCV/HCV, auto rickshaw, cycle rickshaw, 3/4-wheeler goods, maruti van, e-rickshaw and tata magic in which the IPT service operated in study area are- auto rickshaw, cycle rickshaw, tata magic, maruti van, e-rickshaw.

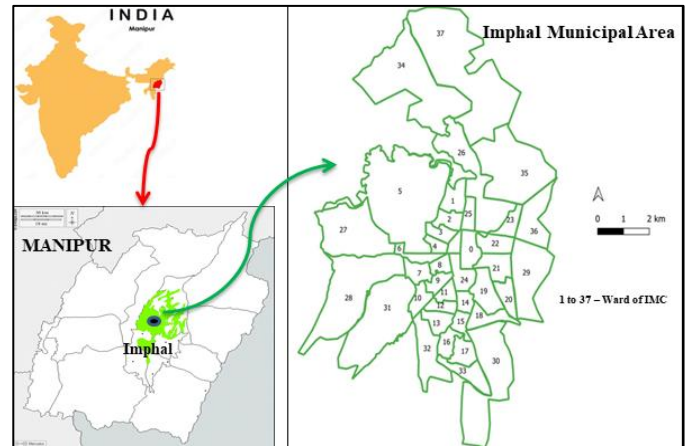


Figure 1 IMC Area Map of Imphal (IMC map: source S. Padma, 2022)

2.2 Data Collection Method

A well-structured questionnaire regarding the customer level of satisfaction was developed for survey and used for primary data. Secondary data sources include academic literature and articles in different journals and magazines. The questionnaire was then distributed amongst the IPT commuters of various wards in the Imphal Municipal area. A 10-point Likert scale scoring of importance ranging from 10 = very importance, 5 = neutral & 1 = unimportance and scoring of satisfaction ranged from 10 = very satisfied, 5 = neutral & 1 = Unsatisfied are used to mark the satisfaction level on each of the 21 attributes. A sample size of 200 was taken for this study and 151 responses were qualified for the study [9].

2.3 Method of Data Analysis

The study uses the Customer Satisfaction Index (CSI) and Importance Performance Analysis (IPA) approach with quantitative data collection to determine the overall satisfaction level of the IPT commuters.

The Customer satisfaction Index is calculated by the following steps [10].

Mean Importance Score (MIS): It is obtained from the average importance level of each IPT commuter.

Mean Satisfaction Score (MSS): It is obtained from the average performance level of each IPT commuter.

Weight factor (WF): It is obtained from the calculation of the MIS value per attribute which is then divided by total amount of MIS multiplied by 100.

Weight Score (WS): The multiplication between each item on each WF and WSS attribute.

Total Median Weight (WMT): It is total amount of the weight score (WS) value.

Customer satisfaction Index (CSI): To find CSI value, the following equation is used:

$$CSI = WMT / HS \times 100\% \quad (1)$$

WMT = total weight score

HS = the maximum scale used i.e., 10.

Table 1 Customer Satisfaction Value Criteria (Bhote 1996)

Value CSI	CSI Criteria
0.81 – 1.00	Very Satisfied
0.66 – 0.80	Satisfied
0.51 – 0.65	Quite Satisfied
0.35 – 0.50	Unsatisfied
0.00 – 0.34	Very dissatisfied

The results of data collection were analyzed using the Importance Performance Analysis (IPA) method. The IPA method is used to improve the quality of a product or service by measuring the relationship between IPT commuters' performance and priority. IPA is a method of analyzing user satisfaction with a service [12]. The following formula is used to measure the satisfaction level of commuters with the performance.

$$T_{ki} = X_i / Y_i \times 100\% \quad (2)$$

T_{ki} = Respondents' conformity level

X_i = Performance level

Y_i = Importance level

The following formula is used to determine the factors affecting satisfaction.

$$X^{\bar{}} = \sum X_i / n \quad (3)$$

$$Y^{\bar{}} = \sum Y_i / n \quad (4)$$

X[̄] = Average score of performance level

Y[̄] = Average score of importance level

n = number of attributes

The average value of importance and performance of each attributes are provided by direct evaluation by IPT commuters and calculated in the specified coordinate system and then produce in a Cartesian diagram, where the horizontal axis represents performance, and the vertical axis represents importance [7] Figure 2.

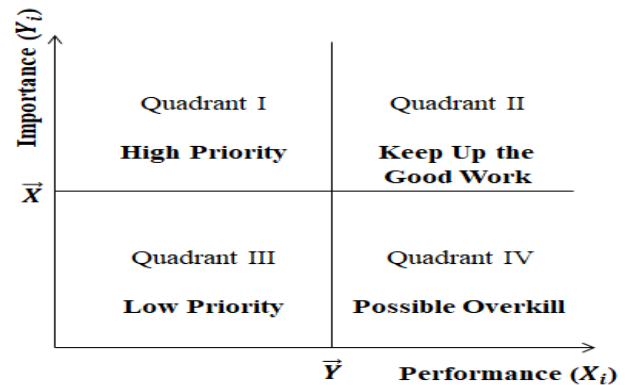


Figure 2 Importance Performance Analysis Matrix

The Cartesian diagram of the Importance Performance Analysis is depicted and divided into four parts with levels of their respective attributes [13]:

- **Quadrant I (High Importance/Low Performance):** usually called concentrate here. The attributes in this quadrant represent important service by IPT commuters but company provides low quality, so they must be improved and are the top priority that needs to be carried out by the company.
- **Quadrant II (High Importance/High Performance):** usually called keeping up the good work. The attributes in this quadrant represent important service by IPT commuters and company provides high quality service and must maintain it. These attributes are the strength, pillars and pride of the company.
- **Quadrant III (Low Importance/Low Performance):**

Performance): usually called low priority. The attributes in this quadrant represent services that are less important and of low quality, so the services here are in lower priorities. [15]

- **Quadrant IV (Low Importance/high Performance):** usually called possible overkill. The attributes in this quadrant are less important service of IPT commuters but the company provide service with high quality so it does not need to take further action on indicators in this

quadrant as it become excessive.

3. Results and Discussion

3.1 Customer Satisfaction Index (CSI)

Method

Average score of the level of performance and the level of importance of each attributes were used to determine the measure of Customer Satisfaction Index (CSI) method. The CSI value was obtained by dividing the total Weight Score (WS) value by the maximum scale used in this study which is 10 and multiplied by 100%. It can be seen in Table 2.

Table 2 Customer Satisfaction Index Analysis Result

Sl. No.	Service attributes	No. of Attributes	Mean Importance Score (MIS)	Weight factor (WF)	Mean Satisfaction Score (MSS)	Weight Score (WS)
1.	Distance of the IPT stop from origin (access distance)	1	5.430	4.766	3.680	17.539
2.	Distance of the IPT stop from destination (egress distance)	2	5.298	4.650	3.530	16.415
3.	Number of IPT routes between origin and destination	3	4.890	4.292	3.850	16.524
4.	Frequency of IPT services between origin and destination	4	4.850	4.257	3.800	16.176
5.	Punctuality of IPT services at the designated time (reliability) between origin and destination	5	5.046	4.429	4.190	18.557
6.	Seat availability within an IPT service while travelling between origin and destination	6	5.520	4.845	4.590	22.238
7.	Cleanliness within an IPT service while travelling between origin and destination	7	5.760	5.056	4.750	24.014
8.	Safe driving of an IPT driver while travelling between your origin and destination	8	6.180	5.424	4.510	24.463
9.	Safety within an IPT service in terms of property theft/eve teasing while travelling between the origin and destination	9	7.440	6.530	4.170	27.231
10.	Safety at the IPT stop in terms of property theft/eve teasing while waiting for the service at the IPT stop	10	7.440	6.530	3.820	24.945

11.	Total travel time between an origin and destination while using an IPT service	11	6.160	5.407	3.850	20.816
12.	Availability of shelter & seating at IPT stop	12	5.320	4.669	4.010	18.724
13.	Maintenance of IPT service in terms of number of breakdowns	13	4.850	4.257	4.100	17.453
14.	Ticket cost for determining your usage of the IPT service	14	5.030	4.415	4.510	19.911
15.	Use of ecological vehicle	15	4.850	4.257	4.710	20.050
16.	Space required for accommodating the goods that commuters are carrying within the IPT service	16	4.920	4.318	4.530	19.562
17.	Comfort of seats within an IPT service while travelling between your origin and destination	17	4.940	4.336	4.190	18.167
18.	Number of transfers of IPT service while travelling between your origin and destination	18	4.960	4.353	4.110	17.892
19.	Presence of a designated IPT stop	19	5.140	4.511	4.190	18.903
20.	Total monthly expenditure spent travelling through IPT services	20	4.880	4.283	4.330	18.546
21.	Waiting time to assess an IPT service between your origin and destination	21	5.030	4.415	4.530	19.999
113.934						
					WMT	418.12
					CSI (%)	41.812

From Table. 2, the value of Customer Satisfaction Index (CSI) of shared auto, auto and e-rickshaw commuters are 41.81% or 0.4181. The result value 0.4181 falls under Customer Satisfaction Index value criteria of 0.35 - 0.5 which is "Unsatisfied" as shown in Table 1. Performance of IPT service needs to improve because there are still 58.19% commuters who have not able to satisfy by the IPT service. So IPT service needs to explore commuters' satisfaction with the performance attributes and the level of satisfaction can change over time depending on the level of interest needed by commuters

3.2 Importance Performance Analysis (IPA) Method

Importance Performance Analysis determines the level of suitability respondents of the commuters that were obtained from comparing the result of performance score with importance score carried out

through questionnaire survey. From the questionnaire survey, the Importance Performance Analysis was obtained as shown in Table 3.

Table 3 Average of Importance and Performance Level

Attributes	Importance level	Performance Level
1	5.400	3.680
2	5.298	3.530
3	4.890	3.850
4	4.850	3.800
5	5.046	4.180
6	5.520	4.590
7	5.760	4.750
8	6.180	4.510
9	7.440	4.170

10	7.440	3.820
11	6.160	3.850
12	5.320	4.010
13	4.850	4.100
14	5.030	4.510
15	4.850	4.710
16	4.920	4.530
17	4.940	4.120
18	4.960	4.110
19	5.140	4.200
20	4.880	4.330
21	5.030	4.530
Average	5.424	4.185

From Table 3, the average value of importance level is 5.424 and that of performance level is 4.185. The average value of importance and performance level are used to analyse the data in the Cartesian Importance Performance Analysis (IPA) diagram by dividing the Cartesian diagram into 4 (four) quadrants as shown in Figure 3. The attributes of IPT commuters which fall in different quadrant of Cartesian diagram after IPA analysis shows scattered plots as shown in Figure 3.

Quadrant I (top priority): The attributes includes are:

- Distance of the IPT stop from origin (access distance) in terms of the usage of the IPT services (1)
- Safety within an IPT service in terms of property theft/eve teasing while travelling between origin and destination in terms of the usage of the IPT service (9)
- Safety at the IPT stop in terms of property theft/eve teasing while waiting for the service at the IPT stop in terms of the usage of the IPT service (10)
- Total travel time between an origin and destination while using an IPT service in terms of the usage of the IPT service (11)

Quadrant II (keep up the good work): The attributes includes are:

- Seat availability within an IPT service while travelling between origin and destination in terms of the usage of the IPT service (6)

- Cleanliness within an IPT service while travelling between origin and destination in terms of the usage of the IPT service (7)
- Safe driving of an IPT driver while travelling between your origin and destination in terms of the usage of the IPT service (8)

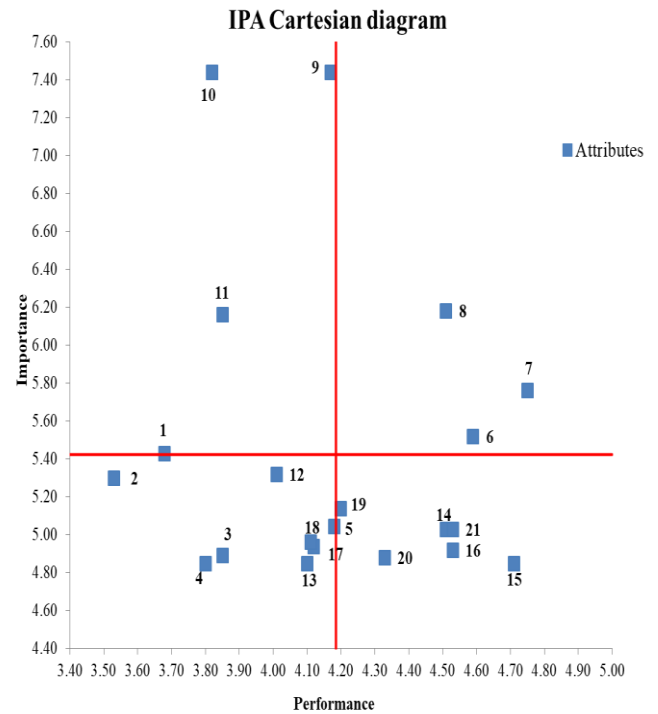


Figure 3 Cartesian Diagram of Importance Performance Analysis
Quadrant III (low priority): The attributes includes are:

- Distance of the IPT stop from destination (egress distance) in terms of the usage of the IPT service (2)
- Number of IPT routes between origin and destination in terms of the usage of the IPT service (3)
- Frequency of IPT services between origin and destination in terms of the usage of the IPT service (4)
- Punctuality of IPT services at the designated time (reliability) between origin and destination in terms of the usage of the IPT service (5)
- Availability of shelter & seating at IPT stop in terms of the usage of the IPT service (12)

- Maintenance of IPT service in terms of number of breakdowns for determining usage of the IPT service (13)
- Comfort of seats within an IPT service while travelling between your origin and destination in terms of the usage of the IPT service (17)
- Number of transfers of IPT service while travelling between your origin and destination in terms of the usage of the IPT service (18)

Quadrant IV (possible overkill): The attributes includes are:

- Ticket cost for determining the usage of the IPT service (14)
- Use of ecological vehicle to commute (15)
- Space required for accommodating the goods that commuters are carrying within the IPT service
- Presence of a designated IPT stop in terms of the usage of the IPT service (19)
- Total monthly expenditure spent travelling through IPT services (20)
- Waiting time to assess an IPT service between your origin and destination (21)

Based on the result, there are four attributes that are in the top priority to be improved in performance. These four attributes should have high performance to increase commuter's satisfaction level.

Conclusion & Recommendation

The analysis was conducted using two methods: The Customer Satisfaction Index (CSI) is found to be 41.81% which is unsatisfaction, and the Importance Performance Analysis (IPA), identified 4 attributes in quadrant I out of 21 attributes which again shows unsatisfaction level of services. Hence it can be inferred that both methods showed unsatisfactory service quality.

Conclusion

Efficient operation of the IPT system is a key factor for the improvement of living condition of a city. In this study, it was found that in the presence of all the service attributes which describe the main aspects characterizing IPT services, including route and service characteristics, service reliability, comfort, cleanliness, fare, information, safety and security, customer services, and environmental protection are

used to measure the satisfaction level of IPT service in Imphal city. Based on the result and discussion carried out in this paper, it has been concluded that the level of satisfaction using Customer Satisfaction Index (CIS) method result in 0.4181 which is in the range of 0.35 – 0.50, the satisfaction level of commuters are unsatisfied with the current IPT services of Imphal city. Based on the result of analysis and discussion using importance Performance analysis (IPA) method, it concluded that the service quality received by the IPT commuters have not met the expectation. The four attributes in the quadrant I is an attribute that needs to be improved with top priorities. These attributes are distance of IPT stop, safety & security, less comfort and service reliability of the commuters. They are considered important to the commuters and it is necessary to improve the performance in order to increase commuters' satisfaction. Three attributes that fall in quadrant II must maintained by IPT service providers because the implementation of performance is in accordance with commuters expectations. The eight attributes in quadrant III are considered less important with lower priority and are not so necessary in measuring performance as they cannot provide satisfaction to commuters. Six attributes in quadrant IV are less important to the commuters and should be considered to reduce performance. IPT commuters' feedback and efficient data related to IPT customer satisfaction was considered to be the main purpose of the service.

Recommendation

In order to improve satisfaction level with IPT system, operators and providers of IPT services need to improve service quality in IPT. It is recommended that the IPT service should aim not only transporting the commuters to their destinations, but also to implement better and safety for the commuters by ensuring property theft reporting policy with increased penalization of the route/ vehicle owners. The reliability as well as seat availability of services needs to be addressed through increasing the fleet sizes. IPT

being the most important mode of transport system in Imphal city, IPT service improvement must be made more comfort, well accepted and highly usable to commuters.

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