

MSc Programme in Urban Management and Development

Rotterdam, the Netherlands

September 2020

Thesis title:

An analysis of customer satisfaction regarding infrastructure provision on solid waste collection and service quality in two income areas (Low & High) of Johar Town, Lahore

Name: Nasira Ahsan

Supervisor: Julia Skinner MSc.

Specialisation: Managing Infrastructure for Green Cities (MIGC)

Country: Pakistan

Report number: 1416

UMD 16

Summary

Population of Lahore has crossed over eleven million as the city has extended into its peri-urban and rural neighbourhoods. This demographic and spatial growth, along with change in consumer-ship has raised municipal solid waste generation between 6500-7000 tons per day (Butt, 2019). In spite of solid waste collection service as non-exclusive, non-rivalled service, the local government can privatize some aspects of MSW services (Rosana D, 2013). Therefore, Lahore Waste Management (LWMC) has outsourced waste collection services in study area to private service provider (OzPak) since 2012.

The study area was selected because it has become a combination of residences belonging to high and low-income groups. In urban areas usually poor families are the ones who face poor solid waste management services due to insufficient waste collection resources (Zurbrügg, 2009) and customer satisfaction is a fundamental variable that narrates clients' verdict regarding any service (Ograjenšek and Gal, 2011). To understand the factors that influence the satisfaction of citizens towards solid waste collection services the literature review firstly enabled researcher to select Infrastructure Service Behaviour Theory (ISB) Theory. The Infrastructure, Service and Behavioural Model ISB model assists in understanding the interactions between provision of infrastructure, service and citizens' behaviour with respect to the service. The biased infrastructure provision & service quality among high income and poor income areas may apparently shift the solid waste collection issues from urban rich to urban poor but issues related to insufficient SWM system persists at city level.

Therefore, the objective of this study is to explain that how people from high and low income areas residing in same neighbourhood perceive the service quality and infrastructure provided by service provider and how these factors influence their level of satisfaction towards solid waste services being rendered.

This explanatory research adopted survey as the research strategy; this research mainly collected primary data (quantitative) through questionnaires and interviews from officials of LWMC and service provider.

In inferential analysis, correlation, regression and ANOVA tests were performed on the data obtained from low and high-income areas. For measuring consistency, Cronbach's alpha test was used for the indicators. The research findings showed that for both income groups provision of infrastructure was significant predictor of customer satisfaction. In addition to this, door-to door waste collection was reason of satisfaction in customers from high-income while low-income group was satisfied with the conduct of staff. Similarly, in service quality, predictors of customer satisfaction that found common in both income groups were environmental cleanliness and user fee. In addition to this, customers from high-income showed their satisfaction on perceived service quality. By comparing low and high-income groups, it was observed that provision of infrastructure, environmental cleanliness and user fee were found common predictors of satisfaction among customers of both income groups.

This research concludes with some suggestions for waste management authorities and provides the perspectives for further research in future.

Key words: Solid Waste Collection, Solid Waste Service Provision, Customer Satisfaction, Infrastructure Provision, Service Quality, High & Low income groups.

Acknowledgements

I am grateful to my family for giving me immense strength and motivation throughout thesis period and encouraging me to pursue this master degree at IHS.

I pay my sincere gratitude to Julia Skinner my research supervisor for believing in me since beginning and Raphaël Smals as second reader for providing me feedback to improve my thesis. You both have helped me to improve my research and analytical skills throughout research period. In addition, I would like to pay my regards to management of OzPak and LWMC who were very cooperative in the entire period of data collection. OzPak management was very supportive and facilitated me in every possible way for data collection.

Lastly, I would like to thank Orange Knowledge Program team, for selecting me as scholarship holder and helping me in pursuing my studies at IHS, Erasmus University Rotterdam.

Foreword

This thesis is a prerequisite towards completion of Masters Degree in Urban Management and Development for 2019-2020, at the Institute for Housing and Urban Development Studies, Erasmus University Rotterdam, Netherlands. The main reason behind selecting this topic for research was my immense interest in the topic. As student of UMD I have learnt that any development in the city is done for citizens and it is the responsibility of the authorities to understand their demands and perspective specially regarding any service.

This research aims to explain that how people from high and low income areas residing in same area perceive the service quality and infrastructure provided by same service provider. This research would not only help the waste management authorities to improve their performance but will provide the basis to conduct researches in further dimensions as well.

Abbreviations

IHS	Institute for Housing and Urban Development Studies
MSW	Municipal Solid Waste
ISWM	Integrated Sustainable Waste Management
SWC	Solid Waste Collection
LWMC	Lahore Waste Management Company
CDGL	City District Government Lahore
PLGO	Punjab Local Government Ordinance
GOP	Government of Punjab
JICA	Japan International Cooperation Agency
KOICA	Korea International Cooperation Agency
ISB	Infrastructure Behaviour Model
HIES	Household Integrated Economic Survey
DTD	Door-to-Door
IV	Independent Variable
DV	Dependent Variable

Table of Contents

Summary	2
Acknowledgements	3
Foreword	4
Abbreviations	5
Chapter 1: Introduction	10
1.1 Background:	10
1.2 Problem statement:	10
1.3 Objective:	12
1.4 Research Question:	12
1.4.1 Sub-questions.....	12
1.5 Relevance of Research:	12
Chapter 2: Literature Review	13
2.1 Introduction:	13
2.2 Solid Waste.....	13
2.3 Integrated Sustainable Waste Management (ISWM)	13
2.4 Municipal Solid Waste Collection:.....	14
2.5 Concept of Service Management:.....	15
2.6 Infrastructure, Service and Behavioural Model:.....	15
2.7 Infrastructure Provision:	16
2.7.1 Budget:.....	16
2.7.2 Provision of waste collection services:	16
2.7.3 Operational requirements:.....	17
2.7.4 Repair and Maintenance:	17
2.8 Service Quality of Solid Waste Collection.....	17
2.8.1 Perception of Service Quality:	18
2.8.2 Frequency of Waste Collection:.....	18
2.8.3 Responsiveness:	19
2.8.4 Environmental cleanliness:	19
2.8.5 User fee:.....	19
2.9 Understanding the Customer Satisfaction w.r.t income areas	20
2.9.1 Coverage:.....	20
2.9.2 Reliability	20
2.10 Behaviour:	21
2.11 Conceptual Framework:	21
Chapter 3: Research Design and Methods	23
3.1 Introduction	23
3.2 Research Question:	23
3.3 Operationalization:	23
3.3.1 Solid Waste Collection:	23
3.4 Definitions of Variables:	23
3.4.1 Infrastructure Provision:	23
3.4.2 Service Quality	24
3.4.3 Customer Satisfaction	24
3.5 Description of Research Design and Methods.....	27
3.5.1 Research type and strategy:	27
3.5.2 Research Instrument for Data Collection.....	27

3.6	Sampling design:	28
3.6.1	Sample Size	28
3.6.2	Sampling Technique:	28
3.7	Data Reliability and Validity	30
3.7.1	Validity:	30
3.7.2	Reliability:	30
3.7.3	Data Analysis:.....	30
3.8	Limitations of Research:.....	30
Chapter 4: Research Findings		32
4.1	Introduction	32
4.2	Data collection and sampling	32
4.2.1	Interviews	32
4.2.2	Questionnaires:	32
4.3	1 st sub research question: Service delivery of solid waste collection in Johar Town, Lahore:..	33
4.3.1	LWMC& International Contracting	33
4.3.2	Delivery of Solid Waste collection Services.....	33
4.4	Control Variable	34
4.4.1	Profile of sample size.....	34
4.5	Second Research sub-question: Influence of infrastructure provision on customer satisfaction in both income areas:	37
4.5.1	Variable: Infrastructure Provision.....	37
4.5.2	Inferential Analysis:.....	44
4.6	3 rd sub-research question: Influence of service quality on customer satisfaction in both income areas: 48	
4.6.1	Variable: Service Quality.....	48
4.7	Inferential Analysis:	54
4.8	Discussion:	58
Chapter 5: Conclusions and Recommendations		62
5.1	Introduction:	62
5.2	Conclusion.....	62
5.2.1	Conclusion for Sub-Research Question One	62
5.2.2	Conclusion for Sub-Research Question Two.....	62
5.2.3	Conclusion for Sub-Research Question Three.....	63
5.2.4	Conclusion for main research Question	65
5.3	Suggestions.....	66
5.4	Further research	66
Bibliography:.....		67
Annex 1: Work Plan		71
Annex 2: IHS copyright form		72
Annex 3: Research Instruments		73
Annex 4: Cross Tabulation Graphs of responses.....		84
Annex 5: Pictures		87
Annex 7: Inferential analysis- Low-income group:		89
Annex 6-Inferential Analysis-High Income Group.....		94

List of Tables

Table 1 Operationalization – Source Researcher	25
Table 2. Research Instruments used in the study	27
Table 3. List of official/ interviewees	30
Table 4. Cross-tabulated Profile of sample size (No. of respondents)	35
Table 5. Number of respondents (on basis of gender)	35
Table 6. Responses (No.) on basis of education	35
Table 7. Monthly income of respondents	36
Table 8. Newly constructed sub variables and their Cronbach Alpha Test	44
Table 9. Correlation between infrastructure provision and customer satisfaction in low-income group.....	44
Table 10. Correlation of infrastructure provision with customer satisfaction in high-income group	45
Table 11. Testing assumptions for regression.....	45
Table 12. Regression Analysis for "infrastructure provision and customer satisfaction" in low-Income group.....	46
Table 13. Regression Analysis for "infrastructure provision and customer satisfaction" in high-income areas.....	47
Table 14. Newly constructed sub variables and their Cronbach Alpha Test	55
Table 15. Correlation between infrastructure provision and customer satisfaction in low-income group.....	55
Table 16. Correlation of infrastructure provision with customer satisfaction in high-income group	56
Table 17. Regression Analysis for "service quality and customer satisfaction" in low-Income group.....	57
Table 18. Regression Analysis for "service quality and customer satisfaction" in high-Income group	57

List of Figures

Figure 1. Perceived service quality- Source: (Chiu and Lin, 2004).....	18
Figure 2. Conceptual Framework- Source Researcher.....	22
Figure 3. Map of Johar Town (Highlighted green area is low income while, rest of area is high income)	29
Figure 4. No. of respondents on basis of income areas.....	36
Figure 5. Responses (percentage) regarding mode of waste collection	38
Figure 6. Responses (percentage) regarding conduct of staff.....	39
Figure 7. Responses (percentage) regarding satisfaction on quantity of waste bins.....	40
Figure 8. Responses (percentage) regarding satisfaction on accessibility to waste bins.....	40
Figure 9. Responses (percentage) regarding satisfaction on quality of waste bins	41
Figure 10. Responses (percentage) regarding satisfaction on quality of waste vehicles	41
Figure 11. Responses (percentage) regarding satisfaction on repair and maintenance of vehicles.....	42
Figure 12. Responses (percentage) regarding satisfaction on service quality	49
Figure 13. Responses (percentage) regarding satisfaction on frequency of waste lifting	50
Figure 14. Responses (percentage) regarding concern on final destination of waste	50
Figure 15. Responses (percentage) regarding satisfaction on registering complaint.....	51
Figure 16. Responses (percentage) regarding satisfaction responsiveness to complaint	52
Figure 17. Responses (percentage) regarding satisfaction on behaviour of complaint resolving staff.....	52
Figure 18. Responses (percentage) regarding satisfaction on cleanliness level	53
Figure 19. Responses (percentage) regarding satisfaction on user fee against service quality	54
Figure 20. Willingness to Pay.....	54

Chapter 1: Introduction

This chapter introduces the topic of customer satisfaction in terms of Municipal Solid Waste (MSW) collection services as perceived by two income areas (low and high) in one neighbourhood (Johar Town) of Lahore city. This chapter highlights the issues associated with poor waste collection in developing countries and privatization of the municipal solid waste collection services. Lastly, this chapter provides the background, problem statement and research questions related to customer satisfaction regarding solid waste collection services.

1.1 Background:

The municipal solid waste term denotes to solid waste produced by community that can be from households, streets, commercial units and institutes (Diaz L et al., 2020). Worldwide growing populace, economic development, urbanisation and better-quality lifestyles all added up in the production MSW. In this context, now a day's city with vast economic growth belongs to developing world and are major contributors towards waste generation (Majeed et al., 2017).

The adequate solid waste management is necessary for all stages i.e. starting from the waste generation, its storage, collection and transport until treatment and final disposal. Provision of solid waste management is a 'necessity – not luxury' as it has direct impacts on health of people and environment (Diaz L et al., 2020). This service provision is the responsibility local government as it is non-exclusive, non-rivalled and essential. No one can be excluded once it is provided to one locality and everyone can get benefit from it despite of being non-payers and even without overcoming the right of other people to enjoy the service (Rosana D, 2013).

In developing countries, municipalities are under capacity to plan and manage the solid waste; this has resulted into involvement of private sector in solid waste management sector. It is argued that private sector is better able to achieve desired level of service provided it is rigorously monitored by municipal authorities (Armah, 2016).

According to World Bank report (Kaza et al., 2018), currently Sub-Saharan Africa and South Asia are fastest growing regions and can be responsible to produce up to 35% of the world's waste by 2050. Pakistan is also facing serious challenges in terms of MSW management services due to rapid and unplanned urbanisation. Under Punjab Local Government Ordinance (PLGO), City District Government of Lahore (CDGL) was established as an attempt to decentralize the powers at local government level, and solid waste management of Lahore city became one of the responsibility of CDGL (GOP, 2001). However, JICA, KOICA and World Bank researched that CDGL was performing inefficiently to manage increasing waste generation in city. Under the findings of these studies, Government of Punjab decided to privatize SWM system of Lahore in 2010. As the result, Lahore became one of the first cities in Pakistan where solid waste collection and transportation services has been delivered through Public Private Partnership (PPP) under international contracting to two firms for seven years (Ashraf et al., 2016).

1.2 Problem statement:

The urbanization and economic growth, shows that approximately 2.01 billion tonnes of municipal solid waste were generated worldwide in 2016 and if keeps on continuing as "business as usual" then it is anticipated it will reach up to 3.40 billion tonnes by 2050 (Kaza et al., 2018). According to (Sridhar, 2016), the average waste generation is 0.45 kg per capita daily in south Asia. The collection services consume the 80% - 90% of municipality's solid waste budget in poor-income countries, and still collection rates are unsatisfactory results into poor efficiency. He further mentioned that, only 21% to 40% population in Pakistan is being served by SWM services.

Population of Lahore has crossed over eleven million as the city has extended into its peri-urban and rural neighbourhoods. This demographic and spatial growth, along with change in consumer-ship has raised municipal solid waste generation between 6500-7000 tons per day (Butt, 2019). In spite of this service as non-exclusive, non-rivalled service the local government can privatize some aspects of MSW services (Rosana D, 2013). City District Government of Lahore (CDGL) was unsuccessful to provide a satisfactory waste management system in the city (Ashraf et al., 2016). To improve and upgrade the cleanliness of Lahore, SWM system of Lahore was privatized¹. However, before undergoing privatization, the Government established Lahore Waste Management Company (LWMC)² in 2011, where all powers to manage the solid waste of city has been transferred to LWMC. To improve cleanliness in Lahore, LWMC outsourced the waste collection and transportation services to two international firms (namely, Albayrak & Ozpak) with the contract period of 7 years i.e. (2012-2019). Privatization of solid waste collection services has improved daily waste collection mechanism from 60% in 2010 to 95% in 2019 per day in Lahore (LWMC).

Solid waste management services especially collection is a daily service provision and any disruption or inconsistency in this service cause unreliability and pose an unpleasant effect on environment and public health. Service quality of solid waste management sector can be assessed by setting up Coverage and could be measured by cleanliness of the environment and customer satisfaction (Esmaili, 2012). The primary concepts in the scholarly literature on service management refers to 'customer satisfaction' and 'service quality. Customer satisfaction is a fundamental variable that narrate clients' verdict regarding any good or service (Ograjenšek and Gal, 2011). They argued that in the local government's view, customer satisfaction with respect to solid waste management services is one of significant benchmarks.

However, in determining the customer satisfaction, it is also important to categorise them because Zurbrügg (2009), stated that in urban areas usually poor families are the ones who face poor solid waste management services due to insufficient waste collection resources³. He further explained that it is mainly due to allocation of more resources (by municipalities) in urban rich areas because of their ties with political links. In all sectors of the economy, organizations need to know how well they are satisfying customer needs and expectations.

The biased infrastructure provision & service quality among high income and poor income areas may apparently shift the solid waste collection issues from urban rich to urban poor but issues related to insufficient SWM system persists at city level. Keeping in mind these arguments, this study seeks to explain that how people from high and low income areas residing in same neighbourhood perceive the service quality and infrastructure provided by same service provider and how these factors influence their level of satisfaction towards solid waste services being rendered.

This research will focus on the area of Johar Town, which is densely populated and originally developed for high income, in a planned manner. However, this town faced a huge influx of informal settlements. Now, this area has become a combination of residences belonging to high

¹ In 2011, Government of Punjab initiated the modernized solid waste management system for Lahore city with the aim to replicate similar model in other major cities of Punjab. Currently 6 Waste Management companies are working in other six cities of Punjab on similar pattern.

² LWMC is the responsible company of Local Government's waste management sector that is established under section 42 of the Companies Ordinance 1984.

³ Poor allocation of waste collection resources in poor income areas e.g waste bins, sanitary workers

and low-income groups (details in chapter 3). This characteristic of the area provides a true representative sample for current study where low-income areas resides near high-income areas and are being served by same service provider.

1.3 Objective:

The main objective of the study is to explain the factors influencing customer satisfaction from two income areas regarding infrastructure provision and service quality on solid waste collection services in Lahore.

1.4 Research Question:

How do provision of infrastructure and service quality for solid waste collection system influence the customer satisfaction in two (low and high) income areas of Johar Town, Lahore?

1.4.1 Sub-questions

1. How is solid waste collection service being delivered in Johar Town, Lahore?
2. What is the influence of infrastructure provision on customer satisfaction in both income areas residing in Johar Town, Lahore?
3. What is the influence of service quality on customer satisfaction in both income areas residing in Johar Town, Lahore?

1.5 Relevance of Research:

World widely, many researches favours the privatization of solid waste management services because of the efficient system while some argue against it because of high cost associated with it. In Lahore, generally studies have been conducted as comparison between services delivered by public sector and private sector by considering the factors like organizational structure, technical aspect and monitoring system. Such studies showed that privatization has improved the waste management system in Lahore. However, these researches did not cover aspect of customer satisfaction and perception of the citizens regarding service quality. This similar question was asked during the interviews from officials of LWMC & service provider, and they confirmed that such type of studies has never been conducted before. This research will be particularly focusing on the service quality as perceived by citizens of different income areas and their satisfaction against solid waste collection services. This study is relevant, as it can be helpful for local governments and private waste management companies to improve their services in near future according to customers' expectations. Moreover, academically this research highlights the importance of citizens' as key stakeholders in improving the waste management services by analyzing their level of satisfaction. Furthermore, this study promotes the concept of ISWM where engagement of all stakeholders has been identified important in order to achieve sustainability in long run.

Chapter 2: Literature Review

2.1 Introduction:

This section will review literature related to the solid waste management, its service quality as perceived by citizens and their satisfaction. The chapter starts with Solid Waste and Integrated Sustainable Waste Management (ISWM) concepts to provide an overview of components of waste management system as this study is focusing on collection component. The next section focuses on understanding the customer satisfaction belonging to two income groups, using the concept of service management. However, in order to understand the phenomenon of customer satisfaction between two income groups, different theories and models have been studied and Infrastructure, Service and Behavioural Model ISB model has been chosen in this research to understand the variables leading to customer satisfaction for both income areas. Based on the theories and concepts, this chapter finally builds a conceptual framework for this research. Service quality in this research is intended to solid waste collection element.

2.2 Solid Waste

Solid waste defined as the variety of refuse products considered as unwanted and useless. It can be of no use for its first user but may be useful for other persons. Solid waste is generated from industrial, residential, and commercial activities in a given area. Types of solid waste produced is usually classified according to the sources from where it is produced for example household waste, commercial waste and industrial waste etc.(Leblanc, 2019). As best practice for environmental planning, it is important to manage the solid waste in a systematic manner for environmental hygiene. Generated Municipal solid wastes (MSW) contain biodegradable organic fractions that may cause environmental, health, odour and aesthetic problems in urban life. Therefore, it is necessary to collect it timely from the source of its generation. This is the step where local governments provide their services of collecting waste from the city. Management of solid waste has been explained in detail in next section along with various stakeholders involved in this system.

2.3 Integrated Sustainable Waste Management (ISWM)

‘Integrated’ in ISWM shows the relationship between waste management elements with technical, legal, organisational and financial activities which are required to function together on many levels; while, ‘sustainable’ indicates relevancy and viability with local conditions and capability to maintain within optimal use of resources over the period of time (Klundert and Anschütz, 2001). They further state that ISWM system considers not only the financial and technical viability of SWM system, but also recognizes that institutional, environmental and sociocultural features generally influence the sustainability of SWM. The framework for ISWM by Klundert and Anschütz (2001), maintains the three dimensions, stakeholders, elements and aspects. Afterwards ISWM framework comprises the three key physical elements i.e. public health, environment and 3Rs – reduce, reuse, recycle. The other aspect focuses on the governance approaches to deliver best SWM system. The system as a whole needs to be, inclusive by engaging customers, suppliers and enablers, financially sustainable in economical way and strong institutions with clear strategies.

There are very limited models with respect to the solid waste management that talk about the linkages between social and cultural, economic, environmental, and technical scopes and ISWM among them has been highlighted because of concept of the all-inclusiveness of stakeholders at planning and decision making stages (Klundert and Anschütz, 2001). This verifies that the concept of good governance in relation to SW collection (used in this study) supports the participation of

all stakeholders (users in this study) to deliver expected service quality. ISWM model highlights the importance of collection in solid waste management system that is applicable to local context of any city, sustainable and backbone by institutions and the stakeholders (Marshall and Farahbakhsh, 2013). ISWM highlights the importance of upgrading all elements as a whole because the waste system should be considered as an integrated whole and seen through the lens of all aspects (Wilson et al., 2013).

The three major components of ISWM with the highlighted part where this study will focus, has been illustrated in Figure 1.

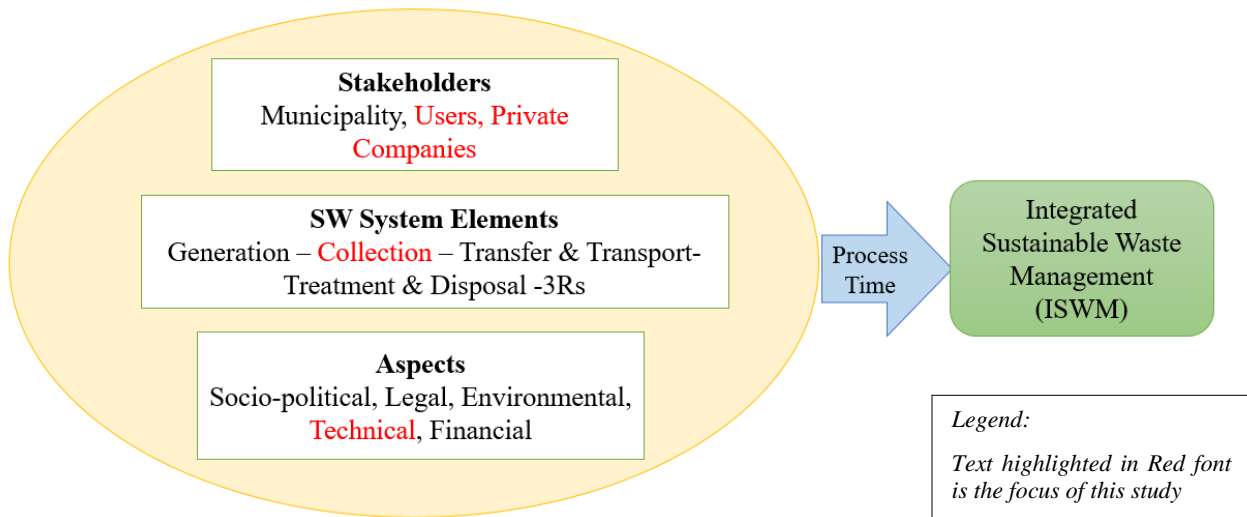


Figure 1. ISWM model highlighting the focus of this study- Source: Van Klundert and Anschutz (2001)

ISWM model has been selected because of its relevancy towards identifying the institutions, actors involved in delivering SWM services. Considering the ISWM model as discussed above, this study is focusing only on users and private companies as stakeholders, solid waste collection as system element and overall covering the technical aspect from ISWM model. This model is used in this study to provide a basic ground to develop the relation of stakeholders, elements and aspects as a whole in order to improve overall SWM system sustainably. As mentioned under section 1.5 (relevance of study) the concept of ISWM is used in this study because this study will draw the importance of engaging main stakeholders in order to achieve sustainable solid waste management system in long run.

2.4 Municipal Solid Waste Collection:

Many cities of developing countries are striving with solid waste collection, as foremost daunting task within SWM system (Sulemana et al., 2018). Moreover, it is widely known that solid waste collection accounts huge expenses within solid waste management. This element is complex and expensive in nature because it involves extensive use of labour and fleet (Das and Bhattacharyya, 2015). Principally, the collection of municipal solid waste (MSW) is divided into 2 phases. Firstly, the MSW, produced from different activities and sources i.e. households, markets, offices is collected and transferred to the adjoining or nearby collection centre or waste bins. Second phase includes where MSW collection vehicle collects waste from such locations and carry the whole waste from its designated route to the dumpsite/landfill (Das and Bhattacharyya, 2015).

The waste collection is done from three different types of waste storage facilities, named as waste depots, open depots, and waste containers. First category is a semi-closed area for collecting wastes

from different locations with solid floor and walls. The second category is an open space having no boundary walls however designated by municipal authorities for waste storage. Third category is communal waste containers with different types and capacities for waste storage. Open- type containers with smaller capacity of 0.75 and 1.0 m³ are open at the top. Containers of capacity 6.5 and 8.5 m³ are closed and have filling windows (Armah, 2016).

Solid waste collection services are directly linked with customers and service provider. As stated above, service provider is responsible to provide waste collection services to every citizen irrespective of the income differences. However, it has been observed that municipalities provide better services to rich areas as compared to low-income areas. Therefore, it is important to understand the concept of service management and its relation with customer satisfaction and service quality.

2.5 Concept of Service Management:

Service management concept is the product of service paradigm as there was much opposition on the manufacturing sector is more focus and service sector is being neglected (Gummesson et al., 2010). This concept adheres with the logic that the customers and their interaction with the provider creates the quality service. This concept advocates that the customers are sole entity for inputs and technology/infrastructure is the way to create value in any service. Service management promotes the balance between perceived quality as per customers and efficiency of services (Gummesson et al., 2010). This concept states that the service value can always be achieved by the efforts from the service provider and the customer/ user. Moreover, the complex nature of customer's economic and social context helps in creating the service quality by integrating their contextual resources along with input of the service provider (Viitamo and Toivonen, 2013).

Concept of Service management is aligned with the new public service management concept. It is an innovative approach that is able to accommodate all society's needs appropriately is needed. In order to bring it into reality, the cooperation among the government, stakeholders and public service users in the process of public service provision is one of the most important matters. These approaches actually invite society, to be involved in the process of public service provision (Anantanatorn et al., 2017).

Service management concept focuses on customer satisfaction by improving quality of services through interacting with customers. This is done by reaching out to customers from all types of backgrounds and income levels through surveys and getting feedback from them (Viitamo and Toivonen, 2013). However, this concept only explains the ways to contact citizens and getting their feedback and it is not enough to explain the determinants of customer satisfaction levels. Therefore, this study digs further into theories and models and has found that Infrastructure, Service and Behavioural Model (ISB) helps in understanding the factors leading to customer satisfaction. This model has been explained in next section where determinants of customer satisfaction i.e. infrastructure provision and service quality of solid waste collection are explained.

2.6 Infrastructure, Service and Behavioural Model:

The Infrastructure, Service and Behavioural Model ISB model assists in understanding the interactions between provision of infrastructure, service and citizens' behaviour with respect to the service. It is envisage that the ISB model serves as a practical tool to enable local authorities to make better waste management decisions in their area. In the ISB model, infrastructure, service and behaviour has been defined as follows:

Infrastructure: is the built environment, products and objects (e.g. buildings, bins, collection vehicles, waste management facilities).

Service: are the systems, providers and enablers that allow people to participate in a particular environmental practice (e.g. collections frequency, method, staff, communication materials, perception of customer service and service provider, user fee etc.).

Behaviour: relates to people: who we are and our character towards the environmental practice (e.g. values, attitudes, knowledge, awareness, personalities, lifestyles, social status and norms) (Timlett and Williams, 2011)

2.7 Infrastructure Provision:

In developing world, the increasing population and increase demand in SWM service levels has posed extreme challenges for municipalities in terms of infrastructure provision (Périou, 2012). McAllister (2015), has identified that in developing countries, usually issues related to infrastructure provision in solid waste collection services associated with budgetary constraints, inadequate service coverage and operational inefficiencies of services including unskilled manpower and ineffective technologies and equipment. The unequal distribution of infrastructural provision among high and low income areas or limited infrastructure provision in low income group can affect the citizens' perception about waste collection services because if the infrastructure isn't provided then people have left with the only choice to throw the waste openly (McAllister, 2015). The literature presented on infrastructure leads further towards following sub variables which are critical, while provision of infrastructure in any city. Explanation of each sub variable of infrastructure provision has been described below.

2.7.1 Budget:

Availability of budget is one of the important aspect while infrastructure provision however, budgetary constraints are commonly observed in developing countries where resources are limited and distribution of these limited funds are mismanaged. There are several municipalities, which are struggling due to financial constraints to achieve acceptable service quality and provision of infrastructure with acceptable coverage of service (McAllister, 2015). While struggling with budgetary constraints, it has been observed that municipalities compromise on providing infrastructure to poor income areas where people pay very less or no fee for waste management services. Hence, they shift their focus on high-income areas where people pay monthly fee regularly (Arfeen et al., 2018). This sub variable will assist in understanding the sources and adequacy of budget that will determine if there is any difference of infrastructural provision among low and high-income groups of study area.

2.7.2 Provision of waste collection services:

Citizens are mainly concerned about solid waste collection services. Depending upon budget, municipalities define different types of collection services. However, there are two main types a) waste to be collected from doorstep (door-to-door collection) and b) where municipality places the waste containers/bins in neighbourhood and citizens bring their waste to these points from where vehicle carries the waste (Zhu et al., 2008). Generally, in developing countries municipalities fails to provide equal and reliable waste collection services in whole city. There are several challenges in provision of solid waste collection services e.g. weak collection schedules and poor planning (Sulemana et al., 2018). In such circumstances, municipalities find easy to provide waste collection services where planning is convenient in terms of ground realities of location especially in high-income areas. Moreover, therefore municipality neglects those areas where they face challenges,

i.e. difficulty of vehicles to access due to poor road infrastructure, narrow and congested streets (Das and Bhattacharyya, 2015). This sub variable will contribute in determining the satisfaction or dissatisfaction of customers residing in low and high-income areas.

2.7.3 Operational requirements:

In addition to finances and budget, another factor is operational requirements of the area. It has been observed that poor operations of solid waste collection services in any areas is directly linked if staff (workers, drivers) is unskilled or limited (Zhu et al., 2008). He further argued that municipal authorities and service providers in cities of developing world generally are only able to serve a limited portion of the urban population with exact operational requirement while remaining population i.e. usually low-income group living in urban settlements is kept left with inadequate waste collection services

In addition to this, he also mentioned that availability of technology and equipment is also critical. Old technologies and equipment can contribute customer dissatisfaction. This is important factor because in developing countries where selection of solid waste collection vehicles is dependent upon factors like; availability of paved roads, streets, width and traffic in the city. However, if the city or some part of city is un-planned then it becomes critical especially in low-income areas where municipalities utilise their outdated vehicles and equipment (Zhu et al., 2008).

2.7.4 Repair and Maintenance:

Adequate repair and maintenance is necessary for increasing the life of any asset. Solid waste collection vehicles demand serious attention towards repair and maintenance because of its daily contact with waste. Keeping a serviceable fleet of waste management trucks and associated equipment is a serious matter for any service provider (Levine.C, 1995). Regular maintenance schedules, daily cleanliness of vehicles and categorization of minor and major repairs increases the life of vehicles and equipment (McCallister, 2015). Repair and maintenance of vehicles is one main area where private sector has performed very successfully, because private sector give top priority towards repairing the vehicle and try to repair the vehicle in less than a half day (Levine.C, 1995). However, it has been observed that if any breakdown occurs to vehicle serving in high-income area and it require detailed repair, then municipality/service provider withdraws the vehicle working in other part of area (mainly poor-income areas) and allocate it to high-income area. Influence of rich people in society, their strong political links and fear of complaints are the main reasons for municipalities for prioritizing high-income areas (Leblanc, 2019) .

2.8 Service Quality of Solid Waste Collection

In order to understand the assessment of service quality, since past 30 years, many researchers proposed concepts and instruments to understand and identify service quality. This concept does not have any concrete definition as it has various dimensions, and varies with time and which makes this concept difficult to define as well as measure however, Odayar (2004), stated that service quality concept is very subjective as per users of that service. Furthermore, he explained that investigating the service quality is usually difficult because a service is produced and consumed simultaneously. On contrary, in terms of goods the customers only come across the traditional markets where they select the goods based on product, its price and distribution. Whereas, the service provider contact the customers even before delivering the service and customers are at more risk as they have not yet seen/experienced the service. In terms of solid waste management, customers/citizens have very less options to select the service provider for themselves and they mostly rely on the municipality's selection procedure for any private service provider. Such interactions between service provider and customer also enhance complexity in

defining the service quality (Odayar, 2004). In order to understand service quality in solid waste collection in detail, its indicators have been explained below.

2.8.1 Perception of Service Quality:

The “perceived service quality model” identified by Grönroos (1982), has two service quality dimensions, the technical side (“what” service is provided) and the functional side (“how” the service is provided) Figure 2. The customers perceives the technical or outcome quality of the process and often more importantly, perceives how the process itself functions, i.e. the functional or process quality dimension (Grönroos, 1984).

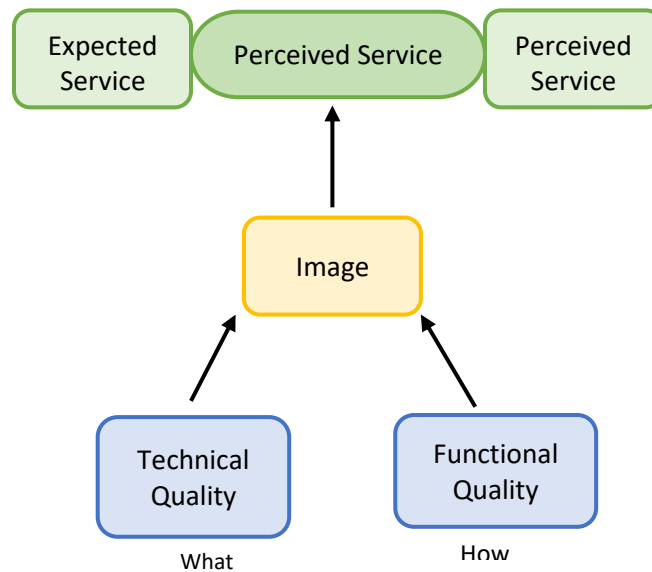


Figure 2. Perceived service quality- Source: (Chiu and Lin, 2004)

It the customer’s verdict about the excellency of a service, which is the customer’s own analysis regarding the service as received and as provided (Edwards et al., 2009). Quality of waste management services is directly linked to the health consequences and that is why the public is more concerned about the quality of services is delivered (Grönroos, 1984). Since residents pay user charges for MSW services delivered, they expect the services to be reliable and appropriate collection vehicles and adequate staff must attend waste bins frequently. In view of this, quality of services delivered to customers is one of the vital criteria towards customer satisfaction (Akaateba and Yakubu, 2013). When solid waste management system is in place then public concerns on service quality become important factor to consider (Chang and Pires, 2015). Perception of citizens can vary according to their age, awareness, level of service quality and their ability to pay for service (Akaateba and Yakubu, 2013). Therefore, this sub variable will help in determining the perception of service quality as perceived by citizens’ belonging to two different levels of income groups in an area.

2.8.2 Frequency of Waste Collection:

The frequency of waste collection is associated to weather conditions for particular city. Researches supports that in order to avoid massive decomposition of waste and becoming breeding place for microorganisms, especially in hot and humid areas, waste collection must be provided daily or preferably twice in a week (Armah, 2016). Any inconsistency in waste collection frequency can cause lack of user confidence in the collection system (Hoornweg, D. and Tata, P., 2012). According to waste characterization studies, low or poor income areas produce waste with

more than 60% organic content and waste from high-income areas generate waste containing plastics and packaging material at higher level as compared to organic waste (Kaza et al., 2018). Therefore, it can be argued that, frequency of waste collection must be high in low-income areas as compared to high-income area based upon the type of waste generate. However, in developing countries where municipalities lack the resources to build the capacity of its operational staff, this phenomenon is ignored. Priority is given to collect the waste from the areas where waste is relatively less organic and has higher re-sale value (e.g. recyclables) and low-income areas are being neglected (Majeed et al., 2017). Therefore, this subvariable is important to assess the satisfaction of people living in low and high-income areas.

2.8.3 Responsiveness:

It is the willingness to help customers and provide prompt services. A well-structured and operative complaint process provides a network between communities and service authorities to have first-hand information valuable for monitoring private sector performance in waste collection. This medium when established by municipalities provides feedback and sense of hope for consumers who hitherto lost complete credibility in the system (Armah, 2016). It is often observed that people with more resources and opportunities are able to express their complaints against any service, as compared to people with no or less opportunities (Breukelman et al., 2019). Therefore, municipalities or service providers prioritize their responses against complaints (if any) received from high-income areas (Leblanc, 2019). This indicator will help in determining the satisfaction or dissatisfaction of customers from both income groups regarding service quality of waste collection.

2.8.4 Environmental cleanliness:

Environmental cleanliness in terms of solid waste is very important as it directly effects the human health (Armah, 2016). Poor waste collection services contribute to outbreaks of diseases, local water resource pollution, and greenhouse gases (Braakhuis, 2016). Provision of solid waste services is challenging as well as costly for municipalities but it is crucial for health, environment, and citizen's quality of life especially the poor and no compromise is expected in this regard. (Zhu et al., 2008). However, it has been observed that underprivileged people face more health issues as compared to privileged people mainly because of poor quality of waste collection services (Zhu et al., 2008). Therefore, the level of satisfaction by each income group on environmental cleanliness will indicate the quality of service.

2.8.5 User fee:

People's willingness to pay is certainly important specially, in cities of developing countries where finances are limited, however, it is linked with the interactions of service provider and customers. The more trust of customers (from both income groups) about reliable solid waste collection services can increase the chances of willingness to pay (Oduro K, 2011). UN-HABITAT, 2010 agrees that residents' willingness to pay for services provided by door-to-door or container based waste collection systems largely depends on the reliability of service providers therefore having value for dues paid. However, municipalities in developing countries face challenges in applying user fees and face resistance from general population. Therefore, some municipalities adopt a system where rich people pay higher user fee as compared to poor people (Akaateba and Yakubu, 2013). The operations of waste collection services must be covered through user fee; however, poor fee recovery system is another challenge that cause financial constraints on budget of municipality (Al-Khateeb et al., 2017). In fact, the amount of user fee and the willingness to pay from all income groups are directly linked to attain efficiency in the solid waste collection services

in any city (Oduro K, 2011). This subvariable will help in assessing the customer's satisfaction of both income groups on quality of services they are receiving against the user fee they pay.

2.9 Understanding the Customer Satisfaction w.r.t income areas

Customer satisfaction is a fundamental essential of marketing success of any service provider. It is the ability of service provider to satisfy the requirements of its customers through improved service provision (Gummesson et al., 2010). Satisfaction is based on service delivery predictions/norms that depend on past experiences, driven by conceptual indications (e.g. equity, regret) (Akinloye Akinboade et al., 2012). Citizens' opinion regarding performance of public sector is critical in determining their trust in governmental policies (Chingos, Henderson and Martin, 2012). Customer satisfaction level, varies as it is the difference or gap between actual services provision and perception of citizens regarding that service (Arfeen et al., 2018).

William (2002), mentioned that income level can be one of the significant factors towards determining customer satisfaction because it is common that people earning high income have better opportunities in experiencing improved services. Moreover, they have better ways, which enable them to express their satisfaction or dissatisfaction more often (Tronvoll, 2007). However, low-income group usually face inequality, discrimination and difficulties in getting service/good as compared to the other income group (Mat et al., 2016). Therefore, this study will analyse the perception of both income groups regarding their satisfaction level on infrastructure provision and service quality, as provided by same service provider in same neighbourhood.

Customer satisfaction in solid waste collection services has been categorized into following sub-variables. (Oduro K, 2011).

2.9.1 Coverage:

Setting collection targets (coverage) is the way to operationalize the aims & objectives in SWM planning of any city. The level of customer satisfaction is linked with provision of 100% waste collection services. Realistic collection targets to achieve maximum coverage is effective tool to make improvements in the current waste management systems (ISWA, 2012). Literature discusses that user coverage of collection and population served, determined by percentage of number of households in service area assessing solid waste collection by service provider and it should be 100% (Armah, 2016). However, as discussed above that usually service providers neglect to provide waste collection services in poor income areas. However, to achieve 100% coverage population from high-income as well as from low-income areas must be included (Arfeen et al., 2018). This sub variable will help in assessing the satisfaction of both income groups

2.9.2 Reliability

It is the ability to perform the promised service consistently and accurately. It is the provision of guaranteed service consistently and precisely (Arfeen et al., 2018). This symbolizes how consistent solid waste collection is carried out on specific given days. Customers are satisfied when solid waste collection service is reliable with no delays in collection schedules (Armah, 2016). Usually the ability to provide reliable waste collection services is linked with user fees. Therefore, in many developing countries, municipalities fail to provide reliable services especially in low-income areas where people are unable to pay for services (Glaser and Bartley Hildreth, 1999). Moreover, the satisfaction on reliability of service from customers of both income groups is of significant importance to service provider for its future businesses as well.

From above literature, it can be concluded that in last decades due to wide spread of information and vast researches in public management where role of citizens and their satisfaction has been

considered vital (Arfeen et al., 2018). Therefore, for every service provider, it is important to assess the citizen's perception from both income groups that influences their satisfaction or dissatisfaction against services quality.

2.10 Behaviour:

As mentioned before only infrastructure and service aspect of ISB model has been adopted to determine the factors influencing customer satisfaction because the literature of researches done regarding behaviour of citizens in solid waste management sector influence the waste generation patterns, segregation and recycling of such waste. In context of household waste, factors like socio-economic status and behaviour influence the waste generation as well as waste separation patterns (Al-Khateeb et al., 2017). Based upon literature, this (behavioural) aspect of ISB model deemed to be not required for present study that is why it has not been included in further chapters.

Hence, from above literature review it is concluded that current study has used and Infrastructure Service behaviour model in developing its conceptual framework. However, it is important to understand the concepts of ISWM, Service Management that has also been explained in order to develop conceptual framework. These concepts collectively help in answering the main research question that aims to investigate influence of provision of infrastructure and service quality for solid waste collection system on the customer satisfaction in low and high-income areas.

2.11 Conceptual Framework:

A conceptual framework is designed to draw the relation between dependent and independent variables. The conceptual framework adopted for this study has been visualized in Figure 3. The conceptual framework is designed by author on the basis of the concept of Infrastructure, Service Behaviour Model with respect to solid waste collection system. Based on literature review, this study used two aspects of this model i.e. Infrastructure provision and service quality as these are more relevant to current study. Both of these are classified as independent variables. Literature review has highlighted five sub variables i.e. availability of finances, waste collection method, technical staff, equipment, vehicles and their timely repair and maintenance for infrastructure provision. While, service quality in solid waste collection system has four sub variables i.e. perception, responsiveness, environmental cleanliness of area and satisfaction on user fee with respect to services they receive. Furthermore, this frameworks highlights two sub variables namely coverage and reliability, of dependent variable i.e. customer satisfaction. Thus, this conceptual framework is produced based on the concept of ISB model with provision of infrastructure, quality of solid waste collection service and the linkages between both eventually influencing customer satisfaction.

Conceptual Framework

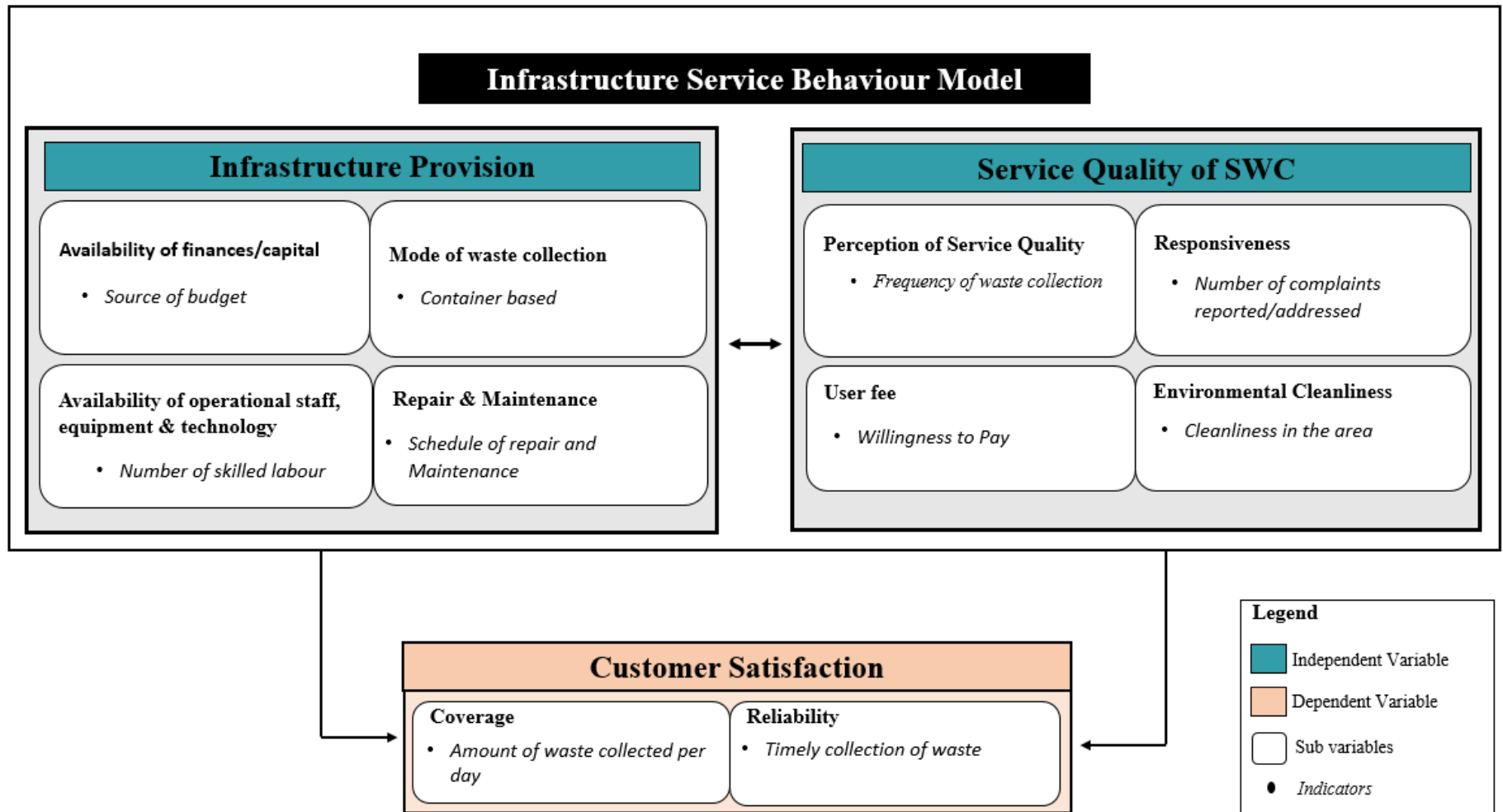


Figure 3. Conceptual Framework- Source Researcher

Chapter 3: Research Design and Methods

3.1 Introduction

This chapter includes the research design and methods adopted for this study. Firstly, chapter presents the reviewed research questions with definitions of variables used in this study. Next section presents the operationalization table based on literature review and conceptual framework as explained in chapter 2. Later, this chapter explains the research strategy chosen to conduct study. This research has selected survey as research strategy with random stratified sampling methods through using questionnaire as research instrument. Furthermore, this chapter identifies the data analysis technique, which will be used in inferential analysis after data collection.

3.2 Research Question:

How do provision of infrastructure and service quality for solid waste collection system influence the customer satisfaction in two (low and high) income areas of Johar Town, Lahore?

Sub-questions

4. How is solid waste collection service being delivered in Johar Town, Lahore?
5. What is the influence of infrastructure provision on customer satisfaction in both income areas residing in Johar Town, Lahore?
6. What is the influence of service quality on customer satisfaction in both income areas residing in Johar Town, Lahore?

3.3 Operationalization:

Operationalization is the conversion from theory to empirical research where theoretical concepts are translated into units that can be measured in the real world (Van Theil, 2014). In this section, the variables derived from research questions have been demarcated. The current study has devised operationalization table as shown in table 1 according to the research questions.

3.3.1 Solid Waste Collection:

It is pertinent to mention here that the collection of municipal solid waste (MSW) is not the variable in this study however, it is important to mention this element of solid waste management system here because variables in this study are closely linked to it. Solid waste collection system is divided into 2 phases. Firstly, the MSW, produced from different activities and sources i.e. households, markets, offices is collected and transferred to the nearby collection centres or waste bins. Second phase includes where MSW collection vehicle collects waste from such locations and carry the whole waste from its designated route to the dumpsite/landfill (Das and Bhattacharyya, 2015). This study will identify the provision of infrastructure and the quality of service in terms of satisfaction regarding daily waste collection mode, staff and vehicles to perform the waste collection task.

3.4 Definitions of Variables:

In this research, the dependent variable is customer satisfaction while the independent variables are service management, service quality and perceived service quality. Each of these variables are explained below.

3.4.1 Infrastructure Provision:

It is known as the built environment, products and objects (e.g. buildings, bins, collection vehicles, waste management facilities like transfer station, incinerators, landfill, recycling units) (Timlett and Williams, 2011). In developing world, the increasing population and increase demand in SWM service levels has posed extreme challenges for municipalities in terms of infrastructure provision

(Périou, 2012). McAllister (2015) has identified that in developing countries, infrastructure provision is hindered by budgetary constraints, inadequate service coverage and operational inefficiencies e.g. unskilled work force and ineffective technologies and equipment with poor repair and maintenance.

3.4.2 Service Quality

It is the customer's verdict about the excellency of a service, which is the customer's own analysis regarding the service as received and as provided (Edwards et al., 2009). The "perceived service quality model" identified by Grönroos (1982), has two service quality dimensions, the technical side and the functional side. Quality of waste management services is directly linked to the health consequences and that is why the public is more concerned about the quality of services delivered (Grönroos, 1984). Since residents pay user charges for MSW services delivered, they expect the services to be reliable and appropriate collection vehicles and adequate staff must attend waste bins frequently (Akaateba and Yakubu, 2013).

3.4.3 Customer Satisfaction

Customer satisfaction is world widely known as a consumer response about their pleasure level against any service (Akinloye Akinboade et al., 2012). It is the ability of service provider to satisfy the requirements of its customers through improved service provision (Gummesson et al., 2010). Customer satisfaction in solid waste management services is the level of achieving targets in solid waste collection services according to customers' demand with provision of infrastructure and collection service (Oduro K, 2011).

Table 1 Operationalization – Source Researcher

Research Questions	Theories/ Concepts	Variables	Sub variables	Indicators	Scale of Measurement	Data Collection method	Research Instrument	Source of data	
How is solid waste collection service being delivered?	Infrastructure Service Behaviour Model	Infrastructure Provision	Availability of Finances	Source of budget	Nominal	Qualitative	Semi Structured Interviews	Program Director from service provider company	
				Adequacy of allocated budget	Nominal	Qualitative			
			Waste collection service mode	Container based waste collection	Likert scale	Quantitative	Questionnaires		Residents from High & Low income areas
				Door-to-door waste collection					
Availability of Operational staff, equipment and technology		Skilled Labour (Workers/Drivers/ Field supervisors)	Nominal	Qualitative	Semi Structured Interviews	Program Director from service provider company			
		Waste bins	Likert scale	Quantitative & Qualitative	Questionnaires & Semi Structured Interviews	Residents from H&L income areas & Program Director from service provider company			
		Waste collection vehicles	Likert scale	Quantitative & Qualitative					
Repair & Maintenance of equipment/vehicles		Repair and maintenance mechanism	Nominal	Quantitative & Qualitative					
What is the influence of infrastructure provision on customer satisfaction?		Infrastructure Service Behaviour Model	Service Quality	Perception of service quality	Degree to which people are satisfied about the overall service	Likert scale	Quantitative	Questionnaires	Residents from High & Low income areas
					Degree to which people are satisfied with the frequency of waste collection	Likert scale	Quantitative	Questionnaires	Residents from High & Low income areas
	Degree to which people are concerned when waste is being collected				Likert scale	Quantitative	Questionnaires	Residents from High & Low income areas	
	Responsiveness			Mode of complaint system	Likert scale	Quantitative	Questionnaires	Residents from High & Low income areas	
What is the influence of service quality on customer satisfaction?	Infrastructure Service Behaviour Model		Service Quality	Perception of service quality	Degree to which people are satisfied about the overall service	Likert scale	Quantitative	Questionnaires	Residents from High & Low income areas
					Degree to which people are satisfied with the frequency of waste collection	Likert scale	Quantitative	Questionnaires	Residents from High & Low income areas
					Degree to which people are concerned when waste is being collected	Likert scale	Quantitative	Questionnaires	Residents from High & Low income areas
Responsiveness				Mode of complaint system	Likert scale	Quantitative	Questionnaires	Residents from High & Low income areas	

Research Questions	Theories/ Concepts	Variables	Sub variables	Indicators	Scale of Measurement	Data Collection method	Research Instrument	Source of data	
				Satisfaction on the response after complaint	Likert scale	Quantitative	Questionnaires	Residents from High & Low income areas	
				Response of field staff	Likert scale	Quantitative	Questionnaires	Residents from High & Low income areas	
				Environmental Cleanliness	Cleanliness level in service area	Likert scale	Qualitative	Questionnaires & Observation	Residents from High & Low income areas & researcher
				User fee	Satisfaction on cost of service provision/willingness to pay	Likert scale	Quantitative	Questionnaires	Residents from High & Low income areas
Measuring Customer satisfaction based on control variables (income areas) as well as waste collection service.		Control Variable	Demographic attributes	Age	Ratio	Quantitative	Questionnaires	Residents from High & Low income areas	
				Gender	Nominal	Quantitative	Questionnaires	Residents from High & Low income areas	
				Education level	Nominal	Quantitative	Questionnaires	Residents from High & Low income areas	
				Household income	Ordinal	Quantitative	Questionnaires	Residents from High & Low income areas	
		Customer Satisfaction	Coverage	Amount of waste collected per day	Ratio	Qualitative	Semi Structured Interviews	Program Director from service provider company	
				Satisfaction on waste collection coverage	Ordinal, Likert scale	Quantitative	Semi Structured Interviews	Program Director from service provider company	
			Reliability	Information sharing regarding waste collection schedule	Likert scale	Quantitative	Questionnaires	Residents from High & Low income areas	
				Adherence to waste collection schedule	Likert scale	Quantitative	Questionnaires	Residents from High & Low income areas	
				Timely collection of waste	Likert scale	Quantitative	Questionnaires	Residents from High & Low income areas	

3.5 Description of Research Design and Methods

3.5.1 Research type and strategy:

The “survey” research strategy has been chosen for this research. It is used when there is something to describe, test or diagnose about the research problem (Van Theil, 2014). This strategy has been reasoned applicable since there are high number of variables i.e. provision of infrastructure and service quality linked with customer satisfaction. All these attributes leads to the decision to choose survey as research strategy, because of large number of variables (as shown in operationalization table) and large number of respondents (as explained in sample size). Precisely, this study will adopt *explanatory survey type*⁴.

Survey strategy is selected for this study because it will not only gather factual, real and new data but also a uniform set of data from large number of respondents with respect to their approach, opinions or beliefs towards certain issue (Van Theil, 2014) . This will enhance the validity of research outcome because large number of units are involved to collect data and this makes easy to conduct all sort of statistical analysis (Verschuren, Doorewaard et al., 2010).

3.5.2 Research Instrument for Data Collection

However, main data collection instrument is questionnaire, supported by qualitative data via semi-structured interviews from selected respondents/ experts. Moreover, information from quantitative and qualitative sources will also be verified through literature as explained in table 2.

Table 2. Research Instruments used in the study

Data collection instrument	Explanation
Questionnaire/Survey	<p>Questionnaire is the major instrument for primary data collection of this study. The questionnaire (Annex 3: Research Instruments) have four sections. It was distributed among high and low-income group of Johar Town area. It is developed to analyse the customer satisfaction on infrastructure provision and waste collection service quality. Questions were asked mainly on the Likert Scale.</p> <p>Initially it was planned to conduct face-to-face survey in both income areas by following all safety protocols under COVID-19 situation. However, due to lockdown condition in city there was very low response received from citizens. Some did not open the door and some refused to answer as COVID-19 has affected the psychology of people. Therefore, only 20% response was achieved with this method and then researcher decided to change this data collection into online mode. Hence, online distribution of the same questionnaire was done through getting contact number of people from complaint cell (1139) of LWMC. Section 4.2.2 of chapter 4 further explains regarding this mode. To check the comprehensibility of the questionnaire, it was tested initially as pilot testing by requesting feedback from two officials of service provider company and three friends residing in Johar</p>

⁴ To describe certain problem by relating different variables

	town. The suggestions and proposed improvements were duly incorporated to improve validity of the questionnaire.
Semi Structured interviews	To supplement the information from questionnaires, semi-structured interviews (Annex 3) were conducted in local language from official of service provider company (OzPak) and LWMC. Total 10 interviews were conducted telephonically and responses were recorded. Further explained in section 4.2.1 of chapter 4
Literature Review	To improve the validity of answers and findings of results, additional knowledge from the literature review was supplemented. Research articles, books, journals, and contract document of LWMC with OzPak were also consulted.

3.6 Sampling design:

3.6.1 Sample Size

According to Pakistan Bureau of Statistics⁵ Censuses results (2017), Johar Town has population of 64695 whereas 95% of confidence level with confidence interval of 5 (d ≠ 0.05) has been considered. This formula provides the minimum number of samples/ number of respondents to be approached for conducting the research i.e. 401.

The Number of samples will be derived from Slovin’s formula (Jauhari T, 2016) i.e.

$$n \neq \frac{N}{1 + N(d)^2}$$

Where,

N ≠ Number of population

n ≠ Number of sampling

d ≠ margin error

$$n \neq \frac{64695}{1 + 64695 (0.05)^2}$$

$$n \neq 401$$

It was decided to divide equal number of samples (200 for each income group) among high and low income areas of Johar town to achieve uniform results.

3.6.2 Sampling Technique:

This study used *Random Stratified as well as Snowballing Sampling* for Quantitative Data (Questionnaires) and *Purposive Sampling* for Qualitative Data (Semi Structured Interviews) collection. Respondents of the *questionnaires* were the “*people living in low and high income areas of Johar Town*”.

As mentioned in section 1.2 , the reason for selecting Johar town was mainly due to its mixed population of income group. Johar Town was developed and planned for high-income group as per Lahore Development Authority’s (LDA) master plan 1995. However, currently this town faced a huge influx of poor people because of opportunity to work in high-income and commercial areas (Asim and Shirwani, 2015). Pakistan Bureau of Statistics, Government of

⁵ The Pakistan Bureau of Statistics is a federal agency under the Government of Pakistan responsible for national statistical services.

Pakistan conducts Household Integrated Economic Survey (HIES)⁶ in each district/city of Pakistan and according to results of this survey the areas are categorised as high, middle or low-income areas. According to HIES 2019-20 survey, the areas where population (approximately 29,000 inhabitants) with low-income earners reside in this town have been categorised as low-income areas and same population was contacted for current study (Figure 4).

This characteristic of the area pose challenge for service provider because solid waste management service is non-rivalry and everyone has the right to be served with this service (Deputy Manager, OzPak). Therefore, this town was selected for current study to identify if customer satisfaction varies as per income group in terms of infrastructure provision and solid waste collection service quality.

Unfortunately, as mentioned in section 3.5.2, due to poor response from people, researcher switched to random online distribution of the same questionnaire to people residing in this town. However, to reach out to the target respondents the researcher used following approaches;

- a- Distributing the questionnaire to friends already living in Johar Town and snowballing sampling method was adopted in this situation.
- b- Random stratified sampling through contact numbers of people, by tracking their residential addresses from complaint cell of LWMC.

Through this method, slightly higher no. of responses (203 from low income and 205 from high income, making total 408 samples) were received while the required sample was 401.



Figure 4. Map of Johar Town (highlighted green area is low income while, rest of area is high income)

However, for interviews, purposive sampling method was adopted by contacting key informants from designations of Project Director until Assistant Manager from OzPak as well as from Lahore Waste Management Company (LWMC) who have the knowledge about program and their input can be beneficial for study. As per Dworkin (2012), the ideal sample size for interviews is from 5-50, and based upon this 10 interviews were conducted as shown in Table 3. The interviewees selected for interview were already working with their respective companies for more than 5 years and all were qualified above bachelor's degree. Only 2 driver who were interviewed have education less than 10th grade.

⁶ This Survey is one of the biggest household survey of Pakistan at district level, for which data is collected electronically under modules i.e. Migration, Disability, Information Communication Technology (ICT), Type and area of houses, Income level of the household.

Table 3. List of official/ interviewees

Six officials from Service Provider (OzPak)	Four officials from Client Company (LWMC)
Project Director	General Manager Operations
General Manager Operations	Senior Manager Operations
Senior Manager Operations	Manager Operations
Deputy Manager Operations	Assistant Manager Operations
2 Drivers	

3.7 Data Reliability and Validity

A verified method of improving reliability and validity is triangulation (Van Theil, 2014). These research instruments deemed suitable for this type of study where, questionnaires will cover the quantitative data collection, interviews will cover the qualitative data collection and with the help of secondary data, triangulation of these techniques will help to increase the internal and external validity and reliability. However, COVID-19 has affected the data validity and reliability especially in online survey.

3.7.1 Validity:

There are two types of validity, internal and external. Both types of validity were ensured to achieve in this study. Internal validity is the coherence of the study and it is ensured by achieving required sample size (Van Theil, 2014). Moreover, control variables were also added to ensure the internal validity to this research. While external validity of this study is enhanced according to, feedback received during pilot testing from the officials and peer researchers. The external validity is ensured if the research results are generalizable. Moreover, according to Van Theil (2014), survey results are the easiest to generalize.

3.7.2 Reliability:

Reliability in a research refers to accuracy and consistency (Van Theil, 2014). In this study, it has been ensured that various indicators are being used to measure the same variable in the questionnaire. Furthermore, Cronbach's alpha tests were also run, to evaluate the uniformity among indicators to guarantee the reliability of the study results. Reliability of the study was further enhanced by receiving information through conducting interviews (from experts and officials) first. This is how, new questions were added and five times pilot tests were conducted before final distribution of questionnaire.

3.7.3 Data Analysis:

Predominantly, this study used quantitative analysis to answer main research question. However, responses from interviews were also incorporated in the form of quotations, where deemed necessary to improve the validity of findings. The information received from interviews was analysed manually and responses were summarised in Annex 3 showing the summary of responses from interviewees.

1st research sub-question was answered mainly through interviews because the information regarding implementation of waste collection system. This question is mainly answered by using quotation from different interviewees from OzPak and LWMC.

For second and third research sub-question, Statistical Package for Social Sciences (SPSS) 26 tool was used to conduct data analysis quantitatively. Before running tests in SPSS, it was made sure that all data is cleaned and properly coded for high and low income areas. To test the reliability and consistency of all indicators respective to their sub-variables, Cronbach's Alpha test was applied. Afterwards, Correlation test (Pearson), multiple regression analysis and ANOVA tests were conducted, to investigate the influence of independent variable on the dependent variable.

3.8 Limitations of Research:

There is unfortunate event of COVID-19 pandemic since research started, so it has mainly affected the overall research period. Mainly when mode from door-to-door data collection was

shifted to online. It was difficult to identify the people as per both income group in on line distribution of questionnaire also explained in section 4.2.2 in chapter 4. Moreover, in online survey, firstly it is difficult to assess if the respondent understood the purpose of study and questions well. Secondly, there is always doubt that if respondent was ready to really answer the questions or just have answered in casual manner. Therefore, results received were showing more % of responses for neutral on likert scale. Such responses may affect the influence of variables on each other.

Another, limitation is when asking the opinion from individual/representative of a company; they can provide biased opinion and only highlights the best part of their services and hiding their weak points in service delivery. Such responses cannot represent the point of view of an entire population and generalization of subjective views is not possible (Krosnick, 2015)

Chapter 4: Research Findings

4.1 Introduction

This chapter summarizes the results generated from data collected through survey and interviews as explained in chapter 3. This chapter answers three sub research questions. Firstly, it presents the answer for the 1st research sub question i.e. how is solid waste collection service being delivered in Johar Town, Lahore?, which has been explained through descriptive analysis highlighting the project background and current waste collection mechanism. Next section presents the profiling of the sample size and second sub research question has been answered. The second sub research question i.e. What is the influence of infrastructure provision on customer satisfaction in both income areas residing in Johar Town, Lahore?, is mainly answered by analysis of quantitative data obtained from questionnaires. It is supported with qualitative data acquired from interviews and presented in the form of quotations. Similarly, third question is answered mainly through quantitative analysis. To check the reliability and internal consistency of the items among sub variables, Cronbach's alpha tests were run and results were presented before undergoing inferential analysis. Correlation, multiple regression analysis and ANOVA tests were conducted to answer second and third sub research question and results were interpreted, regarding those indicators which have significant influence on customer satisfaction.

4.2 Data collection and sampling

Data collection was started with the challenges of COVID-19 situation. Keeping the challenges in mind it was decided that firstly researcher would contact people by going door-to-door while maintaining all rules of social distancing. However, it was assessed that if response rate from door to door survey will be low then researcher will opt online distribution mode for data collection. After 7 days for performing face-to-face data collection and receiving low response from citizens, researcher switched towards online data collection method.

4.2.1 Interviews

All interviews were conducted telephonically due to COVID-19 circumstances. The purposive sampling was adopted for conducting interviews. In total 10 interviews were conducted as shown in Table 3 and their answers were recorded. It is important to mention that all those interviewees were selected only if they have served in Johar Town area and have the knowledge about the dynamics of the area as well.

4.2.2 Questionnaires:

After interviews, the survey through questionnaires was conducted. The reason behind adopting this sequence was that, during interviews from decision makers and authorities the researcher was able to understand the study much better and some questions were added in questionnaire later on according to new information gathered through interviews. Stratified sampling was the method opted for questionnaire distribution. In this method, samples were divided into two subgroups i.e. high-income and low-income areas and simple random sample was drawn within each subgroup. The criterion of selection has been explained in section 3.6.2 of chapter 3.

Initially, survey was started by contacting people door-to-door. However, due to lockdown situation in Pakistan, this method was taking more time and non-responsiveness become a huge challenge at this stage. Social distancing lockdowns due to COVID-19 situation had affect the people psychologically and they were uninterested to answer the questionnaire. This method could only get 20% of the required sample.

In order to complete data collection on time, it was immediately decided to conduct this survey online. The method of distribution of the questionnaire was through getting the mobile phone numbers of citizens from complaint cell (1139) of LWMC that were living in the areas belonging to both income areas of Johar Town. It is important to mention here (also mentioned in section 4.6.1.2) that complaint management system of LWMC works in such way that

complainant is the only person who can verify if he is satisfied with response of complaint or not. To explain further, when any person registers the complaint due to poor service, staff from service provider company reaches to the complainant and resolve that complaint. Afterwards, a representative of complaint cell calls the complainant and confirms if his/her complaint has been resolved or not. If complainant is satisfied then only the status of that particular complaint will be changed into “closed complaint” rather than “open complaint”. This is how equal number of people (i.e. 250 number of people for each status) were being contacted having “open complaint” as well as “closed complaint” statuses. This approach was successful as people who have ever contacted LWMC regarding waste collection complaints were already aware of the waste collection system in city and provided their responses to the questionnaires. Through this method, slightly higher responses (203 from low income and 205 from high income, making total 408 samples) were received while the required sample was 401.

4.3 1st sub research question: Service delivery of solid waste collection in Johar Town, Lahore:

This section will address sub-question 1: “How is solid waste collection service being delivered in Johar Town?”; as mentioned previously in Chapter 3, this question was mainly answered through interviews done with officials of LWMC (Client Company) and OzPak (Service provider).

4.3.1 LWMC& International Contracting

As mentioned in section 1.1, in 2010 LWMC was established under 82 section of companies’ ordinance, where the company received the power to deliver solid waste management services by the Municipal Cooperation of Lahore (MCL). MCL was part of City District Government Lahore (CDGL) was unable to collect more than 60% of waste generated therefore, powers to manage waste in city were transferred to LWMC. With this information, questions were asked to officials in order to understand how solid waste services are being delivered in the study area.

OzPak and LWMC officials stated that Lahore is the second largest city in Pakistan. In response to the increasing issue of uncleanliness in city, LWMC improved the waste Coverage from 60% to 80% but due to lack of new machinery and equipment within LWMC, it was difficult to achieve 100% collection. To resolve this issue, LWMC selected the mode of Public Private Partnership in 2011. Lahore was divided into two zones with equal distribution of population. An international bidding was done in 2011 whereby after the whole process each zone was awarded to two Turkish Firms (OzPak and Albayrak) for the next seven years (2012-2019). Service provider named OzPak is responsible for providing the services in the study area (low and high-income areas of Johar Town).

4.3.2 Delivery of Solid Waste collection Services

To deliver waste collection services, officials from both companies referred to clause 1.2 of their agreement. This clause was about the scope of work that had been assigned to contractor (i.e. service provider OzPak) whose responsibility is to collect and transport the solid waste to an approved disposal site as designated by client.

This section further elaborates, “*Collection of domestic solid waste generated by commercial, residential, governmental entities and public institutions is done through;*

- *50% Door to Door Collection*
- *50% Collection by containers/communal waste bins”*

OzPak officials further added “*before taking over the area, that they first started providing awareness to public regarding new services and informed them about waste collection timings through distributing brochurers in each household.*”

Project Director of Ozpak also mentioned, “*waste collection planning was the first step before taking over any area. Waste collection of Johar Town area was designed in such a way that all*

commercial areas and low-income areas will be provided with communal bins where they can throw their waste. While waste collection from planned areas (which are high-income) were designated in a way by keeping in mind about the width of streets where garbage vehicles can go easily, to perform door-to-door collection.”

Door to door waste collection has been defined in contract as *“the contractor shall collect domestic waste, which will be put in garbage bag and left by local public on road sides, which is easily accessible by garbage collecting vehicle and compactor in front of houses, residences and other buildings at defined days and hours. Garbage vehicle will proceed by collecting these garbage bags from roadsides”*. (Pictures attached in annex 5)

Moreover, OzPak operations officials said, *“in low-income areas where accessibility of compactor or any vehicle is difficult, handcart support is provided. Sanitary workers sweep the street or commercial areas, with the help of handcart/wheeli bins and empty them in the nearby garbage containers on roadside”*.

From above information, it is concluded that by having the liberty to divide the area for 50% door-to-door waste collection and 50% container based collection, OzPak selected high-income areas to be served by door-to-door collection services while low-income and commercial areas were selected to be served through container-based collection.

LWMC officials stated, *“Service providers are liable to prepare and share the waste collection schedule before starting waste collection services in the area”*

Regarding waste collection activities in Johar Town area, officials from OzPak answered that there are two shifts that are being operated for collection of waste from area. *Timings of these shifts are;*

- *1st Shift: 6:00 hours to 14:00 hours*
- *2nd Shift: 14:00 to 22:00 hours*

They further added, *“In Johar Town, daily 80 tons of waste is produced daily”*

OzPak operations staff told that “It is our priority to collect 100% waste in first shift however 2nd shift is required because there is 50km (one sided) distance to disposal site”

Long distance between disposal site and service area, OzPak faced delays in achievement of 100% waste collection in first shift. Therefore, a transfer station was constructed later on, to avoid delays in cleaning the city, which improved their waste collection efficiency. Vehicles instead of spending more time at long queues at disposal sites, they utilise that time in collecting more waste from the areas. However 2nd shift is also operated with less no. of vehicles as compared to 1st shift to keep the area clean and resolve the complaints if any.

From the data gathered from interviews, it can be concluded that OzPak has operationalised its waste collection services in such a manner that high-income areas are served by door-to-door waste collection services and low income areas are served through container-based collection. Furthermore, in first shift, their priority is to collect waste from residential areas (of both income areas). However, as public keeps on generating waste throughout day and to clear the backlog of first shift, 2nd shift is also operated.

4.4 Control Variable

4.4.1 Profile of sample size

As mentioned above, 203 samples from low-income group and 205 from high-income group were collected. The profile of sample has been cross tabulated and presented as per income groups in table 4. Furthermore, this section explains each control variable in detail as well.

Table 4. Cross-tabulated Profile of sample size (No. of respondents)

Control Variable		Low-Income Group	High Income group
Gender	Female	54	41
	Male	149	164
Education	Illiterate	15	0
	Less than 10 th Grade	92	0
	10 th Grade	88	18
	High school/FA	3	29
	Bachelors	4	108
	Masters	1	35
	MPhil/PhD	0	15
Income Per month (PKR)	10,000-25,000 (52-131 €)	49	-
	26,000-40,000 (136-210 €)	142	12
	41,000-100,000 (215-526 €)	12	146
	More than 100,000 (above 530 €)	-	47

Gender

Data was collected from two areas i.e. low-income and high-income areas with almost equal sample size. Out of 408 respondents (203 respondents from low income and 205 from high-income group), 95 were female and 313 were male as shown in Table 5.

Table 5. Number of respondents (on basis of gender)

	Female	Male	Total (income group wise)
Low Income	54	149	203
High Income	41	164	205
Total (gender wise)	95	313	408

There was huge difference among the gender of respondents because during door-to-door data collection there were some responses from females. However, when data collection mode was changed and contact numbers of citizens from complaint cell were received, they were mostly males. Due to cultural factors, usually females do not use their mobile numbers while calling some public office; instead, they use the numbers of any male member from house. Due to this reason, there are fewer responses from females as compared to males in sample size. However, the distribution respondents in terms of gender did not affect the results because as per the social norm of Pakistan, females stay indoors. Moreover, as stated by one interviewee from OzPak mentioned, *“In high income areas, waste is managed by servant not female owner of house and in low income areas, usually children or male members are responsible to throw their waste into waste containers.*

Education

In the sample of 408 respondents, as shown in Table 6. In low-income group, it was observed that 107 people were with no education or basic education which represents 52% of low-income group. While 96 respondents i.e. 47% were educated. There was only one respondent with education level of masters and no respondent was MPhil or PhD. However, opposite trend was observed in high-income group. The all people (100%) from this group were educated. These findings supported the study conducted by Hause (1975), where he mentioned that people acquire education to improve their incomes and this is reason usually wealthier people are educated as well.

Table 6. Responses (No.) on basis of education

	Illiterate	Less than 10 th grade	Matric/ 10 th grade	High school/FA	Bachelors	Masters	MPhil/PhD	Total
Low Income	15	92	88	3	4	1	0	203
High Income	0	0	18	29	108	35	15	205
Total	15	92	106	32	112	36	15	408

From the Table 6, 26% respondents from total sample size were either illiterate or had less education (i.e. under 10th grade) and 64% were either educated (above 10th grade) or highly educated (masters/PhD) respondents. Moreover, it can be concluded as this survey was conducted online and there was high number of educated respondents who participated to the online survey.

Income Group

The distribution according to monthly incomes of low and high-income groups, located in Johar Town, is shown in Table 7. It was observed there were 12 respondents from low-income area were earning more than 40,000 PKR, which is taxable income according to Federal Board of revenue Government of Pakistan. Similarly, there were people from high-income area who mentioned their monthly income between 26,000 - 40,000 PKR that is not taxable income in Pakistan.

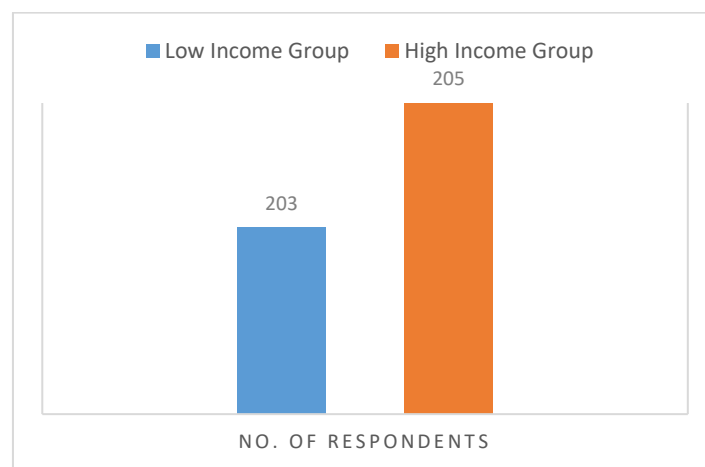


Figure 5. No. of respondents on basis of income areas

However, it can be seen that in low-income group there was no respondent who earn more than 100,000PKR/month i.e. equivalent to 530 €⁷ and similarly in high-income group no respondent was earning less than 25,000 PKR/month i.e. 130 € approximately.

Table 7. Monthly income of respondents

Income per month in PKR	No. of respondents from Low Income Group	No. of respondents from High Income Group
10,000-25,000 (52-131 €)	49	-
26,000-40,000 (136-210 €)	142	12
41,000-100,000 (215-526 €)	12	146
More than 100,000 (above 530 €)	-	47
Total	203	205

This distribution of income in both income groups depict the relevance between HIES survey as well, in which the locations where people earning low wages were categorised as low income areas as mentioned in section 3.6.2.

The above-mentioned profiling of sample size as per different control variables will help in understanding the inferential analysis in section 4.5.2 where the impact of independent variable on dependent variable can be analysed in the presence of control variable.

⁷ 1€= 188/-PKR (as per June 2020 exchange rates)

4.5 Second Research sub-question: Influence of infrastructure provision on customer satisfaction in both income areas:

The focus of this section is on Infrastructure Provision as 1st independent variable of this study. This section will answer the second sub research question “What is the influence of infrastructure provision on customer satisfaction in both income areas of Johar Town”. The four sub-variables in this sub research question are based on the Theory of Infrastructure Service Behaviour and was mainly answered quantitatively through questionnaires. However, indicators i.e. source of budget, adequacy of allocated budget, number of skilled labour, number & types of waste bins, number & type of waste collection vehicles and schedule of repair and maintenance have been answered through interviews from LWMC and OzPak officials. The information gathered through interviews has been triangulated with data from survey in the form of tables showing percentages and literature review. Before conducting the inferential tests, Cronbach’s alpha test for both income areas was done to test internal consistency of the assigned questions per indicator.

4.5.1 Variable: Infrastructure Provision

4.5.1.1 Sub-variable 1: Availability of Finances

This sub variable has two indicators, source of budget and adequacy of budget.

Source of budget

General Manager Operations from LWMC stated, *“There are two sources of budget for LWMC. First is from CDGL for regular operations and second is granted annually by provincial government for payments to service providers.”*

He further added, *“We pay 19.04 \$ (equivalent to 16 €) per ton for performing door to door waste collection method and 17.31 \$ (equivalent to 14.3 €) per ton for container based collection method.”*

In addition to this interviewee from OzPak explained, *“At the end of each month, we develop a progress report showing the amount of waste collected from the area in tons, and submit the invoice accordingly to LWMC.”*

The service provider has to provide service to entire allocated area despite of high and low income areas and the only difference in payment mode lies in the method of waste collection service. Therefore, from interviews it can be concluded that LWMC pay 16 €/ton for provision of door-to-door services in high-income areas and 15 €/ton for container based collection in low-income areas.

Adequacy of budget

LWMC and OzPak officials were from operations department and were hesitant towards answering the adequacy of allocated budget. However, OzPak officials answered, *“Yes, I think the commitment from past 7 years proves that budget was adequate, however we faced some delays in payments in these years”*

General Manager LWMC added, *“There is 21.45% waste management fee incorporated in monthly bill of water supply. However, water supply is managed by another organization i.e. Water and Sanitation Authority, Lahore (WASA) therefore they retain 15% of this amount as a service charge and pay remaining 85% to Municipal Corporation Lahore(MCL)wing of CDGL”*

According to Al-Khateeb (2017), poor fee recovery system is another challenge that cause financial constraints on budget of municipality.

Manager Operations of LWMC stated, *“Each year relying on budget from CDGL and government usually cause delay in payments to service providers”*

He added, “Currently we are charging 0.11 \$ (0.092 €) from low-income groups and 0.55 \$ (0.46 €) from high-income group per month per household”.

GM operations LWMC stated, “We have proposed a new revenue generation plan based on rich and poor areas. According to this proposal the increase in charges ranges from 1.0 \$ (0.84€) for low-income areas and 6.0\$ (5€) for high-income areas /month/household)”

It is analysed from responses that, LWMC is financially dependent upon CDGL and Governmental funding each year. Moreover, low rates of user fee and dependency of fee collection on other department has created a challenge for LWMC to become financially independent. However, LWMC is still struggling to revise and implement the new rates of user fee. The average household monthly income in Lahore generally ranges from 60\$ to 400\$ (50.41€ to 350€)⁸, and proposed user fee will account 1.6%–2% of household income. According to Wilson et al., (2012), affordability of user charges for SWM should not exceed 1%. This is the reason that LWMC is facing challenges to implement new user charges till date.

4.5.1.2 Sub-variable 2: Waste Collection Service Mode

This sub variable has two indicators; container based waste collection and door-to door waste collection.

Container based waste collection

In survey, from low income group question was asked regarding their satisfaction on the mode of waste collection in their area. As, Figure 6 shows 7% respondents were not satisfied, while 13% were neutral. However, a huge percentage i.e. 80% showed their satisfaction towards container based collection. From the results it can be concluded that despite of having different mode of service as compared to high-income group, 80% respondents from low-income group are satisfied with the container based collection services in their area.

OzPak Project Director informed, “before 2012, there was no reliable service given to citizens regarding waste collection and specially low-income areas were neglected”

Therefore, it can be argued that the reason behind higher satisfaction of low-income group regarding mode of waste collection is that there was no service of daily waste collection from their area before service provider (Annex 5-i).

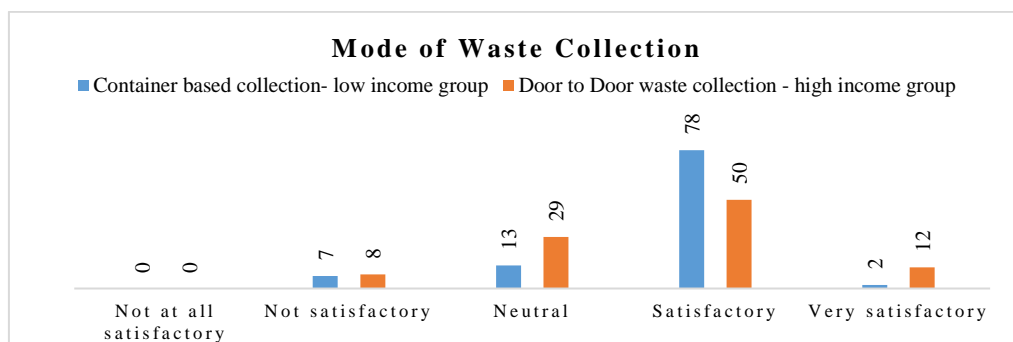


Figure 6. Responses (percentage) regarding mode of waste collection

Door-to-door waste collection

Responses from Figure 6 showed that 8% of high-income group are not satisfied while 29% were neutral about satisfaction on door-to-door waste collection services. While 62% responses expressed their satisfaction on waste, collection from their door step. These responses can be related with the findings of World Bank report that stated high-income group expects much improved door-to-door waste collection services from their area (Kaza et al., 2018).

Comparing the satisfaction level on mode of waste collection in both income areas showed that there is high number of satisfaction from low income is group i.e. 80% for container based

⁸ HEIS survey 2019-2020

collection mode as compared to high-income group i.e. 62% where mode of waste collection is door-to-door. As, explained above, the reason behind higher satisfaction from low-income group is that they were never served by any such service before.

4.5.1.3 Sub-variable 3: Availability of Operational staff, equipment and technology

This sub variable has three indicator, skilled labour, waste bins and waste collection vehicles/fleet.

Skilled labour (Workers/Drivers/ Field staff)

In order to assess this indicator quantitatively, this question was asked from citizens regarding their satisfaction on the conduct of staff and professionalism. Figure 7 **Error! Reference source not found.** shows that in low-income group, 4% people were not satisfied, 25% were neutral while 65% were satisfied with conduct of staff. Only 5% responses were highly satisfied. Similarly, in high-income group, 2% respondents were not satisfied at all, 7% were not satisfied and 23% were neutral regarding this indicator. 57% people showed their satisfaction and 11% expressed their extreme satisfaction with staff of the service provider. The comparison of both income areas shows that responses from high-income group are slightly higher in percentage i.e. 11% as compared to low-income group i.e. 4%, regarding their dissatisfaction towards conduct of staff. While both income areas observed similar trend of percentages on likert scale.

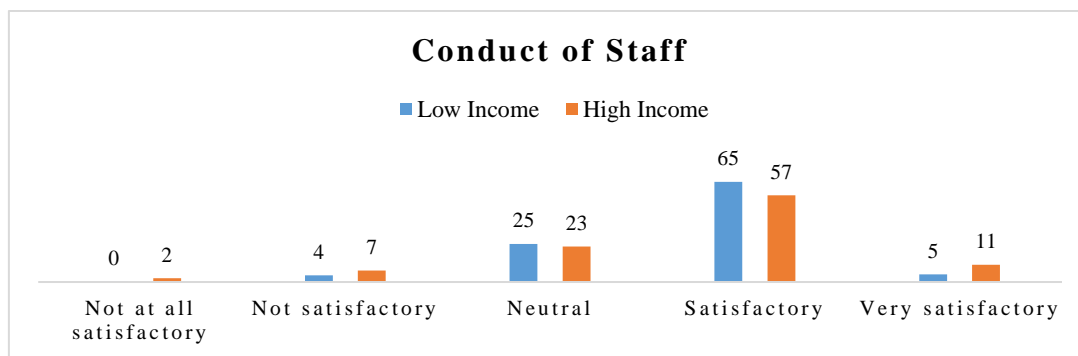


Figure 7. Responses (percentage) regarding conduct of staff

OzPak officials responded regarding human resource, *“There are 115 sanitary workers and 10 drivers allocated for Johar Town area (including both income areas)”*.

The allocation number of sanitary workers is done according to World Bank study where Zhu et al., (2008), suggests that one sanitary worker must be deputed over population of 500 people or 100 houses. Moreover, this study states that this number can vary according to local condition of area, population density and waste generation patterns of residents. However, from this criterion it can be assessed that there is shortage of 15 sanitary workers in Johar Town.

Furthermore, they OzPak interviewee added, *“When any driver is hired, there is a standard procedure to train him for 2-3 days regarding vehicle operation and dealing with public”*

Other Interviewee from OzPak mentioned, *“We arrange twice a year trainings for our drivers regarding health, safety and traffic rules with collaboration of city traffic police department and public dealing trainings for field staff”*

According to results, it can be analysed that, there are enough number of staff deputed to collect waste from both income areas of Johar Town area. Moreover, it was assessed that OzPak is providing necessary trainings to its staff and survey results shows that approximately 70% of responses from both income group showed their satisfaction towards conduct of staff. This finding reflects the same results of study that argues, for good operations of solid waste

collection services in any area the first requirement is to hire skilled and trained staff (i.e. workers, drivers) (Zhu et al., 2008).

Waste bins:

Three questions were asked under this indicator regarding respondent’s satisfaction on availability of no. of waste bins, accessibility and quality in both income areas. In low-income group, as shown in Figure 8, zero response was observed with not satisfaction at all for no. of bins 6% were not satisfied, 33% were neutral and 54% were satisfied. Only 6% were highly satisfied. In high-income group, 9% were not satisfied, 29% were moderate in their opinion and 44% were satisfied regarding quantity of waste bins in their area. Only 16% very satisfied. The difference in satisfaction level among both income groups regarding no. of waste bins is because of the reason that low-income group is directly depending upon container-based collection while high-income group is not aware of the placement and quantity of bins.

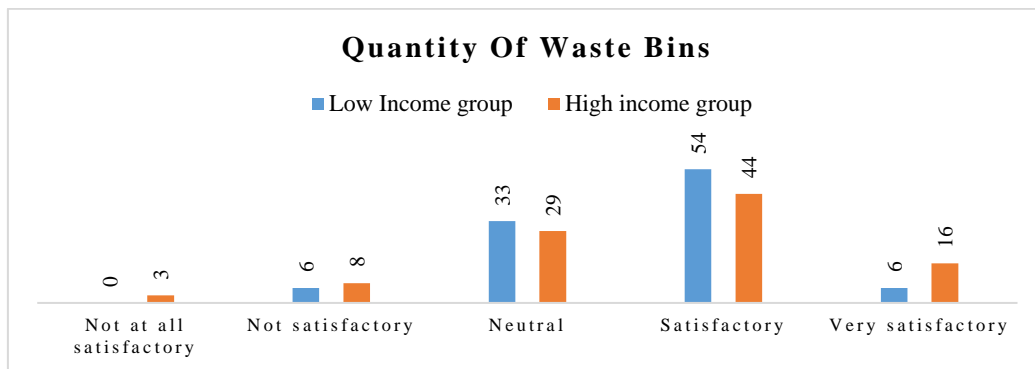


Figure 8. Responses (percentage) regarding satisfaction on quantity of waste bins

Regarding accessibility to these containers, Figure 9 showed similar trend of responses in Figure 8 where low-income group is slightly more satisfied as compared to high income group in terms of accessibility, as low-income group use containers/bins to throw their waste unlike the high income group.

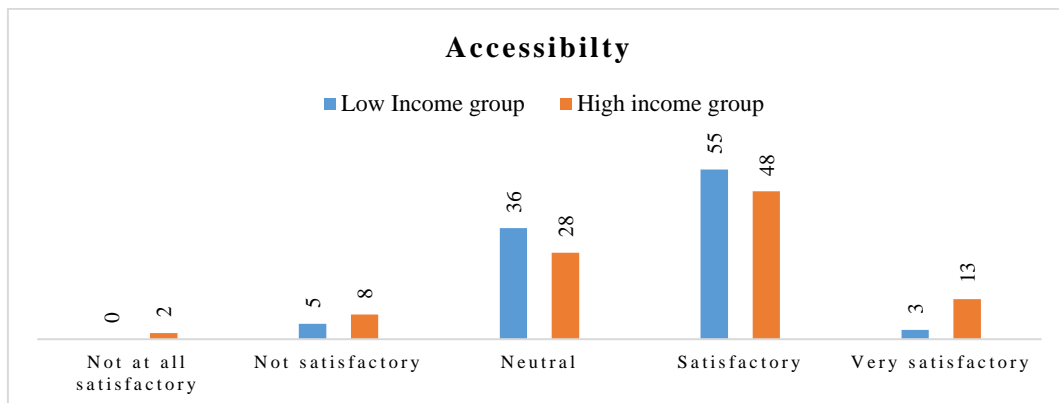


Figure 9. Responses (percentage) regarding satisfaction on accessibility to waste bins

Correspondingly, Figure 10 shows the respondent’s satisfaction on quality of waste bins in their area. The results from low-income and high-income group showed similar trend as mentioned in figure 8 & 9. Low-income group showed higher level of satisfaction as compared to high-income group because they observe waste bins more often as compared to high-income group.



Figure 10. Responses (percentage) regarding satisfaction on quality of waste bins

Comparison of both income areas reveals interesting results. High-income group is mainly served by door-to-door waste collection service and do not use waste bins but there was a higher percentage of high-income group i.e. 5% who are not at all satisfied. While in contrast, no one from low-income group responded to not satisfactory at all.

OzPak officials responded, “There are total 250 containers placed in Johar Town. Majority (70%) of these containers are placed in low income areas while some (30%) have been placed in commercial areas of high income areas”.

From above responses, it is assessed cluded that, if public is being provided with basic infrastructure i.e. adequate number of waste bins, with accessibility and good quality, their satisfaction can be achieved (Ali et al., 2012). Moreover, it is also assessed that service provider manages the balance for providing basic infrastructure to both income areas.

Waste collection vehicles

From Figure 11 we can observe that in low-income group 9% responses were not satisfactory, 27% were neutral and 51% are satisfied. 13% respondents were very satisfied with quality of vehicles that came to collect waste from waste bins. Similarly, in high-income group 2% were not at all satisfied with quality of waste collecting vehicles, while 10% were not satisfied. 20% responses were neutral, 52% were satisfied and 16% were highly satisfied. The comparison of both income areas showed that there is slight higher percentage (68%) of satisfaction towards quality of waste collecting vehicles as compared with low-income group (64%). This can be argued from results that high-income group respondents mainly rely on waste collection vehicles because of door-to-door collection services and yet are slightly more satisfied with quality of vehicles.

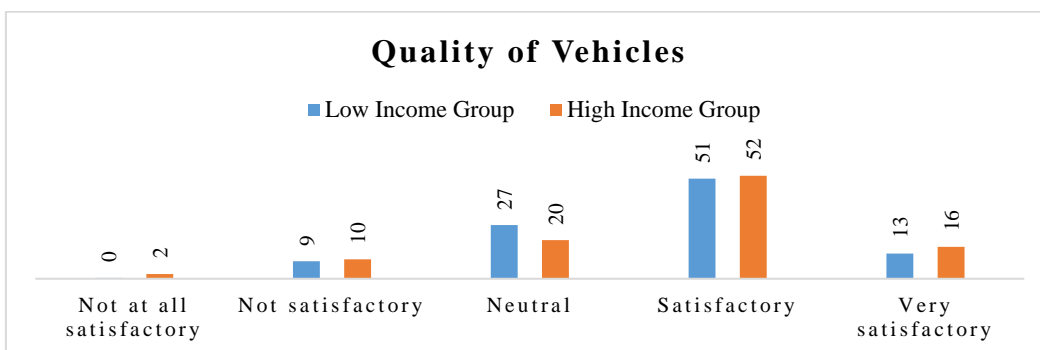


Figure 11. Responses (percentage) regarding satisfaction on quality of waste vehicles

OzPak official mentioned, “Fleet for waste collection in Johar town has been distributed in following manner;

	<i>1st Shift</i>	<i>2nd Shift</i>
Low Income	<i>3 compactors for container based collection</i>	<i>2 compactors for container based collection</i>
High Income	<i>3 Mini dumpers and 2 compactors for door to door waste collection</i>	<i>2 compactors for commercial areas</i>

LWMC officials responded, “The allocation of the number of vehicles mainly depend upon the waste generation, its geographical location and type of area i.e. either planned or unplanned or mixed. We monitor the number of waste collection vehicles as well as their operations in the area”.

Results from above mentioned figures show that slightly higher number of vehicular resources have been provided in high-income areas. As mentioned in literature review section 2.7.3, there is provision of more solid waste collection vehicles in high income area because of factors like; availability of paved roads, streets and their width if some part of city is not planned then it becomes critical specially in low-income areas where municipalities utilise their outdated vehicles and equipment (Zhu et al., 2008). However, it is important to mention here that despite of allocating more resources in high-income areas, OzPak is neither neglecting nor providing outdated vehicles in low-income areas. They are providing the container based waste collection services in both shifts in low-income areas.

Reliability of all indicators under this sub variable has been checked through Cronbach Alpha test as shown in Annex7 Annex 7: Inferential analysis- Low-income group:. Cronbach-Alpha test of low-income group has value of 0.77 while high-income group has 0.88. In both cases, it is greater than 0.7 so these indicators were combined, and new indicator was named as “provision of infrastructure” (equipment and vehicles) for further analysis (section 4.5.5).

4.5.1.4 Sub-variable 4: Repair & Maintenance of equipment/vehicles

This sub variable has one indicator, repair and maintenance mechanism.

Repair and Maintenance Mechanism:

In order to receive the perception of citizens regarding their satisfaction on repair and maintenance of vehicles, results are shown in Figure 12. In low-income group 2% people were not satisfied at all with repair and maintenance of vehicles, 4% were not satisfied and 31% were neutral in this regard. 62% responses from low-income group showed their satisfaction towards repair and maintenance of vehicles. While, in high-income group 3% people were not at all satisfied, 6% were not satisfied and 27% showed their neutral opinion. 55% people from high-income group were satisfied and 14% were highly satisfied with repair and maintenance of vehicles. Comparing the responses from both income areas showed that there is slight higher percentage of people from high-income group having their satisfaction i.e. 64% than low-income group i.e. 62%.

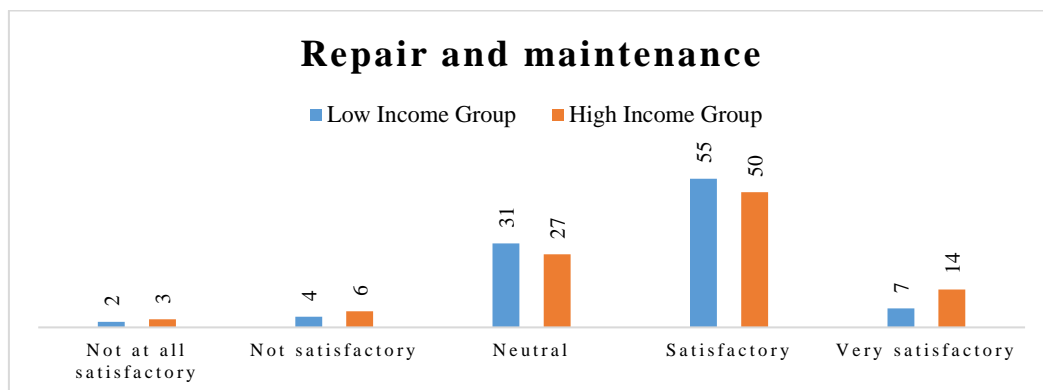


Figure 12. Responses (percentage) regarding satisfaction on repair and maintenance of vehicles

During interview with OzPak officials stated, *“Repair and maintenance is one the important aspect in waste management sector. It not only increases the life of vehicle but also improves the service quality”*

Operations department official from OzPak mentioned, *“We cannot afford our vehicles to remain out of order for a single day. Therefore, we have three types of repair and maintenance schedules i.e. daily, scheduled (either weekly or monthly) and emergency ones”*

- a) Daily maintenance: checking oils, breaks, sirens, and lights (indicators) of vehicles. Moreover, at the end of every shift each vehicle is washed/cleaned before being parked at parking lot.
- b) Scheduled maintenance: includes engine overhaul, tyre change, change of air filters etc.
- c) Emergency: top priority is given to cases when some accident or major breakdown of vehicle occurs.

In connection to this, researcher asked a question regarding repair of containers present in field, and OzPak official responded, *“We have two mobile workshops, these are vehicles which have necessary repair and maintenance material. Whenever there is damage to any container or it need to be replaced, these vehicles fix such problems on spot. This mechanism is very helpful in terms of saving time and fixing the problem on spot.”*

From interviews, it can be argued that service provider aims to provide all its vehicles in workable condition and manages to stick with repair and maintenance schedules. As, mentioned in chapter 2 section 2.7.4 repair and maintenance of vehicles is one main area where private sector has performed very successfully, because private sector give top priority towards repairing the vehicle and try to repair the vehicle in less than a half day (Levine.C, 1995). Consequently, the responses indicate that, high-income group people are mostly satisfied with repair and maintenance of these vehicles because waste collection from their area is directly dependent upon vehicles (for door-to-door collection). Moreover, it can also be assessed that low-income group is also satisfied as they rely on container based collection where vehicle fitness is very as important for timely waste lifting.

To conclude the responses from interviewees and respondents, for 1st independent variable i.e. infrastructure provision, it can be assessed that service provider is providing similar infrastructure in terms of waste collection schedules, repair and maintenance, staff and fleet in both income areas. Overall, it has been analysed that more than 50% responses from both income areas showed the trend towards satisfaction in terms of infrastructural provision. This finding slightly contradicts with study where Zurbrügg (2009), stated that in urban areas usually poor families are the ones who face poor solid waste management services due to insufficient waste collection resources⁹ and mainly due to allocation of more resources (by municipalities) in urban rich areas. However, this statement of Zurbrugg is also slightly applicable with the findings of current research because still there is difference towards mode of waste collection among high-and low-income group in Johar Town. Nevertheless, as explained by operational staff during interview, due to liberty given by contract of OzPak with LWMC, the division of two modes of collection among both income group is justifiable. Secondly, because of narrow streets and poor infrastructural development in low-income area makes difficult for heavy waste collection vehicles to enter (Zhu et al., 2008).

To analyse the influence of infrastructural provision on customer satisfaction, statistical inferential analysis were performed as explained in sext section.

⁹ Poor allocation of waste collection resources in poor income areas e.g. waste bins, sanitary workers

4.5.2 Inferential Analysis:

To check the relationship between infrastructure provision and customer satisfaction among both income areas, appropriate inferential tests were performed. It is important to mention here that no indicators were discarded. Firstly, sub-variable “availability of operational staff, equipment and technology” has three indicators that were combined after performing Cronbach alpha test. A new sub-variable was made by combining them and named “provision of infrastructure” as shown in Table 8. The Cronbach alpha test of this new sub-variable came 0.77 for low-income group and 0.88 for high-income group. Both results are >0.7 and thus, used in next steps of analysis.

Similarly, sub variable i.e. “Reliability” from dependent variable (customer satisfaction) has three indicators namely “waste collection schedule, adherence to waste collection schedule and timely collection of waste” were combined for the analyses. The new sub-variable was named “reliable service”. There were two main reasons for combining these indicators. First, all of three indicators were measured on same scale i.e. likert scale. Second, when tested for Cronbach’s alpha, result was 0.82, which is higher than 0.7 and thus, decided to aggregate and combine them.

Table 8. Newly constructed sub variables and their Cronbach Alpha Test

Sub variable	Indicators	New sub variable	Cronbach Alpha test	
			Low-income	High-income
Independent sub variable: <i>Availability of Operational staff, equipment and technology</i>	a) Skilled Labour b) Waste bins c) Waste collection vehicles	Provision of infrastructure	0.77	0.88
Dependent sub variable: <i>Reliability</i>	d) waste collection schedule e) Adherence to waste collection schedule f) Timely collection of waste	Reliable Service	0.82	0.89

For both income areas, Table 8 shows the aggregated indicators, their Cronbach alpha value and newly created sub variable of independent and dependent variable. To analyse further, correlation and regression analysis was performed for both income areas.

4.5.2.1 Correlation:

For the correlation analysis, the Pearson correlation was used. A correlation coefficient ranges from -1 to +1 wherein -1 is a perfect negative correlation while +1 is a perfect positive correlation. Additionally, a zero means no correlation.

The correlation results Table 9 showed positive correlation amongst all independent and dependent variables in low-income group. Most variables show strong positive correlations (more than 0.5 and less than 0.7) which is amongst the independent variables i.e. provision of infrastructure with container based waste collection. The highest positive strong correlation (0.791) was observed between both dependent variables i.e. reliable service and coverage.

Table 9. Correlation between infrastructure provision and customer satisfaction in low-income group

Correlation of infrastructure provision with customer satisfaction in low income group							
		1	2	3	4	5	6
1	Container based waste collection	1					
2	Provision of infrastructure	.686	1				
3	Repair and maintenance	.442	.637	1			
4	Conduct of staff	.426	.676	.520	1		
5	Coverage (D.V)	.250	.385	.295	.370	1	
6	Reliable Service (D.V)	.340	.496	.328	.447	.791	1

The correlation results for high-income group as shown in Table 10 suggests that all variables have positive correlation with each other, while strong correlations are highlighted bold. The strong positive correlation i.e. 0.819 is observed between conduct of staff and provision of infrastructure. Moreover, there is strong positive relation observed between door-to-door waste collection and reliable service i.e. 0.604. Similarly, provision of infrastructure and reliable service are also observed strong correlated with 0.66 value.

Table 10. Correlation of infrastructure provision with customer satisfaction in high-income group

Correlation of infrastructure provision with customer satisfaction in high income group							
		1	2	3	4	5	6
1	Door to Door waste collection	1					
2	Provision of infrastructure	.643	1				
3	Repair and maintenance	.523	.741	1			
4	Conduct of staff	.628	.819	.685	1		
5	Coverage (D.V)	.482	.556	.487	.491	1	
6	Reliable Service (D.V)	.604	.666	.558	.593	.864	1

Comparing the both income group, from table 9 & 10, correlation analysis showed there is strong correlation of customer satisfaction in low-income group with infrastructure provision, conduct of staff and repair of vehicles. This implies that when appropriate waste management infrastructure and collection system is provided in low-income areas by understanding the local conditions, people will be satisfied with waste management services. While, people from high-income group showed strong correlation of their satisfaction towards door-to-door waste collection and availability of staff, bins and vehicles. These results also compliments that high-income group is already served with better form of waste collection i.e. door-to-door however, reliable service from OzPak has increased the level of satisfaction among high-income group as well.

4.5.2.2 Testing assumptions for regression analysis:

Before conducting multiple linear regression analysis, following six assumptions were tested. Table 11 explains the assumptions and results are attached in annex 7 part C.

Table 11. Testing assumptions for regression

S. No.	Assumptions	Results of Assumption tests
1	Dependent variable should be measured at the continuous level (i.e., they are either interval or ratio variables).	2 sub variables of dependent variable for this research are measured on interval scale.
2	A linear relationship must exists between the two variables.	Correlation table above showed that in both income groups linear relationship exists between variables.
3	Dependent variable should be approximately normally distributed.	Histogram in annex 7 showed approximated normal distribution
4	There should be no significant outliers	No significant outliers exists as shown in annex 7.
5	There is homogeneity of variances	Homogeneity of variances exists (annex 7) Levene's test and all having no significant values.
6	You should have independence of observations (at least 20)	There were more than 200 observations for each income groups

4.5.2.3 Multiple Linear Regression:

Multiple linear Regression has been conducted to study the influence of independent variable on the dependent variable. The results are shown in form of coefficient b (the effect) and significance (size of effect). Two models were generated, to estimate the effect of independent

variable on predicted value of dependent variable. To control the other effects on dependent variable, control variables from the given data have been added in some models to allow in estimating the effects of independent variable on dependent variable. For the current data, there are two indicators of dependent variables i.e. coverage and reliable service so each dependent variable has been tested against two same models with combination of different independent and control variables.

Model 1: All indicators of independent variable i.e. infrastructure provision against two indicators of dependent variable.

Model 2: All indicators of independent variable i.e. infrastructure provision and all indicators of control variable against two indicators of dependent variable.

Table 12. Regression Analysis for "infrastructure provision and customer satisfaction" in low-Income group

	Dependent Indicator- Coverage						Dependent Indicator- Reliable Service					
	Model 1			Model 2			Model 1			Model 2		
	B	R2	Sig.	B	R2	Sig.	B	R2	Sig.	B	R2	Sig.
(Constant)	1.44	0.172	0	1.583	0.347	0	1.24	0.272	0	1.245	0.428	0
Container based waste collection	0.015		0.877	0.009		0.92	0.004		0.959	0.058		0.427
Provision of infrastructure	0.272		0.056	0.176		0.178	0.355		0.002	0.25		0.02
Repair & maintenance	0.048		0.535	0.089		0.21	-0.018		0.778	0.001		0.99
Conduct of staff	0.201		0.034	0.215		0.013	0.182		0.019	0.2		0.005
Gender				-0.532		0				-0.537		0
Age				-0.008		0.067				0.002		0.663
Education				-0.959		0.002				-0.412		0.105
Income level				0.058		0.944				0.067		0.184

As Table 12 shows the analysis of dependent indicator (coverage) against two models. Model 2 involving all indicators (independent and control) exhibited a high R2 value i.e. 0.347. It has been analysed from same table that co-efficient (B) value in both models is positive that means all independent indicators have positive effect on the dependent indicator. This implies that if the value of the indicators of independent variable (i.e. container-based collection, provision of infrastructure, repair & maintenance and conduct of staff) will increase, the mean of the indicator (of dependent variable) i.e. coverage will also tend to increase. However, only three indicators from control variable in model two i.e. gender, age and household size showed negative value of co-efficient (B). Table 12 further shows the significant effect of “provision of infrastructure” and “conduct of staff” on “coverage” in both models with p value of less than 0.05 (i.e. 0.056 & 0.034 in model 1 and 2).

Second dependent indicator i.e. “reliable service” in Table 12

was analysed against two models in similar way. Model 1 & 2 shows same results, where “provision of infrastructure” and “conduct of staff” has a positive Co-efficient value (B) as well as significant effect on “reliability”. The p value of these indicators are also less than 0.05 (i.e. 0.002, 0.019 in model 1 and 0.02, 0.005 in model 2).

After analysis of all models in Table 12, it can be argued that availability of infrastructure and conduct of staff has a positive effect (B) as well as high significance (p) on customer satisfaction in low-income areas and it rejects the null hypothesis ($H_0 =$ there is no effect). This can be argued that these both indicators have significant positive effect on dependent variable and results can be generalised for larger population.

Table 13. Regression Analysis for "infrastructure provision and customer satisfaction" in high-income areas

	Dependent Indicator- Coverage						Dependent Indicator- Reliable Service					
	Model 1			Model 2			Model 1			Model 2		
	B	R2	Sig.	B	R2	Sig.	B	R2	Sig.	B	R2	Sig.
(Constant)	0.78	0.380	0.001	0.845	0.398	0.016	0.702	0.513	0	0.529	0.541	0.05
DTD waste collection	0.157		0.041	0.169		0.03	0.231		0.001	0.239		0.003
Provision of infrastructure	0.091		0.023	0.108		0.043	0.232		0.029	0.231		0.029
Repair & maintenance	0.08		0.315	0.065		0.415	0.061		0.321	0.043		0.481
Conduct of staff	0.021		0.828	0.025		0.798	0.032		0.679	0.042		0.581
Gender				-0.172		0.15				-0.142		0.123
Age				-0.007		0.119				-0.006		0.081
Edu				0.015		0.879				0.105		0.168
Income level				0.008		0.744				0.025		0.166

Table 13 represents regression analysis of high-income group where two dependent indicators i.e. Coverage and reliability have been assessed against indicators of independent and control variables. Model 1 & 2 under “coverage” showed that indicator i.e. “door-to-door waste collection” and “provision of infrastructure” has positive co-efficient (B) as well as significant impact (p value i.e. 0.001, 0.041, 0.023 respectively). However, “gender & age” has negative (B) and insignificant impact (p) on “coverage”. The negative co-efficient (B) value means that if the value of the gender and age will increases, the mean of the dependent variable (i.e. coverage) will tends to decrease. However, the p values of these indicators are showing insignificant impact with higher R2 value in model 2 (0.39) than model 1 i.e. 0.38.

Regression analysis of second dependent indicator i.e. “reliable service” is analysed against two models in similar way as represented in Table 13. Both models showed, two indicators of independent variable i.e. door-to-door waste collection and provision of infrastructure have positive co-efficient (B) value as well as significant effect on reliable Service. Their p value in model 1 is <0.05 i.e. 0.001, 0.029 for door-to-door waste collection and provision of infrastructure respectively. While p value in model 2 is 0.003 and 0.029 for same indicators. Amongst both models under “reliable service” second model has higher R2 value i.e. 0.54.

The significance value of two indicators (i.e. door to door waste collection and provision of infrastructure) of independent variables against indicators of dependent variable (coverage and reliable service) rejects the null hypothesis ($H_1 =$ there is no effect) as explained above. By rejecting null hypothesis, it can be argued that door-to-door waste collection and availability of infrastructure have not only positive effect (B) but also significant (p) effect on customer satisfaction in high-income areas and this hypothesis ($H_1=$ there is an effect) can be applied to larger population in general.

By comparing the results of regression analysis in both income groups, it can be concluded that satisfaction of low-income group is significantly dependent upon “*provision of infrastructure*” (staff, bins and vehicles) and “*conduct of staff*” and satisfaction of high-income groups is dependent upon “*door-to-door waste collection*” and “*provision of infrastructure*”. These indicators are rejecting null hypothesis where it shows that these indicators have effect on customer satisfaction. These finding from both income groups are in accordance where Zhu et al., (2008), stated that for a municipality physical handling of solid waste, i.e. door to door waste collection and availability of infrastructure (bins, staff etc.) is equally important as providing training and capacity development to it waste management staff. Moreover, it is worth mentioning here that regression analysis of both income areas showed that control

variables like age and gender has no significant impact on infrastructure provision and customer satisfaction.

Result from ANOVA Tests:

To further verify the results from regression analysis and to compare both income groups, researcher performed ANOVA test. ANOVA is performed to know the statistical differences among the means of two or more groups. For this purpose, researcher firstly selected only those indicators which were significant and common (in regression analysis) between high and low-income groups. ANOVA table (a) on page 93 shows that p value is 0.85 which is > 0.05 and not significant. This significant value shows that null hypothesis is not rejected and it can be argued that no difference exists between means of both income groups. Hence, it can be concluded that customers will be satisfied if infrastructure is being provided to them despite of their income groups. Solid waste management services exhibit the characteristics of non-rivalry and non-exclusion, which means that if municipality provides waste containers, vehicles then it is practically impossible to prevent anyone from using it and the same unit of the good can be consumed by more than one person despite of demographic background (Ezebilo and Animasaun, 2011).

To assess further, researcher carefully selected indicators which were significant in regression analysis i.e. “door to door collection” from high-income group and “container based collection” from low-income group. The ANOVA results of this indicator shows p value 0.000. This indicates that it is less than 0.001 (but not exactly 0), which, in turn, means that it is less than significance level of 0.05. Therefore, to narrate the results it can be said that there is significant difference between high and low income group’s satisfaction on their mode of waste collection (either door to door or container based) and rejects null hypotheses. This result also verifies the results from regression where it showed that only high-income people are significantly satisfied with door-to-door waste collection services as compared to low-income group. Conclusion can be drawn that people from high-income areas enjoy the privileges of living in planned areas where this service is being provided.

4.6 3rd sub-research question: Influence of service quality on customer satisfaction in both income areas:

This section answers the third sub research question “What is the influence of service quality on customer satisfaction in both income areas residing in Johar Town, Lahore?” This section has been mainly answered through quantitative analysis, supported by interviews and literature. There are four sub-variables showing the perception of people from each income group regarding their satisfaction the service quality of waste collection in their area.

4.6.1 Variable: Service Quality

This variable has 4 sub-variables; perception of service quality, responsiveness, environmental cleanliness and user charges.

4.6.1.1 Sub-variable 1: Perception of Service Quality

As mentioned in chapter two (section 2.8.1), the customers most importantly show their perception regarding the quality of the outcome of any process or service (Grönroos, 1984). To understand perception of service quality three indicators were identified and questions were asked from respondents. These three indicators are explained below.

Perception about overall service quality:

Regarding perception of service quality in waste collection, question regarding degree to which people are satisfied about the overall service quality was asked from both income groups. As observed in Figure 13, in low-income group, 16% people were not satisfied, 9% were neutral and 71% were satisfied with overall service quality. 2% from low-income group only 2% were highly satisfied. Similar responses from high-income group was observed as shown in Figure

An analysis of customer satisfaction regarding infrastructure provision on solid waste collection and service quality in Low & High income areas of Johar Town, Lahore 48

13, that 15% were not satisfied, 9% were neutral and 66% were satisfied. 8% from high income group were highly satisfied with over service quality from OzPak.

Comparing both income groups, it was observed that approximately same number of percentages were observed in both income areas, on likert scale, from not satisfactory to very satisfactory. From results it can be argued that overall, approximately 70% people from both income areas showed their satisfaction towards overall quality of waste collection service. During interview, official of OzPak stated, *“This is the only example of successful PPP in Pakistan waste management sector and people have been accustomed to the services since last 7 years as they were deprived of any such service before”*.

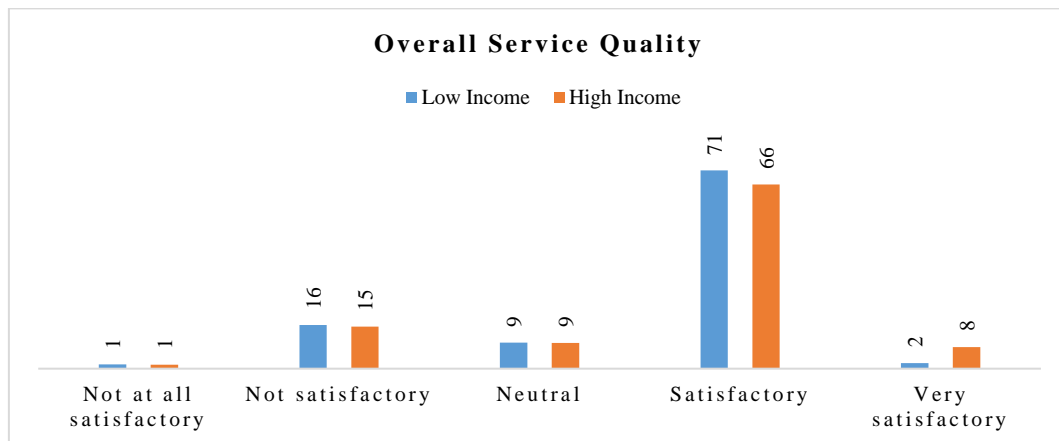


Figure 13. Responses (percentage) regarding satisfaction on service quality

Chang & Pires, (2015) stated that when solid waste management system is in place then public concerns on service quality become important factor to consider. Similarly, from above mentioned responses and interviews, it can be argued that waste management sector was one of the neglected areas and once government place system to deliver waste management services, people get accustomed to the services.

Frequency of waste collection

Frequency of waste collection from residential area is one of the major indicator that can influence or impede the satisfaction of customers. Figure 14 below, showed the responses from low-income group where 11% respondents were not satisfied and 54% were neither satisfied nor dissatisfied regarding frequency of waste collection. However approximately 34% respondents from this income group were satisfied. While in high-income group 12% respondents were not satisfied, 41% were neutral about the perception on waste lifting frequency. Approximately 37% were satisfied regarding waste lifting frequencies.

Comparing responses from both income groups, it can be seen that there was less number of responses i.e. 34% from low-income group who are satisfied as compared to high-income group i.e. 45%. OzPak official mentioned the difference in satisfaction level on waste collection frequency, in interview, *“Main problem we face in low income area is the lack of cooperation or awareness from citizen’s side.”*

Other official from LWMC mentioned, *“People from low-income group, are not punctual in throwing their waste into containers. Sometimes, waste can be seen overflowing and therefore OzPak provide waste collection services in 2nd shift specially in low income areas”*

Moreover, as it has been stated that all phases in solid waste management system (from waste generation until disposal) depend on public awareness and corporation (Zhu et al., 2008). Thus, it can be argued that if service provider improves the frequency of waste lifting with cooperation from public then solid waste collection system can become successful.

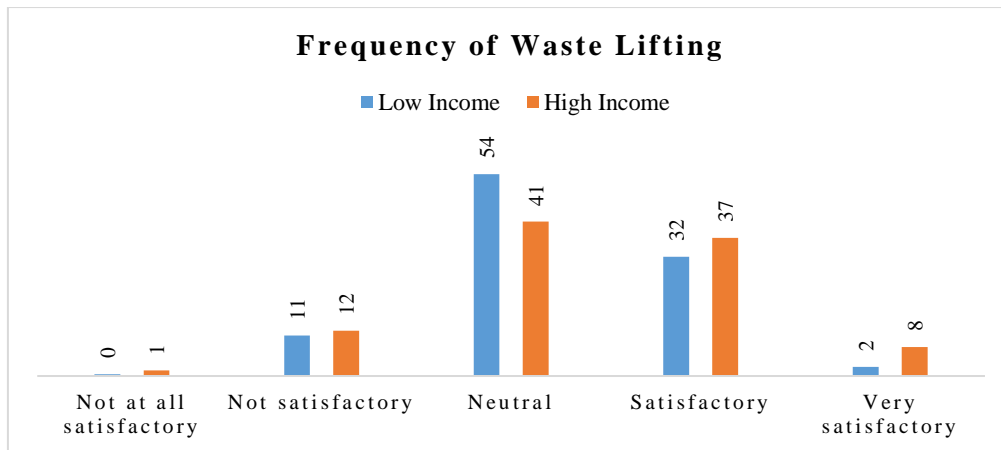


Figure 14. Responses (percentage) regarding satisfaction on frequency of waste lifting

Concern towards final destination after waste collection

In terms of service quality of waste collection, it is important to know the perspective of citizens degree to which they are concerned about final destination of waste. According to Figure 15, 6% people from low-income group not concerned, 32% were neutral and 51% were concerned. Only 9% people from low-income group were highly concerned regarding final destination after waste being collected from their area. Looking at responses from high-income group, 4% were not at all concerned, 5% were not concerned and 29% were neutral. 45% responses were concerned and 16% were highly concerned about the final fate of the collected waste. Overall it can be justified from results that number of responses from high-income group is slightly higher i.e. 62% as compared to low-income group i.e. 60% regarding concern on final destination of waste once lifted from their area.

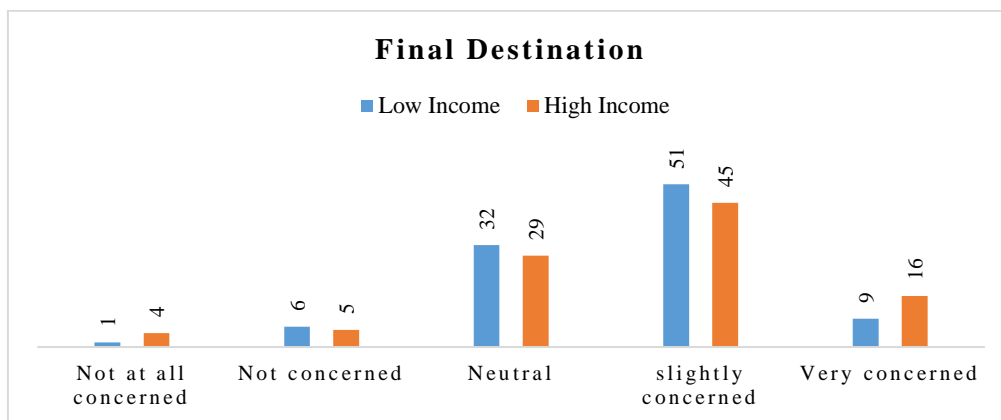


Figure 15. Responses (percentage) regarding concern on final destination of waste

These findings can be linked with education level of respondents, where in survey as mentioned in section 4.4.1, 52% of low-income group were uneducated while 100% respondents from high-income group were educated.

Reliability test (Cronbach Alpha) of all three indicators was performed and it came 0.7 for low-income group and 0.77 for high-income group. Both results show that data is reliable that is why a new variable was developed by combining these three named as “satisfaction on perceived quality of waste collection services”. The analysis will be further explained in section 4.6.4.

4.6.1.2 Sub-variable 2: Responsiveness

As mentioned in section 2.8.3 in Chapter 2, responsiveness to complaints is one of the first hand communication between citizens and municipal authorities. In order to understand the responsiveness, three indicators were chosen and questions were asked from respondents from both income areas.

Mode of complaint system

Regarding satisfaction of people on mode of complaint management system, firstly they were asked that whether they are aware of any complaint number provided by LWMC or OzPak. Since these people were already approached by getting their contact numbers from complaint cell. Therefore, majority of respondents were aware of the complaint cell and its mode of registering complaints. Figure 16 shows that 4% citizens from low-income group were not satisfied by the mode of registering the complaint, 41% showed neutral response while 44% were satisfied and 9% were highly satisfied. In high-income group, approximately 8% of people showed their dissatisfaction, 36% were neutral. However, 43% were satisfied and 13% were very satisfied with method to register complaint.

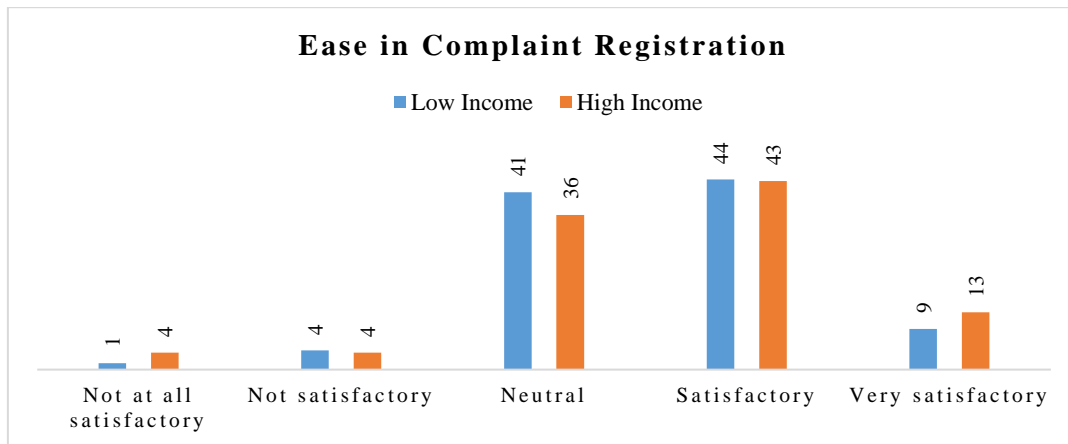


Figure 16. Responses (percentage) regarding satisfaction on registering complaint

Comparing both income groups it can be concluded that slightly higher number of people from high-income group i.e. 56% were very satisfied as compared to low-income group with 53%. However responses from both income groups showed similar trend on likert scale.

Interview from OzPak official responded, *“There is an independent complaint management system (1139 is the call number) where citizens can directly make telephonic call and easily register their complaints. Response time for each complaint has been categorized according to its nature and type”*

Other interviewee responded, *“Once complaint is resolved, it is duty of our relevant officer to inform back to complaint cell about its resolution. Finally, complaint cell contact the citizens and confirms from them if they were satisfied with resolution of their complaint”*

According to complaint resolution, mechanism must be easy for public and for officers to measure their performance (Armah, 2016). Moreover, according to operations department respondents from both companies shared the complaint status of June 2020, from Johar Town area. There were 40 complaints were received in a month and 38 were resolved.

Satisfaction on the response after complaint

The responses on citizen’s satisfaction after registering complaints, Figure 17 show that in low income group only 4% were not satisfied, 20% were neither satisfied nor dissatisfied, 66% were satisfied and 9 % people were highly satisfied. While in high-income group 9% of respondents were not satisfied, 17% were neutral, 60% were satisfied and 14% responses were very satisfied with the response given by authorities towards their complaints.

Comparing responses from both income groups, Figure 17 shows that more than 70% people from both income areas have shown the trends of satisfaction on the responses after registering complaints, which explains that complaint-registering mechanism is transparent and citizens are satisfied as well.

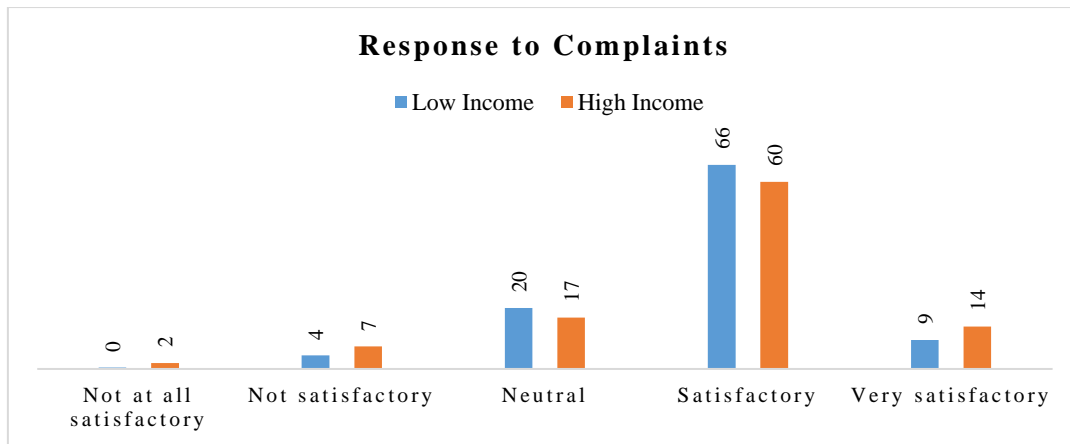


Figure 17. Responses (percentage) regarding satisfaction responsiveness to complaint

Conduct of complaint resolution staff:

As, in interviews it was mentioned that relevant field staff receives the complaint and contacts the citizen in order to resolve complaint. Therefore, researcher found this information interesting and same question was asked from citizens if they are satisfied with staff's behaviour when they come to resolve their complaint. Results from Figure 18 shows that in low-income group only 6% were not satisfied, 31% were neutral, 55% were satisfied while 8% respondents were very satisfied. In high-income group 6% were not satisfied, 29% were neutral, 49% were satisfied and 15% were highly satisfied. Comparing, the responses of both income-groups, it can be stated that there is 60% satisfaction on conduct of complaint resolution staff in both income groups.

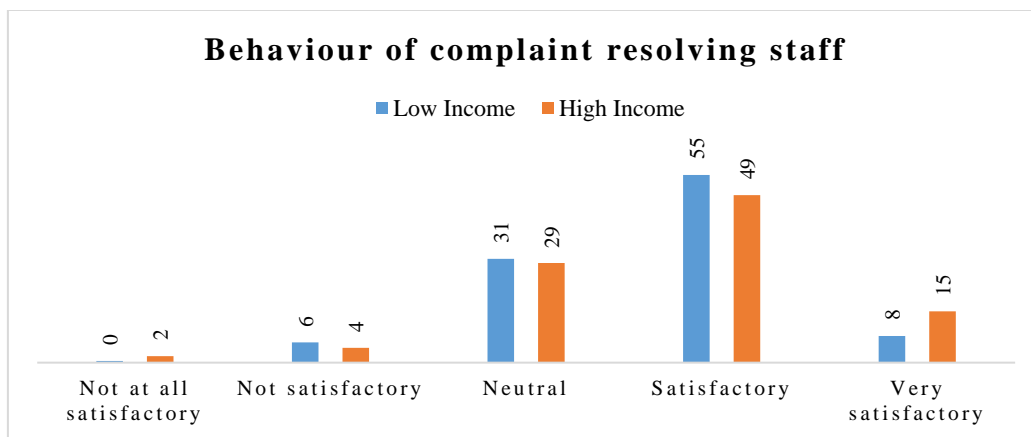


Figure 18. Responses (percentage) regarding satisfaction on behaviour of complaint resolving staff

These findings can be linked with information where interviewee from OzPak, stated that *“It is our priority to train our staff, as they are face of our company to public”* and hence can be concluded that staff treats everyone equally with no discrimination of poor or rich.

Furthermore, reliability test of these indicators was done through Cronbach Alpha test. For low income it is 0.79 and for high-income it is 0.89. Both results show that data is reliable and therefore it is decided to combine these indicators into one variable and will be used in correlation and regression analysis later on.

4.6.1.3 Sub-variable 3: Environmental cleanliness

This sub-variable has one indicator i.e. overall cleanliness as perceived by citizens.

Cleanliness level in service area

From Figure 19, it can be observed that from low-income group 9% were not satisfied, 62% shared their neutral responses. 26% were satisfied and only 2% were highly satisfied. In high-

income group, 10% responses were not satisfied, 54% were neither satisfied nor dissatisfied 28% were satisfied, 8% people were very satisfied with cleanliness in their area. By comparing the responses from both groups, it can be stated that there is more inclination towards neutral opinion on likert scale.

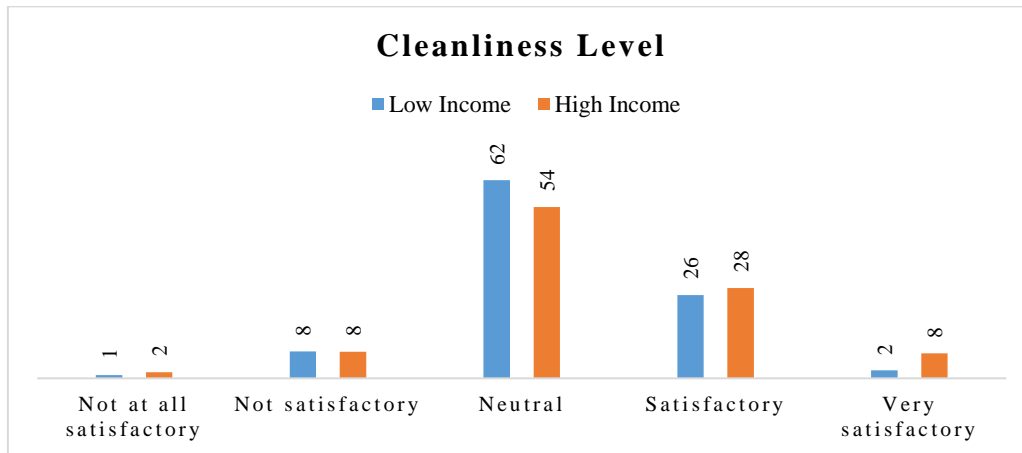


Figure 19. Responses (percentage) regarding satisfaction on cleanliness level

These responses are in accordance as stated in section in chapter 2, that provision of solid waste services is challenging for municipalities because of its association with environment and health of citizen particularly, the poor. However, there was more than 50% responses from both income groups towards neutral opinion and slightly high number of satisfaction was observed in higher income as low-income group. This finding can be associated with education and awareness level of respondents where 52% of low-income group were uneducated while 100% respondents from high-income group were educated.

Moreover, from the interviews, researcher assessed that, according to contract service provider is paid by LWMC each month on basis of total waste collected in tons. Therefore, service provider is very interested to collect waste as much as possible to increase the monthly tonnage and consequently, it improves the cleanliness in the area (Pictures attached in Annex 5).

4.6.1.4 Sub-variable 4: User fee

This sub-variable has one indicator i.e. Satisfaction on cost of service provision.

Satisfaction on cost of service provision

Regarding this indicator, the question was asked from people if they are satisfied with the amount they pay as sanitation fee to the government and the services they receive in return. From Figure 20 it can be observed that in low-income group only 3% were not satisfied, 66% were neutral while 30% showed trend of satisfaction. While, in high-income group 8% respondents were inclined towards their dissatisfaction, 58% were neutral about their opinion, 27% were satisfied and 7% responses were very satisfied on cost of service provision. By comparing the responses of both income groups, it can be argued that in both income groups, more than 50% people were neutral and 30% of low-income group while 35% from high-come group were satisfied towards the services they receive and amount they pay for it.

These findings, confirm the statement of interviewees that citizens are already receiving a good service as compared to amount they pay for it. As mentioned in section 4.5.1, interviewees mentioned, “*LWMC does not charge any money directly from citizens. However, some citizens pay directly to sanitary worker for their private work, which does not mean that LWMC receives it*”.

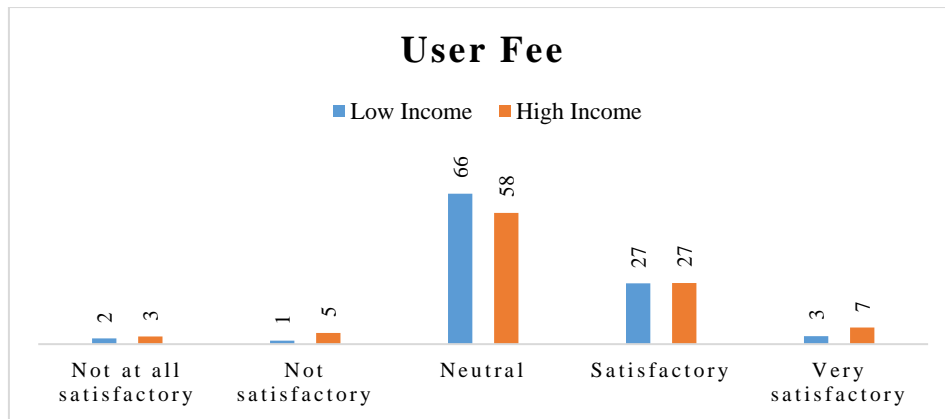


Figure 20. Responses (percentage) regarding satisfaction on user fee against service quality

In connection to this question, another question regarding willingness to pay more amount, was asked from both income groups and Figure 21 shows that 53% (108 no. of responses) people from high income group agrees to pay more amount of user fee while 47% (97 no. of responses) were not willing to pay more amount to LWMC. In low-income group, only 18% (37 no. of responses) showed willingness to pay more amount while 82% (166 no. of responses) people were not willing to pay more.

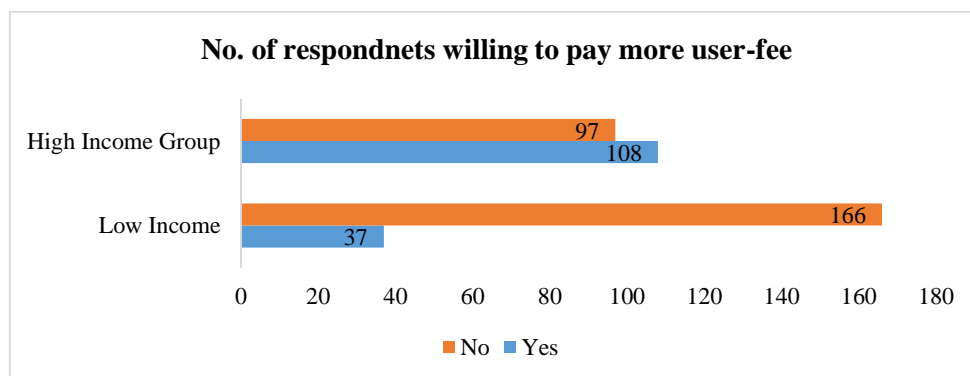


Figure 21. Willingness to Pay

Interview from LWMC mentioned that *“More than 3 times in past 7 years, company tried to revise and upgrade the sanitation fee so that governmental subsidy can be reduced. However, there is a huge opposition from political representatives who say that they do not want their people to be troubled under waste tax, therefore all such efforts have been drained down”*.

According to Zhu et al., (2008), municipalities (in this case LWMC also) levy monthly user fees in water and sanitation to meet the operating and maintenance cost of the service. Nevertheless, due to poor recovery of funds LWMC like other municipal authorities (from developing countries) do not generate sufficient funds and suffer a major deficit of funds to meet their obligations. However, because currently this PPP model is highly supported by government that is why through direct funding from government LWMC is able to pay to its service providers.

4.7 Inferential Analysis:

To analyse the relationship between service quality and customer satisfaction inferential tests were performed. As mentioned in section 2.8.1 “perception of service quality” and 2.8.3 “responsiveness” each has three indicators. Therefore, it was decided to check the reliability and Cronbach alpha test was performed for indicators of both sub variables. After reliability tests, new variables were constructed by combining these indicators. Newly constructed aggregated variables were named as “Perception on quality of service delivery” for 1st sub

variable and “perception on responsiveness to complaints” for 2nd sub-variable. The Cronbach’s alpha results for both income group has shown in Table 14.

Table 14. Newly constructed sub variables and their Cronbach Alpha Test

Sub variable	Indicators	New sub variable	Cronbach Alpha test	
			Low-income	High-income
Independent sub variable: <i>perception of service quality</i>	a) Perception on service quality b) Frequency of waste collection c) Concern towards final destination after waste collection	Perception on quality of service delivery	0.77	0.88
Independent sub variable: <i>Responsiveness</i>	a) Mode of complaint system b) Satisfaction on the response after complaint c) Conduct of complaint resolution staff	Perception on responsiveness to complaints	0.699	0.778

4.7.1.1 Correlation:

For the correlation analysis, the Pearson Correlation was applied. As shown in Table 15 in low-income group, all variables have positive correlation with each other. However, it can be observed that “overall cleanliness level” has slightly strong positive correlation i.e. 0.722 and 0.741 with both dependent variables i.e. coverage and reliability respectively. Similarly, quality & user fee indicator also showed slightly strong positive correlation with “reliability”. From this finding, it can be argued that customer’s satisfaction in low-income group is slightly strongly related with cleanliness level and service quality w.r.t user fee. These results can be verified according to interviewee as mentioned on page no. 37, where it was informed that very less amount of waste management fee (i.e. 0.092 €) is being charged from households belong to poor income areas. This can be concluded that due to improved service quality for solid waste collection from service provider people from low-income group are pleased with the improved cleanliness in their areas despite of knowing the fact that the user fee they pay for this service is very low. As mentioned above, Figure 21 shows that in low-income group, only 18% (37 no. of responses) showed willingness to pay more amount as user fee while 82% (166 no. of responses) people were not willing to pay more.

Table 15. Correlation between infrastructure provision and customer satisfaction in low-income group

Correlation of Service Quality with Customer Satisfaction in low income group							
		1	2	3	4	5	6
1	Perception on quality of service delivery	1					
2	Perception on responsiveness to complaints	.743	1				
3	Overall cleanliness level	.721	.583	1			
4	User fee	.648	.478	.687	1		
5	Coverage	.634	.448	.722	.666	1	
6	Reliable Service	.684	.495	.741	.724	.791	1

The correlation results for high-income group as shown in Table 16 also shows positive correlation amongst all indicators. However, the strong correlation has been observed between independent variables and dependent variables i.e. perception on quality of service delivery, Overall cleanliness level and user fee has slightly strong correlation with both dependent variables i.e. 0.759, 0.766 and 0.804 for coverage and 0.802, 0.779 and 0.796 for reliable service.

It can be interpreted, from the analysis that perception on service quality among high-income group is satisfied. This group is satisfied with improved cleanliness level provided by service provider along with user fee they pay for services. Here, it can be argued that high-income area

is already served by door-to-door waste collection services and people are satisfied with the amount they are currently paying for services. However, as response from Figure 21 showed that due to their ability to pay more and satisfaction on service quality, high-income group is willing to pay for solid waste collection services.

Table 16. Correlation of infrastructure provision with customer satisfaction in high-income group

Correlation of Service Quality with Customer Satisfaction in high income group							
		1	2	3	4	5	6
1	Perception on quality of service delivery	1					
2	Perception on responsiveness to complaints	.801	1				
3	Overall cleanliness level	.746	.593	1			
4	User fee	.762	.568	.755	1		
5	Coverage	.759	.552	.766	.804	1	
6	Reliable Service	.802	.646	.779	.796	.864	1

4.7.1.2 Regression:

Multiple linear Regression has been applied to see the influence of service quality on the customer satisfaction. Regression analysis provides the effect of independent variable on predicted value of dependent variable and their significance. To control the other effects on dependent variable, control variables from the given data have been added in second model to allow in estimating the effects of independent variable on dependent variable. For the current data, there are two indicators of dependent variables i.e. Coverage and Reliable Service so each indicator from dependent variable has been tested against two same models with combination of indicators of independent and control variables.

Model 1: All indicators of independent variable “service quality” against each indicators of dependent variable.

Model 2: All indicators of independent variable “service quality” along with “control variables” against each indicator of dependent variable.

In Table 17, the results are shown in form of coefficient (b) (the effect) and significance (size of effect). Firstly, indicator of dependent variable (Coverage) has been analyzed against two models. Model 2 involving all indicators (independent & control) exhibited a high R2 value i.e. 0.650. It has been analysed that “cleanliness level” and “user-fee” showed positive coefficient (B) and significant impact on “coverage” with p value <0.05 in both models. However, gender and age showed negative yet significant effect on coverage.

In Table 17, 2nd indicator “reliable service” of dependent variable (customer satisfaction) has been analysed against two models in similar way. In both models, “cleanliness level” and “user-fee” showed significant effect on “reliable service” with p value 0.002 and 0.005 in model 1 and 0.001 and 0.007 in model 2. However, R2 value of model 2 was observed high i.e. 0.7. From the all models presented in Table 17, it can be concluded that customer satisfaction in low-income group is significantly dependent upon “cleanliness” in the area and “user-fee” and it rejects the null hypothesis ($H_0 = \text{There is no effect}$). These results are in accordance with results of correlation as shown in Table 15 where it was concluded that due to improved service quality for solid waste collection from service provider, people from low-income group are pleased with the improved cleanliness in their area as well as the user fee they pay. However, a study in Nepal showed that if service provider or municipality succeeds in providing proper waste collection frequency and cleanliness of the streets, will improve the welfare of poor people and eventually they will be willingness to pay more for services (Rai et al., 2019).

Table 17. Regression Analysis for "service quality and customer satisfaction" in low-Income group

	Dependent Variable: Coverage						Dependent Variable: Reliable Service					
	Model 1			Model 2			Model 1			Model 2		
	B	R2	Sig.	B	R2	Sig.	B	R2	Sig.	B	R2	Sig.
(Constant)	0.577		0.007	0.791		0.004	0.698		0	0.739		0.001
Perception on quality of service delivery	0.327		0.52	0.352		0.13	0.235		0.5	0.241		0.21
Perception on responsiveness to complaints	-0.018		0.845	-0.008		0.932	-0.07		0.357	-0.063		0.382
Cleanliness level	0.436		0.002	0.409		0.003	0.327		0.005	0.298		0.002
User fee	0.265	0.598	0.001	0.2	0.650	0.002	0.31	0.656	0.003	0.268	0.702	0.001
Gender				-0.272		0.004				-0.298		0.003
Age				-0.006		0.044				0.003		0.247
Education				-0.56		0.015				-0.025		0.893
Income level				0.009		0.579				0.014		0.288

For high-income group, Table 18 represents same models with both indicators of dependent variables i.e. coverage and reliable Service. Model 1 & 2 under 1st indicator of dependent variable shows that “perception on quality of service delivery” and “cleanliness level” and “user fee” has positive coefficient (B) value as well as significant in both models. However, gender and age has negative coefficient (B) yet significant impact on coverage. The negative co-efficient (B) value means that if the value of the gender and age will increases, the mean of the dependent variable (i.e. coverage) will tends to decrease (as observed on page no. 45). R2 value of model 2 under coverage variable is slightly higher (0.39) than model 1 i.e. 0.38.

Second indicator of dependent variable i.e. “reliable service” was analysed against same two models as represented in Table 18. Both models showed that three indicators of independent variable i.e. “perception on quality of service delivery”, “cleanliness level” and “user fee” have positive co-efficient (B) and significant effect on “reliable service”. Their p value is <0.05 in both models. The positive co-efficient (B) value means that if “cleanliness level” and “user fee” will increase, then customer satisfaction will tends to increase. Amongst both models under “reliable service” model 2 has higher R2 value i.e. 0.541.

Table 18. Regression Analysis for "service quality and customer satisfaction" in high-Income group

	Dependent Variable: Coverage						Dependent Variable: Reliable service					
	Model 1			Model 2			Model 1			Model 2		
	B	R2	Sig.	B	R2	Sig.	B	R2	Sig.	B	R2	Sig.
(Constant)	0.194		0.236	0.449		0.043	0.316		0.022	0.306		0.097
Perception on quality of service delivery	0.375		0.009	0.368		0.003	0.293		0.002	0.28		0.001
Perception on responsiveness to complaints	-0.097		0.215	-0.083		0.291	0.032		0.632	0.046		0.477
Cleanliness level	0.288	0.380	0.001	0.283	0.398	0.006	0.245	0.513	0.005	0.251	0.541	0.007
User fee	0.41		0.001	0.422		0.001	0.295		0.003	0.3		0.002
Gender				-0.141		0.071				-0.104		0.112
Age				-0.007		0.017				-0.005		0.039
Edu				0.003		0.959				0.111		0.039
Income level				0.003		0.817				0.024		0.052

The significance value of three indicators of independent variables i.e. “perception on quality of service delivery”, “cleanliness level” and “user fee” against both dependent indicators rejects the null hypothesis (i.e. H₁ = there is effect) in both models presented in Table 18.

These results from regression analysis are also in accordance with correlation findings as shown in Table 16. It can be argued that satisfaction of citizens from high-income group is dependent upon “improved, perceived quality of service delivery”, “cleanliness level” and “user-fee”. Similarly, in low-income group the customer satisfaction is dependent upon “cleanliness level” and “user fee”. The findings from analysis on both income groups show that “cleanliness level”, “user fee” are common predictors for customer satisfaction in both groups however, in high-income group “perception of service quality” is also one of the predictors of customer satisfaction. These findings rejects the null hypothesis and these can be applied to larger population in general. A possible reason for the satisfaction in high income groups can be that people who pay more and are happy about quality of service delivery and hence cleanliness in their area is also better. Moreover, it can be concluded as well that affluent people can afford private measures when there is no public service available (Wang et al., 2011). It is worth mentioning here that regression analysis of high-income group showed that control variables i.e. education has no significant impact on service quality perception and customer satisfaction, thereby which means that provision of quality service of solid waste management improves the perception of citizens regardless of their education level.

Result from ANOVA Tests:

Similarly, to further verify the results from regression analysis and to compare both income groups, researcher performed ANOVA test. This test is performed to know the statistical differences among the means of two or more groups. For this purpose, researcher firstly selected only those indicators which were significant and common (in regression analysis) between high and low-income groups i.e. “cleanliness level” and “user fee”. ANOVA table i & ii on page no. 97 shows that p value is 0.102 for “cleanliness level” and 0.091 for “user fee” which is >0.05 and not significant. These insignificant values shows that null hypothesis cannot be rejected and no difference exists between means of both income groups in case of both indicators. Hence, it can be concluded that customers will be satisfied despite of their income groups if service provider succeeds in improving cleanliness level in area according to user fee they pay for services. According to Ezebilo and Animasaun, (2011), as stated above, it is impossible to restrict anyone from utilising this service also known as “environmental goods”. Moreover, because it is difficult to eliminate people from using this service, even who refuse to pay or pay less amount (in this case low-income areas). If high-income group near to their area is paying for services, then low-income group will get benefit to live in clean neighbourhood even if they do not pay (fully) for it.

To assess further, researcher carefully selected indicator “Perception on quality of service delivery” which was significant only in high-income group and not in low-income group. The ANOVA results of this indicator shows p value 0.023 (page no. 97). It is less than significance level of 0.05. Therefore, to narrate the results it can be said that there is significant difference between high and low-income group’s satisfaction on “perception on quality of service delivery” and rejects null hypotheses. This result also verifies the results from regression where it showed that only high-income people are significantly satisfied with perception on quality of waste collection services” as compared to low-income group.

4.8 Discussion:

Inferential tests (correlation, regression and ANOVA) were conducted on indicators of independent variables to see the effect on dependent variable i.e. “customer satisfaction”. It was observed that all independent indicators have positive correlation with each other and to understand the extent of the relation in terms of its effects, regression analysis was run on data sets from both income groups. Furthermore, to compare between low and high-income groups, significant indicators from both independent variable were again tested using ANOVA. This analysis provided the clarification towards answering sub research questions.

First sub-research question, provided the background to the service delivery system in study area, where interviewees explained that, despite of mixed population in terms of income groups, they try to provide equal waste collection services. However, due to dynamics of local conditions and streets situation (as shown in Annex 5: Pictures) they have divided two modes of collection according to the income groups.

OzPak interviewee stated, *“We provide door-to-door waste collection in high-income areas and container based collection in low-income areas”*.

Moreover, it was informed by LWM official, *“it is only one PPP project that completed 7 years successfully because, there was no such provision of waste collection services before this project”*.

From the interviews, the officials from both organisations were confident about provision of services. Because it is a non-stop service, which must be provided to every citizen every day. More likely, it was the reason that, they focused only on service delivery and such never realised to conduct such customer satisfaction survey in 7 years of project.

From responses from interviews, survey was conducted to answer 2nd and 3rd sub research question. In first independent variable “infrastructure provision”, its indicators “availability of infrastructure” and “conduct of staff” were significant predictor of customer satisfaction in low-income group. As argued by Hoornweg and Giannelli (2007), that infrastructural problems are the main obstacle towards achieving sustainable solid waste management systems in poor income areas. They further mentioned that provision of right infrastructure should be first priority of municipalities to improve the solid waste management system. These findings and study from above mentioned literature showed that people from low-income group from Johar Town area are satisfied with the infrastructure provided to them not only in terms of waste bins and vehicles but also trained staff. According to research conducted in Nairobi city, by Longe et al., (2010), it was found that the lack of skilful human resources in solid waste management sector leads to unreliable services and citizen’s dissatisfaction.

OzPak official mentioned, *“Our sanitary workers, collect waste from narrow streets with use of wheeli bins or handcarts and transfer to the nearest waste bins”*.

According to this statement, the results from low-income group can be verified where citizens were satisfied with the conduct of staff, because they get the chance to interact with staff providing waste cleaning services in their streets, while high-income people have no interaction with staff. While, for same independent variable i.e. Infrastructure provision, in high income areas, “door-to-door waste collection” and “availability of infrastructure” were significant predictors of customer satisfaction in.

These results are aligned with the interviews, where interviewees mentioned, *“We provide door to door waste collection services in planned and high-income areas”*.

Moreover, 62% people from high-income group were satisfied with door-to-door waste collection from their house. A research, done by Zhu et al., (2008), regarding SWM in the developing world, stated that waste collection from planned or high income areas is less challenging where vehicles can easily access alleys or streets as compared to unplanned settlements or low-income areas. Due to this reason, it can be argued that high-income group is satisfied with the mode of waste collection (door-to-door) from their area as well as with the infrastructure provided.

Moreover, in infrastructure provision, it was found that “repair & maintenance” has positive correlation yet was non-predictor of customer satisfaction in both income groups. These results contradict with Levine. C (1995), where according to him, repair and maintenance of vehicles is one main area where private sector has performed very successfully to gain public’s

satisfaction on waste management services. It can be argued that, in current study, there is positive correlation of repair & maintenance with both indicators of customer satisfaction; however, effect is not significant, because customers' directly do not observe the activity of repairing the vehicles. However, it is also obvious from results that, if people from both income groups are satisfied with "available infrastructure" then it means that proper repair and maintenance is being done by service provide in order to provide waste collection services on daily basis.

ANOVA test was performed to further for checking the difference between common and significant indicators between both groups and verified the results of regression as well. The ANOVA results showed that if service provider provides the basic infrastructure in area for waste collection services then no difference observed among satisfaction of high and low income groups. In other words, it can be said that, due to nature of the service i.e. non-rival and non-excludable (Ezebilo and Animasaun, 2011), the availability of waste bins, staff and vehicles are for everyone from any income group in the area. Similarly, ANOVA test showed that difference exists between satisfaction of high-income group and low-income group in terms of door-to-door waste collection and container based collection. The reason is simply because waste is collected from the doorstep of a house of any high-income group while in low-income area, people have to bring their waste to containers.

In 2nd independent variable "service quality" the indicators "cleanliness level" and "user-fee" were significant predictors of customer satisfaction in low-income group. This results is in contrary with study that argue that people of lower socio-economic groups tend to have less regard for environmental issues on the basis that employment and housing are their main priorities (Periou, 2017). However, another study conducted by Breukelman et al., (2019) stated that when street cleaning services are provided within domain of waste collection system, then it reduces the direct contact of public with waste and results in non-clogged drains. This argument verifies this result because in low-income group of Johar Town, where daily street cleaning services are provided and people are satisfied with service quality in terms improvement in overall cleanliness of area (as shown in pictures Annex 5). In addition to this, people from low-income group think that the amount they pay for sanitation services and the service quality they are receiving in return is also satisfactory. This can be referred from the literature where, Breukelman et al., (2019), stated that the poorest cannot pay for proper waste management services. However, cross subsidy programs between the high-income and the low-income can help in determining the amount to be charged from citizens (Ali et al., 2012). In Lahore, this mechanism of different scales of user fee exists but as mentioned in section 2.7.1 these user fee are old and requires new rates to be implemented.

According to correlation and regression analysis, "cleanliness level", "user fee" and "perception of quality of service delivery" were predictors of high-income group. This shows that people from high-income group are satisfied with perceived quality of waste collection services in their area. According to Wang et al., (2011), the possible reason for the satisfaction in high-income groups because they pay more for waste management services and they can afford private measures if there is no public service available. Therefore, if cleanliness in their area improves then their perception about quality of service delivery is also satisfactory.

Moreover, to verify above-mentioned results for 2nd independent variables, ANOVA tests were performed between both incomes group with indicators "cleanliness level", "user fee" and "perception on quality of service delivery". Results showed that there is no difference between satisfactions of high and low income groups in terms of "cleanliness level" and "user fee". The reason behind these results are also presented on page no. 97 because it is difficult to eliminate people from using this service, even who refuse to pay or pay less amount (in this case low-income areas). If high-income group near to their area is paying for services, then low-income group will get benefit to live in clean neighbourhood even if they do not pay (fully) for it

(Ezebilo and Animasaun, 2011). However, difference was observed in “perception on quality of service delivery” between both income groups, and possible reason behind this satisfaction is that people from high income daily receive services of door-to-door waste collection and are satisfied with quality of service delivery in their area. A possible reason for the satisfaction in high income groups on these indicators is that people who pay more have good perception about quality of service delivery and hence cleanliness in their area is also better. Moreover, it can be concluded as well that affluent people can afford private measures when there is no public service available (Wang et al., 2011).

Chapter 5: Conclusions and Recommendations

5.1 Introduction:

This chapter summarise the key findings and results for each sub research question to ultimately answer the main research question i.e. how do provision of infrastructure and service quality for solid waste collection system influence the customer satisfaction in two (low and high) income areas of Johar Town, Lahore?. Moreover, in this chapter the results are subsequently connected with the literature, with concept of Infrastructure, Service Behaviour Model. In next section, researcher suggested some recommendations for strategy decisions and further perspectives for research.

5.2 Conclusion

5.2.1 Conclusion for Sub-Research Question One

Interviews were conducted to understand the service delivery regarding solid waste collection in Johar Town. Lahore Waste Management Company (LWMC) has outsourced the collection services to private service provider and OzPak is the service provider in Johar Town since 2012. According to agreement between LWMC and OzPak, collection of waste from any areas must be done by door-to-door collection (50%) and by containers/communal waste bins (50%). Project Director of Ozpak also mentioned, *“Waste collection planning was the first step before taking over any area”*.

They have planned waste collection in Johar Town area in a way that in all commercial areas and low-income areas communal bins have been provided where people can throw their waste. While waste collection from planned areas (which are high-income) is through door-to-door. Moreover, OzPak operations official said, *“in low-income areas where accessibility of compactor or any vehicle is difficult, sanitary workers sweep the street”*

Two shift are being operated in Johar Town area to collect waste every day. Timings of these shifts are; 6:00 hours to 14:00 hours & 14:00 to 22:00 hours. In first shift, the priority is given to collect waste from residential areas (of both income areas). However, due to huge distance to disposal site and traffic congestion in day, there was delay in achievement of 100% waste collection in first shift. Therefore, OzPak has constructed a transfer station to avoid delays in cleaning the city, which improved their waste collection efficiency. As stated by, Bhat (1996), one brief innovation in waste collection system by adding one transfer station can reduce costs as well as improves the collection efficiency. Vehicles instead of spending more time at long ques at disposal sites, they utilise that time in collecting more waste from the areas. However 2nd shift is also operated keep the area clean and resolve the complaints if any.

5.2.2 Conclusion for Sub-Research Question Two

As mentioned in literature review, that Infrastructure Service Behaviour Theory is used for current study, where focus was on infrastructure provision and service quality. 2nd sub research question focuses on Infrastructure provision. This independent variable has been studied under various indicators, which are availability of finances, waste collection service mode, availability of operational staff, equipment and technology, repair & maintenance of equipment/vehicles.

LWMC is financially dependent upon CDGL and Governmental funding each year. There is user fee of 0.11 \$ (0.092 €) for low-income groups and 0.55 \$ (0.46 €) for high-income group per month per household”.

According to Zhu et al., (2008), municipalities (in this case LWMC also) levy monthly user fees in water and sanitation to meet the operating and maintenance cost of the service. Nevertheless, due to poor recovery of funds LWMC like other municipal authorities (from developing countries) do not generate its own finances therefore currently the PPP model is

highly supported by government's funding. LWMC intends to increase the user fee and its own collection mechanism to reduce its yearly burden on government. The suggested increase in user fee will account 1.6%–2% of household income. According to Wilson et al., (2012), affordability of user charges for SWM should not exceed 1%. Therefore, LWMC is facing challenges to implement new user charges till date.

The results from survey showed that there was high number of satisfaction from low-income group i.e. 80% for container based collection mode as compared to high-income group i.e. 62% where mode of waste collection is door-to-door. As, explained above, the reason behind higher satisfaction from low-income group is that they were never served by any such service before. In terms of skilled staff, OzPak provides trainings twice a year to its staff and therefore people from both income groups were satisfied with conduct of staff. There was high number of satisfaction (more than 80%) in both income groups on availability of waste bins, accessibility and quality of vehicles. The reason behind satisfaction of customers on available infrastructure is the robust repair and maintenance system of service provider. OzPak official responded, *"We have two mobile workshops with necessary repair and maintenance material, to fix the vehicles in field"*

Similarly, the regression analysis showed that provision of infrastructure and conduct of staff has a positive effect (B) as well as high significance (p) on customer satisfaction in both income areas and it rejects the null hypothesis ($H_0 =$ there is no effect). These are common as well as significant indicator for satisfaction of both income groups. While *"conduct of staff"* is predictor of satisfaction in low-income group and *"door-to-door waste collection"* is significant predictor in high-income group. According to Zhu et al., (2008) for a municipality provision of infrastructure (bins, staff etc.) is equally important as providing training and capacity development to its waste management staff. Therefore, it can be concluded that, infrastructure provision for solid waste management is the responsibility local government and it is non-exclusive, non-rivalled. This means that no one can be excluded once it is being provided to one locality and everyone can get benefit from it (Rosana D, 2013).

Furthermore, ANOVA tests between provision of infrastructure and conduct of staff in both income groups showed p value of 0.85 that is > 0.05 and not significant. This in-significant value shows that null hypothesis is not rejected and it can be concluded that customers will be satisfied if infrastructure is being provided to them despite of their income groups. Due to nature of this service, it is practically impossible to prevent anyone from using it and more than one person despite of demographic background can utilise this service (Ezebilo and Animasaun, 2011).

5.2.3 Conclusion for Sub-Research Question Three

In order to understand the influence of service quality on customer satisfaction, this independent variable was analysed using four sub variables i.e. perception of service quality, responsiveness, environmental cleanliness and user fee. According to ISB theory, perception of customers regarding quality of service is important factor for service provider. Therefore, survey results showed that approximately 70% people from both income areas showed their satisfaction towards overall quality of waste collection service. Chang & Pires (2015), stated that when solid waste management system is in place then public concerns on service quality become important factor to consider. Similarly, from above mentioned responses and interviews, it can be argued that waste management sector was one of the neglected areas and once government places system to deliver waste management services, people get accustomed to the services.

Regarding second variable, responsiveness, results from both income groups showed that slightly higher number of people from high-income group i.e. 56% were very satisfied as compared to low-income group with 53% in terms of easiness to register their complaints.

According to Armah (2016) complaint resolution, mechanism must be easy for public and for officers to measure their performance. There is 60% satisfaction on conduct of complaint resolution staff in both income groups. OzPak official stated, *“It is our priority to train our staff, as they are face of our company to public”* and hence can be concluded that staff treats everyone equally with no discrimination of poor or rich, which explains that responsiveness to complaints is transparent. In inferential analysis, this sub variable showed positive correlation, however, it was not significant predictor of customer satisfaction in both income groups. This finding can be related with the fact that responsiveness to complaints become very critical because only when customers have the option to choose their service provider (Kamal Gupta and David W. Stewart, 1996). While in this study, it is not significant predictor of customer satisfaction in both income groups.

3rd sub variable i.e. environmental cleanliness showed that slightly higher percentage of satisfaction in high-income as compared to low-income group. This finding can be associated with education and awareness level of respondents where 52% of low-income group were uneducated while 100% respondents from high-income group were educated. However, in both income groups environmental cleanliness was observed as significant predictor of customer satisfaction. These findings can be linked with the fact that service provider receives the payment on the basis of amount of waste collected each month. Therefore, the focus of service provider is towards lifting the waste as much as possible from area and hence eventually it improved the cleanliness level in the area.

Regarding last sub variable i.e. user fee, 53% respondents of high-income group were willing to pay more amount of user fee while 47% were not willing to pay. While, in low-income group, only 18% showed willingness to pay and 82% were not willing to pay more amount of user fee. Moreover, survey results showed that 30% of low-income group while 35% from high-income group are satisfied towards the services they receive and amount they pay for it. These findings, confirm the statement of interviewee from LWMC, *“Citizens are already receiving a good service as compared to amount they pay for it”*.

According to results of inferential analysis, for low-income group, firstly all indicators under service quality showed positive correlation with customer satisfaction. In regression analysis it is concluded that customer satisfaction in low-income group is significantly dependent upon “cleanliness” in the area and “user-fee” and it rejects the null hypothesis (H_0 = There is no effect). Because, due to improved service quality for solid waste collection from service provider, people from low-income group are pleased with the improved cleanliness in their area as well as the user fee they pay and if service remain persistent, they would be willing to pay more in future (Rai et al., 2019).

Similarly, in high-income group all indicators under service quality showed positive correlation with customer satisfaction, while regression models showed that three indicators of service quality i.e. “perception on quality of service delivery”, “cleanliness level” and “user fee” have positive co-efficient (B) and significant effect on “reliable service”. Their p value is <0.05 in both models. The positive co-efficient (B) value means that if “cleanliness level” and “user fee” will increase, then customer satisfaction will tend to increase.

Moreover, ANOVA tests were performed between both incomes group and results showed that there is no difference between satisfactions of high and low income groups in terms of “cleanliness level” and “user fee”. The reason behind these results are that it is difficult to eliminate people from using this service, even who refuse to pay or pay less amount (in this case low-income areas) (Ezebilo and Animasaun, 2011). However, difference was observed in “perception on quality of service delivery” between both income groups, and possible reason behind this satisfaction is that people from high income daily receive services of door-to-door waste collection and are more satisfied with quality of service delivery in their area.

5.2.4 Conclusion for main research Question

The main research question is answered by using concepts of service management, ISWM and ISB theory focusing on customer satisfaction by improving quality of services through interacting with customers because when solid waste management system is in place then public concerns on service quality become important factor to consider (Chang and Pires, 2015). However, the limitation regarding people's understandings to questions in online survey and face-to-face survey was anticipated before starting the survey and researcher could not get the chance to conduct face-to-face survey and interviews but succeeded to achieve the sample size i.e. 401.

To answer main research question i.e. "How do provision of infrastructure and service quality for solid waste collection system influence the customer satisfaction in two (low and high) income areas of Johar Town, Lahore?" three sub questions were examined.

Descriptive and qualitative analysis of first sub question provided the basis about the project details and provision of solid waste collection services in both income areas. Important finding was observed that service provider is providing container based collection in low-income areas and door-to-door waste collection in high-income areas of Johar Town. These findings are consistent with study by Das and Bhattacharyya (2015), where they stated that municipalities provide door-to-door waste collection services in such places where planning for waste collection is convenient in terms of ground realities of streets. Whereas, they further stated that in places where they face challenges regarding difficulty of vehicles to access due to poor road infrastructure or narrow streets they prefer container based collection or no collection at all.

Quantitative analysis regarding provision of infrastructure showed that, availability of infrastructure i.e. bins, vehicles and skilled staff were influencing significantly towards satisfaction of customers in both income groups. According to Rosana D (2013), infrastructure provision for solid waste management is non-exclusive and non-rivalled service, therefore both income groups are utilising the infrastructure and showed satisfaction as well. While in low-income group, the conduct of staff was significant predictor of customer satisfaction because they interact with staff of service provider more (due to provision of street sweeping service) as compared to high-income group. Subsequently, door-to-door waste collection was one of the significant predictor of customer satisfaction in high-income group because it is provided exclusively in their area only.

Quantitative analysis regarding service quality for solid waste collection showed that cleanliness level in the area and user-fee are significant predictors of customers' satisfaction in both income groups. It has been discussed in section 4.5.1.1, where findings from interviews showed that high-income group is already paying more user fee (i.e. 0.46 €) as compared to low-income group (0.092 €) and yet there were 53% people from high income group who were willing to pay more. Because as stated by Akaateba and Yakubu (2013), when residents pay user charges for MSW services, their perception regarding quality of services become one of the vital criteria towards customer satisfaction and perception of citizens varies according to the level of service quality and their ability to pay for service. Therefore, analysis showed that for customer satisfaction in high-income group perception of service quality was significant predictor. To conclude, it can be stated that for both income groups provision of infrastructure was significant predictor of customer satisfaction. In addition to this, door-to door waste collection was reason of satisfaction among customers from high-income while low-income group was satisfied with the conduct of staff. Similarly, in service quality, significant predictors of customer satisfaction that found common in both income groups were environmental cleanliness and user fee. In addition to this, customers from high-income showed their satisfaction on perceived service quality. By comparing low and high-income groups, it can be concluded that provision of infrastructure, environmental cleanliness and user fee were found common predictors of satisfaction among customers of both income groups.

5.3 Suggestions

Recently LWMC is at the stage of planning new contract because previous contract was from 2012-2019 and one year extension was given to service providers. Before undergoing new contract, it is suggested that LWMC should conduct customer satisfaction survey from different parts of city, in order to receive the feedback and expectations of citizens. This practice is align with ISWM model where involvement of all stakeholders in waste management of their city is necessary and people/general public must be involved in such process and their opinion must be prioritize while designing new waste management plan for city.

According to ISB theory, if there is provision of infrastructure and services then behaviour of citizens can be changed or improved. Therefore, it is suggested to implement uniform mode of waste collection in the area. There should be no discrimination based on income level regarding provision of door-to-door services or container based collection services. Unplanned or low-income areas must also be served by equal services by introducing smaller vehicles that can access the narrow streets of such areas. Moreover, due to non-rival nature of waste management services it is the right of every citizen to receive equal level of services. This will help the city authorities to maintain a clean and healthy city in future.

5.4 Further research

Currently this research focused on one service provider while comparing the low and high-income groups. This research can be further explored, by comparing the customer satisfaction on performance of service delivery between two service providers in Lahore. As mentioned earlier, no such research has been conducted before where perspective of citizens were taken into account, therefore it is necessary for integrated sustainable waste management to involve citizens as they are the larger users of the service and their opinion matters for improving solid waste management system of city.

Bibliography:

- Akaateba, M.A. and Yakubu, I., 2013. Household's satisfaction towards solid waste collection services of Zoomlion Ghana Ltd in Wa, Ghana. *European Scientific Journal*, 9(32), pp. 198. [Accessed 19 April 2020].
- Akinloye Akinboade, O., Chanceline Kinfaek, E. and Putuma Mokwena, M., 2012. An analysis of citizen satisfaction with public service delivery in the Sedibeng district municipality of South Africa. *International Journal of Social Economics*, 39(3), pp. 182-199. doi: 10.1108/03068291211199350 Available at: <https://www.emerald.com/insight/content/doi/10.1108/03068291211199350/full/html> [Accessed 19 April 2020].
- Ali, H., Ali, N., Ahmad, A.R., Ibrahim, M. et al., 2012. Solid waste management and the willingness to pay for improved services towards achieving sustainable living. *Advances in Natural and Applied Sciences*, 1pp. 56-60. [Accessed 02-Aug-2020].
- Al-Khateeb, A., Al-Sari, M., Al-Khatib, I. and Anayah, F., 2017. Factors affecting the sustainability of solid waste management system—the case of Palestine. *Environmental Monitoring and Assessment*, 189(2), pp. 1-12. doi: 10.1007/s10661-017-5810-0 Available at: <https://search.proquest.com/docview/1865254076> [Accessed 02 June 2020].
- Anantanatorn, A., Yossomsakdi, S., Wijaya F, A. and Rochma, S., 2017. Public Service Management in Local Government, Thailand (Case Study of Solid Waste Management in Pattaya City). *Energy Sources, Part B: Economics, Planning, and Policy*, 12(5), pp. 434-442. doi: 10.1080/15567249.2016.1176088 Available at: <http://www.tandfonline.com/doi/abs/10.1080/15567249.2016.1176088> [Accessed 11 May 2020].
- Arfeen, M. I., Sarantis, D. and Pereira, F.A., 2018. Assessment of Citizen Perception: A Case Study of Municipal Solid Waste Management System in Guimaraes, Anonymous Academic Conferences International Limited. pp. 42-XVIII. Available at: <https://search.proquest.com/docview/2291507937> .
- Armah, T.V., 2016. The effects of private sector participation regulation on solid waste collection methods and quality of service delivery. A case of Nima East Accra. Rotterdam: Erasmus University Rotterdam. [Accessed 31 March 2020].
- Ashraf, U., Hameed, I. and Chaudhary, M., 2016. Solid waste management practices under public and private sector in Lahore, Pakistan. *Bulletin of Environmental Studies*, 1(4), pp. 98-105. Available at: <https://doaj.org/article/59e5e979a2854e0cb6ead016848814ce> [Accessed 31 March 2020].
- Asim, M. and Shirwani, K.R., 2015. Measuring Social Capital in Planned and unplanned neighborhoods of Lahore: A case study of Johar Town. *Journal of Research in Architecture and Planning*, 19 [Accessed 07-Aug-2020].
- Braakhuis, L., 2016. Predicting pro-environmental behavior: Analyzing variables related to plastic waste separation behavior of young people. Utrecht: University of Utrecht. Available at: <https://dspace.library.uu.nl/handle/1874/346396> [Accessed 27 April 2020].
- Breukelman, H., Krikke, H. and Löhr, A., 2019. Failing Services on Urban Waste Management in Developing Countries: A Review on Symptoms, Diagnoses, and Interventions. *Sustainability (Basel, Switzerland)*, 11(24), pp. 6977. doi: 10.3390/su11246977 Available at: <https://search.datacite.org/works/10.3390/su11246977> [Accessed 04-Aug-2020].
- Butt, W.H., 2019. Beyond the Abject: Caste and the Organization of Work in Pakistan's Waste Economy. *International Labor and Working-Class History*, 95pp. 18-33. doi: 10.1017/S0147547919000061 [Accessed 31 March 2020].

- Chang, N. and Pires, A., 2015. *Systems Engineering Principles for Solid Waste Management*. New Jersey & Canada: John Wiley & Sons. [Accessed 02 June 2020].
- Das, S. and Bhattacharyya, B.K., 2015. Optimization of municipal solid waste collection and transportation routes. *Waste Management*, 43pp. 9-18. doi: 10.1016/j.wasman.2015.06.033 Available at: <http://dx.doi.org/10.1016/j.wasman.2015.06.033> [Accessed 19 April 2020].
- Diaz L, L., Golueke G, C., Savage M, G. and Eggerth L, L., 2020. *Revival: Composting and Recycling Municipal Solid Waste*. 2nd. CRC Press.
- Dworkin, S., 2012. Sample Size Policy for Qualitative Studies Using In-Depth Interviews. *Archives of Sexual Behavior*, 41(6), pp. 1319-1320. doi: 10.1007/s10508-012-0016-6 Available at: <https://www.ncbi.nlm.nih.gov/pubmed/22968493> [Accessed 17 May 2020].
- Edwards, J., Burguete, J.V., Vaughan, R. and Rodríguez, P.G., 2009. Quality dimensions in the public sector: municipal services and citizen's perception. *International Review on Public and Nonprofit Marketing*, 6(1), pp. 75-90. Available at: http://econpapers.repec.org/article/spiripnkm/v_3a6_3ay_3a2009_3ai_3a1_3ap_3a75-90.htm [Accessed 19 April 2020].
- Esmaili, D., 2012. *Assessing Organizational Competency in Infrastructure Asset Management: The Case of Water and Wastewater in Ontario Municipalities*. ProQuest Dissertations Publishing. Available at: <https://search.proquest.com/docview/1325671352> .
- Ezebilo, E. and Animasaun, E., 2011. Households' perceptions of private sector municipal solid waste management services: A binary choice analysis. *International Journal of Environmental Science & Technology*, 8(4), pp. 677-686. doi: 10.1007/BF03326252 Available at: <https://search.proquest.com/docview/1241998651> [Accessed 21-Aug-2020].
- Glaser, A.M. and Bartley Hildreth, B., 1999. Service Delivery Satisfaction and Willingness to Pay Taxes: Citizen Recognition of Local Government Performance . *Public Productivity & Management Review*, 23(1), Available at: <https://www.jstor.org/stable/3380792> [Accessed 19 April 2020].
- Grönroos, C., 1984. A Service Quality Model and its Marketing Implications. *European Journal of Marketing*, 18(4), pp. 36-44. doi: 10.1108/EUM0000000004784 Available at: <https://www.emerald.com/insight/content/doi/10.1108/EUM0000000004784/full/html> [Accessed 19 April 2020].
- Gummesson, E., Lusch, R.F. and Vargo, S.L., 2010. Transitioning from service management to service-dominant logic. *International Journal of Quality and Service Sciences*, 2(1), pp. 8-22. doi: 10.1108/17566691011026577 Available at: <https://www.emerald.com/insight/content/doi/10.1108/17566691011026577/full/html> [Accessed 11 May 2020].
- Hause, J.C., 1975. Ability and Schooling as Determinants of Lifetime Earnings, or If You're So Smart, Why Aren't You Rich? In: *Ability and Schooling as Determinants of Lifetime Earnings, or If You're So Smart, Why Aren't You Rich?* In: Education, Income, and Human Behavior. National Bureau of Economic Research, Inc. pp. 123-150. Available at: <http://econpapers.repec.org/bookchap/nbrnberch/3695.htm>. [Accessed 04-Aug-2020].
- Hoorweg, D. and Giannelli, N., 2007. *Managing Municipal Solid Waste in Latin America and the Caribbean : Integrating the Private Sector, Harnessing Incentives*. World Bank, Washington, DC. Available at: <http://hdl.handle.net/10986/10639> [Accessed 1-Aug-2020].
- ISWA, 2012. *Solid Waste Guidelines for successful planning*. International Solid Waste Association. [Accessed 11 May 2020].

- Jauhari T, A., 2016. Determinants of Household Participation in Solid Waste Segregation: A case study in Depok, Indonesia. Erasmus University, Rotterdam. [Accessed 01 May 2020].
- Kamal Gupta and David W. Stewart, 1996. Customer Satisfaction and Customer Behavior: The Differential Role of Brand and Category Expectations. *Marketing Letters*, 7(3), pp. 249-263. doi: 10.1007/BF00435741 Available at: <https://www.jstor.org/stable/40216411> [Accessed 06 June 2020].
- Kaza, S., Yao, L., Bhada-Tata, P. and Woerden. V, F., 2018. What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050. Washington, DC: International Bank for Reconstruction and Development / The World Bank. [Accessed 31 Mar 2020].
- Klundert, V.A. and Anschütz, J., 2001. Integrated Sustainable Waste Management, the Concept. Netherlands: [Accessed 27 April 2020].
- Krosnick, J. A., 2015. The Future of Survey Research: Challenges and Opportunities. [Accessed 23-April-2020].
- Leblanc, R., 2019. An Introduction to Solid Waste Management. Available at: <https://www.thebalancesmb.com/an-introduction-to-solid-waste-management-2878102> [Accessed 2020].
- Levine.C, S., 1995. Private Sector Participation in Municipal Solid Waste Services in Developing Countries. *Urban Management and the Environment*, 1[Accessed 5-April.2020].
- Longe, E.O., Longe, O.O. and Ukpebor, E.F., 2010. People's Perception On Household Solid Waste Management In Ojo Local Government Area In Nigeria. *Iranian Journal of Environmental Health, Science and Engineering*, 6(3), Available at: <http://www.bioline.org.br/abstract?id=se09031> [Accessed 24-July-2020].
- Majeed, A., Batool, S. and Chaudhry, M., 2017. Informal Waste Management in the Developing World: Economic Contribution Through Integration With the Formal Sector. Dordrecht: Springer Netherlands. Available at: <https://search.proquest.com/docview/1880747954> [Accessed 31 March 2020].
- Marshall, R. and Farahbakhsh, K., 2013. Systems approaches to integrated solid waste management in developing countries. *Waste Management*, doi: <https://doi.org/10.1016/B978-0-12-391946-5.02001-6> [Accessed 27 April 2020].
- Mat, A., Said, A.M., Bakar, E.A., Kori, N.L. et al., 2016. Determining the Income Differences and Complaint Behavior Among Automobile Repairs and Service Consumers in Shah Alam, Malaysia. *Procedia Economics and Finance*, 37pp. 21-26. doi: 10.1016/s2212-5671(16)30087-9 Available at: https://www.openaire.eu/search/publication?articleId=base_oa_____:296890377ffe841476117dfb462a6981 [Accessed 01-Aug-2020].
- Mcallister, J., 2015. Factors Influencing Solid-Waste Management in the Developing World. DigitalCommons@USU. Available at: https://www.openaire.eu/search/publication?articleId=od____1459::5f25ff4537bf015704cd1636a1cdf285 [Accessed 17 May 2020].
- Odayar, A.M., 2004. What are the levels of customers satisfaction within the waste disposal industry. University of Natal (Durban). [Accessed 02 June 2020].
- Oduro K, S., 2011. Private Sector Involvement in Urban Solid Waste Collection. Baton Rouge: CRC Press Inc. doi: 10.1201/b11560 Available at: <https://www.taylorfrancis.com/books/9781466552814> [Accessed 27 April 2020].

- Ograjenšek, I. and Gal, I., 2011. The Concept and Assessment of Customer Satisfaction. In: *The Concept and Assessment of Customer Satisfaction. In: Modern Analysis of Customer Surveys*. Chichester, UK: John Wiley & Sons, Ltd. pp. 107-127. doi: 10.1002/9781119961154.ch7 Available at: <https://onlinelibrary.wiley.com/doi/abs/10.1002/9781119961154.ch7>. [Accessed 31 March 2020].
- Periou, C., 2017. Challenges and opportunities associated with waste management in India. *Royal Society Open Science*, 4 (3), pp. 160764 Available at: 10.1098/rsos.160764 Available at: <https://www.ncbi.nlm.nih.gov/pubmed/28405362> [Accessed 06-June-2020].
- Rai, R.K., Nepal, M., Khadayat, M.S. and Bhardwaj, B., 2019. Improving Municipal Solid Waste Collection Services in Developing Countries: A Case of Bharatpur Metropolitan City, Nepal. *Sustainability (Basel, Switzerland)*, 11(11), pp. 3010. doi: 10.3390/su11113010 Available at: <https://search.datacite.org/works/10.3390/su11113010> [Accessed 3-Aug-2020].
- Rosana D, D., 2013. A service delivery issue : privatisation of waste management : solid waste. Wageningen University, Netherlands. Available at: http://reference.sabinet.co.za/sa_epublication_article/resource_v13_n3_a4 [Accessed 11 May 2020].
- Sridhar, K.S., 2016. Solid Waste Management in Asia Pacific. *Public Works Management & Policy*, 21(1), pp. 53-70. doi: 10.1177/1087724X15570642 Available at: <https://journals.sagepub.com/doi/full/10.1177/1087724X15570642> [Accessed 31 March 2020].
- Sulemana, A., Donkor, E.A., Forkuo, E.K. and Oduro-Kwarteng, S., 2018. Optimal Routing of Solid Waste Collection Trucks: A Review of Methods. *Journal of Engineering*, 2018pp. 1-12. doi: 10.1155/2018/4586376 Available at: <https://dx.doi.org/10.1155/2018/4586376> [Accessed 11 May 2020].
- Theil V, S., 2014. *Research Methods in Public Administration and Public Management*. London, Newyork: Routledge. [Accessed 02 May 2020].
- Timlett, R. and Williams, I.D., 2011. The ISB model (infrastructure, service, behaviour): A tool for waste practitioners. *Waste Management*, 31(6), pp. 1381-1392. doi: 10.1016/j.wasman.2010.12.010 Available at: <http://dx.doi.org/10.1016/j.wasman.2010.12.010> [Accessed 19 April 2020].
- Tronvoll, B., 2007. Complainer characteristics when exit is closed. *International Journal of Service Industry Management*, 18(1), pp. 25-51. doi: 10.1108/09564230710732885 Available at: <https://search.datacite.org/works/10.1108/09564230710732885> [Accessed 22-July-2020].
- Van Theil, S., 2014. *Research Method in Public Administration and Public Management*. New York: 2 Park Square, Milton Park, Abingdon, Oxon OX14 4RN. [Accessed 12 May 2020].
- Viitamo, E. and Toivonen, M., 2013. Is the concept of service productivity compatible with the framework of service-dominant logic? pp. 603-630. Available at: <http://www.econis.eu/PPNSET?PPN=751016594> [Accessed 11 May 2020].
- Wang, H., He, J., Kim, Y. and Kamata, T., 2011. Municipal Solid Waste Management in Small Towns. An Economic Analysis Conducted in Yunnan, China. (World Bank Development Research Group Environment and Energy Team), doi: <https://doi.org/10.1596/1813-9450-5767> [Accessed 21-Aug-2020].
- Wilson, D.C., Velis, C.A. and Rodic, L., 2013. Integrated sustainable waste management in developing countries. *Proceedings of the Institution of Civil Engineers - Waste and Resource Management*, 166(2), pp. 52-68. doi: 10.1680/warm.12.00005 Available at: <https://search.proquest.com/docview/1429830761> [Accessed 19 April 2020].
- Zhu, D., Asnani, P.U., Zurbrugg, C., Anapolsky, S. et al., 2008. *Improving Municipal Solid Waste Management in India*. Washington DC: The World Bank. [Accessed 06-Aug-2020].

Annex 1: Work Plan

Dates	Tasks
18 th May 2020	Submission of 1 st Proposal
25 th May 2020	Go or No Go Decision
28 th – 29 th May 2020	[In case of GO] Work on improving research instruments
1 st - 30 th June 2020	Field Work
1 st – 31 st July 2020	Data Analysis & Thesis Writing
10 th August 2020	Submission Draft Thesis
18-30 th August 2020	Working on improving thesis based upon feedback
31 st August 2020	Final submission of final thesis

Annex 2: IHS copyright form

In order to allow the IHS Research Committee to select and publish the best UMD theses, participants need to sign and hand in this copy right form to the course bureau together with their final thesis.

Criteria for publishing:

1. A summary of 400 words should be included in the thesis.
2. The number of pages for the thesis is about 50 (without annexes).
3. The thesis should be edited

Please be aware of the length restrictions of the thesis. The Research Committee may choose not to publish very long and badly written theses.

By signing this form you are indicating that you are the sole author(s) of the work and that you have the right to transfer copyright to IHS, except for items cited or quoted in your work that are clearly indicated.

I grant IHS, or its successors, all copyrights to the work listed above, so that IHS may publish the work in *The IHS thesis series*, on the IHS web site, in an electronic publication or in any other medium.

IHS is granted the right to approve reprinting.

The author(s) retain the rights to create derivative works and to distribute the work cited above within the institution that employs the author.

Please note that IHS copyrighted material from *The IHS thesis series* may be reproduced, up to ten copies for educational (excluding course packs purchased by students), non-commercial purposes, providing full acknowledgements and a copyright notice appear on all reproductions.

Thank you for your contribution to IHS.

Date : 31-Aug-2020

Your Name(s) : Nasira Ahsan

Your Signature(s) :



Please direct this form and all questions regarding this form or IHS copyright policy to:

The Chairman, IHS Research Committee Burg. Oudlaan 50, T-Building 14 th floor, 3062 PA Rotterdam, The Netherlands	j.edelenbos@ihs.nl Tel. +31 10 4089851
--	--

Annex 3: Research Instruments

Interview Guide

Title.....

Department.....

- 1- What are the current Solid Waste Collection Methods in Johar Town?
- 2- Please briefly explain how solid waste collection system was managed before private sector involvement in Lahore?
- 3- How are finances managed to pay the service provider? What human resources and fleet you provide in Johar Town?
- 4- What is repair and maintenance mechanism if break down occur?
- 5- Do you have any observation, problems or comments related to service provider in terms of solid waste collection?
- 6- If any, how do you intend to solve this in the future?
- 7- Is there any means through which customers can access your organization and express their concerns regarding service quality of service provider?
- 8- What is response mechanisms placed for citizens? (Complaint lines) If yes, how quickly do you react to complaints? If no, how do you handle user complaints?
- 9- Under the current circumstances, is it possible to attain desired level of service Quality in Johar Town?
- 10- Have such survey to assess the customer satisfaction was done before?

Thank you very much for your time and cooperation

Questionnaire:

Thesis Topic: An analysis of customer satisfaction regarding infrastructure provision on solid waste collection and service quality in two income groups (High & Low) of Johar Town, Lahore

I am Nasira Ahsan, doing masters in Urban Management and Development at Institute of Housing and Urban Development Studies, Erasmus University Rotterdam, the Netherlands. My research is aimed to measure the customer satisfaction regarding infrastructure provision and service quality of solid waste collection in two income groups (High & Low) of Johar Town, Lahore.

This questionnaire is designed for the residents of Johar Town area. This questionnaire has been divided into 4 sections with 29 questions. It should take 10-15 minutes of your time only.

Kindly be guaranteed that your answers are voluntary, and confidentiality will be ensured. The responses in this survey will be analysed in groups and not individually. Thank you for your time and valued contribution.

Nasira Ahsan

nasiraahsan4@gmail.com

Supervisor: Julia Skinner MSc.

Section 1: Socio Demographic Characteristics

No.	Question	Option
1.	Gender	<input type="checkbox"/> Male <input type="checkbox"/> Female
2.	Address	
3.	Age Years
4.	Education	<input type="checkbox"/> Uneducated <input type="checkbox"/> Below Matric

		<input type="checkbox"/> Matric <input type="checkbox"/> F A <input type="checkbox"/> B A <input type="checkbox"/> M A <input type="checkbox"/> MPhil/ PhD
5.	Indicate your Family Monthly Income range.	<input type="checkbox"/> Less than PKR. 15000 <input type="checkbox"/> PKR. 15000 – 30000 <input type="checkbox"/> PKR. 30000 – 45000 <input type="checkbox"/> More than PKR. 45000

Section 2: Solid Waste Collection Methods (Infrastructure Provision)

6. What kind of mode of waste collection is provided in your house?

- Door-to-Door
 Container based

7. To what extent do you rate your satisfaction with the door-to-door waste collection?

Not Satisfied (1)	Slightly Satisfied (2)	Neutral (3)	Satisfied (4)	Highly Satisfied (5)
----------------------	---------------------------	----------------	------------------	-------------------------

8. To what extent do you rate your satisfaction towards container based waste collection by service provider?

Not Satisfied (1)	Slightly Satisfied (2)	Neutral (3)	Satisfied (4)	Highly Satisfied (5)
----------------------	---------------------------	----------------	------------------	-------------------------

9. To what extent do you rate your satisfaction with the number of communal bins/waste containers provided in your area?

Not Satisfied (1)	Slightly Satisfied (2)	Neutral (3)	Satisfied (4)	Highly Satisfied (5)
----------------------	---------------------------	----------------	------------------	-------------------------

10. To what extent do you rate your satisfaction regarding the accessibility to these containers?

Not Satisfied (1)	Slightly Satisfied (2)	Neutral (3)	Satisfied (4)	Highly Satisfied (5)
----------------------	---------------------------	----------------	------------------	-------------------------

11. To what extent do you rate your satisfaction with quality of waste containers in your area?

Not Satisfied (1)	Slightly Satisfied (2)	Neutral (3)	Satisfied (4)	Highly Satisfied (5)
----------------------	---------------------------	----------------	------------------	-------------------------

12. To what extent do you rate your satisfaction with the quality of vehicles that serves your area?

Not Satisfied (1)	Slightly Satisfied (2)	Neutral (3)	Satisfied (4)	Highly Satisfied (5)
----------------------	---------------------------	----------------	------------------	-------------------------

13. To what extent do you rate your satisfaction with the repair and maintenance of the vehicles that serves your area?

Not Satisfied (1)	Slightly Satisfied (2)	Neutral (3)	Satisfied (4)	Highly Satisfied (5)
----------------------	---------------------------	----------------	------------------	-------------------------

14. To what extent do you rate your satisfaction with the conduct of staff (drivers, workers & supervisors) of service provider?

Not Satisfied (1)	Slightly Satisfied (2)	Neutral (3)	Satisfied (4)	Highly Satisfied (5)
----------------------	---------------------------	----------------	------------------	-------------------------

Section 3: Quality of Service Delivery

15. To what extent are you satisfied with the overall efficiency of service provider in providing the services of waste collection?

Not Satisfied (1)	Slightly Satisfied (2)	Neutral (3)	Satisfied (4)	Highly Satisfied (5)
----------------------	---------------------------	----------------	------------------	-------------------------

16. To what extent are you satisfied about the frequency of waste collection service?

Not Satisfied (1)	Slightly Satisfied (2)	Neutral (3)	Satisfied (4)	Highly Satisfied (5)
----------------------	---------------------------	----------------	------------------	-------------------------

17. To what extent are you concerned that when once waste is being collected from your area, where does it go?

Not concerned (1)	Slightly concerned (2)	Neutral (3)	Satisfied (4)	Highly Satisfied (5)
----------------------	---------------------------	----------------	------------------	-------------------------

18. Do you know about complaint number regarding waste management issues?

Yes

No

(if yes) What is it: -----

19. How do you rate your satisfaction with the ease to reach the service provider about registering complaint?

Not Satisfied (1)	Slightly Satisfied (2)	Neutral (3)	Satisfied (4)	Highly Satisfied (5)
----------------------	---------------------------	----------------	------------------	-------------------------

20. To what extent are you satisfied with the compliant management system of service provider?

Not Satisfied (1)	Slightly Satisfied (2)	Neutral (3)	Satisfied (4)	Highly Satisfied (5)
----------------------	---------------------------	----------------	------------------	-------------------------

21. To what extent are you satisfied with the response from service provider, when you registered your complaint?

Not Satisfied (1)	Slightly Satisfied (2)	Neutral (3)	Satisfied (4)	Highly Satisfied (5)
----------------------	---------------------------	----------------	------------------	-------------------------

22. To what extent are you satisfied with the staff who are involved in responding to your complaint?

Not Satisfied (1)	Slightly Satisfied (2)	Neutral (3)	Satisfied (4)	Highly Satisfied (5)
----------------------	---------------------------	----------------	------------------	-------------------------

23. To what extent are you satisfied with overall cleanliness level in your area?

Not Satisfied (1)	Slightly Satisfied (2)	Neutral (3)	Satisfied (4)	Highly Satisfied (5)
----------------------	---------------------------	----------------	------------------	-------------------------

24. To what extent are you satisfied with the quality of waste collection services against the amount you pay for the services?

Not Satisfied (1)	Slightly Satisfied (2)	Neutral (3)	Satisfied (4)	Highly Satisfied (5)
----------------------	---------------------------	----------------	------------------	-------------------------

25. Are you willing to pay more user fee against improved services in future?

Yes

No

Section 4: Customer Satisfaction:

26. To what extent are you satisfied with the coverage of waste collection services in your area?

Not Satisfied (1)	Slightly Satisfied (2)	Neutral (3)	Satisfied (4)	Highly Satisfied (5)
----------------------	---------------------------	----------------	------------------	-------------------------

27. To what extent are you satisfied with the adherence of service provider with provided waste collection schedule?

Not Satisfied (1)	Slightly Satisfied (2)	Neutral (3)	Satisfied (4)	Highly Satisfied (5)
----------------------	---------------------------	----------------	------------------	-------------------------

28. To what extent are you satisfied, with the timely lifting of waste?

Not Satisfied (1)	Slightly Satisfied (2)	Neutral (3)	Satisfied (4)	Highly Satisfied (5)
----------------------	---------------------------	----------------	------------------	-------------------------

29. To what extent are you satisfied with waste collection timings in your area?

Not Satisfied (1)	Slightly Satisfied (2)	Neutral (3)	Satisfied (4)	Highly Satisfied (5)
----------------------	---------------------------	----------------	------------------	-------------------------

Title: Project Director OzPak

Department: Head of Pakistan Office

- 1- What are the current Solid Waste Collection Methods in Johar Town?
Collection of domestic solid waste generated by commercial, residential, governmental entities and public institutions is done through; 50% Door to Door Collection & 50% Collection by containers/communal waste bins
- 2- Please briefly explain how solid waste collection system was managed before private sector involvement in Lahore?
Before 2012, there was no reliable service given to citizens regarding waste collection and specially low-income areas were neglected. Solid waste management services were delivered by the Municipal Cooperation of Lahore (MCL). After LWMC's inception, waste collection coverage improved from 60% to 80% but due to lack of new machinery and equipment LWMC selected the mode of Public Private Partnership in 2011. Lahore was divided into 2 zones with equal distribution of population. An international bidding was done in 2011 whereby after the whole process each zone was awarded to two Turkish Firms (OzPak and Albayrak) for the next seven years (2012-2019)
- 3- How are finances managed to pay the service provider?
We prepare monthly progress report where total waste lifted from area is mentioned and LWMC pay us according to contract terms. The rates are 17\$/ton for container based collection and 19\$/ton for door-to-door based collection.
- 4- Do you have any observation, problems or comments related to service provision in terms of solid waste collection?
Main problem we face in low-income area is the lack of cooperation or awareness from citizen's side.
- 5- If any, how do you intend to solve this in the future?
Through Public awareness, we intend to resolve this issue in future.
- 6- Is there any means through which customers can access your organization and express their concerns regarding service quality of service provider?
Yes, we have a complaint cell (1139) where public reach us. Moreover through social media and our representatives in field where they deal with issues of public.
- 7- What is response mechanisms placed for citizens? (Complaint lines). How quickly do you react to complaints?
There is an independent complaint management system (1139 is the call number) where citizens can directly make telephonic call and easily register their complaints. Response time for each complaint has been categorized according to its nature and type.
- 8- Has any customer satisfaction survey was done before?
No, we have not done such survey before and I think it should have been done in order to assess our performance from the point of view of people.

Title: General Manager Operations OzPak

Department: Operations

- 1- What are the current Solid Waste Collection Methods in Johar Town?
Collection of domestic solid waste is done through; 50% Door to Door Collection & 50% Collection by containers/communal waste bins. Waste collection planning was the first step before taking over any area. Waste collection of Johar Town area was designed in such a way that all commercial areas and low-income areas will be provided with communal bins where they can throw their waste. While waste collection from planned areas (which are high-income) were designated in a way by keeping in mind about the width of streets where garbage vehicles can go easily, to perform door-to-door collection."
- 2- What are resources for solid waste collection system in Johar Town?

There are 115 sanitary workers and 10 drivers allocated for Johar Town area (including both income areas)”.
There are total 250 containers placed in Johar Town. Majority (70%) of these containers are placed in low income areas while some (30%) have been placed in commercial areas of high income areas.

There are 3 compactors for container based collection in 1st shift and 2 in second shift for low income areas. While 3 mini dumpers & 2 compactors in 1st shift and 2 compactors in 2nd shift in high income area.

- 3- How are finances managed and do you think is it adequate?
We are paid by LWM on rates of 17\$/ton for container based collection and 19\$/ton for door-to-door based collection. Yes it is adequate for us.
- 4- Do you have any observation, problems or comments related to service provision in terms of solid waste collection?
Main problem we face in low-income area is the lack of cooperation or awareness from citizen’s side. Changes in the management of LWMC cause us lot of trouble for our bill clearance.
- 5- If any, how do you intend to solve this in the future?
Public awareness is domain of LWMC and they must focus on this. However, we also we resolve this issue by our campaigns at local level.
- 6- Is there any means through which customers can access your organization and express their concerns regarding service quality of service provider?
Yes, citizens reach to us through complaint cell (1139), social media and our field staff.
- 7- How quickly do you react to complaints?
We try to resolve issue in less than 24 hours.
- 8- How many and what types of complaints you receive from Johar Town in general?
From Johar Town in June 2020, there were 40 complaints were received in a month and 38 were resolved. The general type of complaints include street weeping, container lifting.

Title: Senior Manager Operations OzPak

Department: Operations

- 1- What are the current Solid Waste Collection Methods in Johar Town?
Collection of domestic solid waste is done through; 50% Door to Door Collection & 50% Collection by containers/communal waste bins. In Johar Town area all commercial areas and low-income areas are provided with communal bins while high-income are served y door to door waste collection.
There are two shifts that are being operated for collection of waste from area. Timings of these shifts are; 1st Shift: 6:00 hours to 14:00 hours & 2nd Shift: 14:00 to 22:00 hours
In Johar Town, daily 80 tons of waste is produced and 100% collection is achieved daily
- 2- What are resources for solid waste collection system in Johar Town?
There are 115 sanitary workers and 10 drivers in human resource. Team of operations department monitor the whole area vehicles. There are total 250 containers placed and 5 compactors work in 1st shift and 3 compactors in 2nd shift.
- 3- How are finances managed and do you think is it adequate?
We as operations department are un-aware of financial matter of company.
- 4- Do you have any observation, problems or comments related to service provision in terms of solid waste collection?
The distance to disposal site from Johar town is 50 km (one sided) distance to disposal site. Therefore, we faced delays in achievement of 100% waste collection in first shift.
- 5- If any, how do you intend to solve this in the future?

A transfer station has been constructed in previous years, and it has improved our waste collection efficiency. Now, vehicles spend more time in collecting more waste from the areas, instead of waiting in long queues at disposal site in day shift.

6- What is training mechanism for your staff in OzPak?

When any driver is hired, there is a standard procedure to train him for 2-3 days regarding vehicle operation and dealing with public.

7- Has such customer satisfaction survey been done before?

No, we have not done such survey before. I think LWMC must perform such survey to assess the performance of service providers in city.

Title: Senior Manager Operations OzPak

Department: Operations

1- What are the current Solid Waste Collection Methods in Johar Town?

Collection of domestic solid waste is done through; 50% Door to Door Collection & 50% Collection by containers/communal waste bins. In Johar Town area all commercial areas and low-income areas are provided with communal bins while high-income areas are served by door to door waste collection.

There are two shifts that are being operated for collection of waste from area. Timings of these shifts are; 1st Shift: 6:00 hours to 14:00 hours & 2nd Shift: 14:00 to 22:00 hours

In Johar Town, daily 80 tons of waste is produced and 100% collection is achieved daily

2- What are resources for solid waste collection system in Johar Town?

There are 115 sanitary workers and 10 drivers in human resource. Team of operations department monitor the whole area vehicles. There are total 250 containers placed and 5 compactors work in 1st shift and 3 compactors in 2nd shift.

3- How are finances managed and do you think it is adequate?

We as operations department are un-aware of financial matter of company.

4- Do you have any observation, problems or comments related to service provision in terms of solid waste collection?

The distance to disposal site from Johar town is 50 km (one sided) distance to disposal site. Therefore, we faced delays in achievement of 100% waste collection in first shift.

5- If any, how do you intend to solve this in the future?

A transfer station has been constructed in previous years, and it has improved our waste collection efficiency. Now, vehicles spend more time in collecting more waste from the areas, instead of waiting in long queues at disposal site in day shift.

6- How do you conduct repair and maintenance of your vehicles?

7- We cannot afford our vehicles to remain out of order for a single day. Therefore, we have three types of repair and maintenance schedules i.e. daily, scheduled (either weekly or monthly) and emergency ones.

8- What is training mechanism for your staff in OzPak?

When any driver is hired, there is a standard procedure to train him for 2-3 days regarding vehicle operation and dealing with public.

9- Has such customer satisfaction survey been done before?

No, we have not done such survey before. I think LWMC must perform such survey to assess the performance of service providers in city.

Title: Deputy Manager Operations OzPak

Department: Operations

1- What are the current Solid Waste Collection Methods in Johar Town?

There are two collection modes a) Door to Door Collection b) container based collection. We have divided the areas according to local dynamics and situations of streets and that which mode fits best for performing waste collection services.

We work in two shifts with 5-7 compactors and collect almost 70-75 tons of waste daily from Johar Town.

- 2- What are resources for solid waste collection system in Johar Town?
There are 115 sanitary workers and 10 drivers reserved for this area and 250 containers are placed.
- 3- How are finances managed and do you think is it adequate?
We as operations department cannot comment on this.
- 4- How you conduct repair and maintenance of your vehicles?
We have three types of maintenances a) Daily maintenance: checking oils, breaks, sirens, and lights (indicators) of vehicles. Moreover, at the end of every shift each vehicle is washed/cleaned before being parked at parking lot. b) Scheduled maintenance: includes engine overhaul, tyre change, change of air filters etc. c) Emergency: top priority is given to cases when some accident or major breakdown of vehicle occurs.
We have two mobile workshops, these are vehicles which have necessary repair and maintenance material. Whenever there is damage to any container or it need to be replaced, these vehicles fix such problems on spot. This mechanism is very helpful in terms of saving time and fixing the problem on spot.
- 5- What is training mechanism for your staff in OzPak?
Every new personnel upon hiring undergoes a weekly training before going into field. It includes drivers specially. Moreover, we conduct trainings at our own after every 6 months. These days our focus is to keep our workers safe due to COVID-19. We cannot stop our services, therefore, we trained our staff as per safety rules of WHO on COVID-19 so that citizens as well as our staff must stay safe.
- 6- Has any customer satisfaction survey was done before?
No, we never performed such survey before.

Title: Two Drivers- OzPak

Department: Operations

- 1- How OzPak has improve your skills as drivers?
When we joined our job, they took our trial test and taught us about company's policy and how to deal with citizens.
- 2- How often you are being provided by trainings?
Our company organized the trainings with traffic police and they give us trainings on road signs and traffic rules for heavy vehicles.
- 3- What other trainings you have attended?
Every week we meet with our team leader and convey our concerns related to work. They provide us counselling and specially trained us about COVID-19 protocols as well.

Title: General Manager LWMC

Department: Operations

- 1- What are the current Solid Waste Collection Methods in Johar Town?
Johar Town is area with mixed population OzPak provides 2 types of waste collection there. 1- Door to Door Collection, 2-Collection by containers/communal waste bins.
- 2- Please briefly explain how solid waste collection system was managed before private sector involvement in Lahore?
LWMC managed to improve the collection but we had old vehicles therefore we chose PPP mode. Through international bidding, 2 service providers were selected and they came with new vehicles which has improved the cleanliness of whole city.
- 3- How are finances managed to pay the service provider?

There are two sources of budget for LWMC. First is from CDGL for regular operations and second is granted annually by provincial government for payments to service providers.

The rates as per contract to pay service provider is 17\$/ton for container based collection and 19\$/ton for door-to-door based collection.

4- What is the user fee and how is it charged?

There is 21.45% waste management fee incorporated in monthly bill of water supply. However, water supply is managed by another organization i.e. Water and Sanitation Authority, Lahore (WASA) therefore they retain 15% of this amount as a service charge and pay remaining 85% to Municipal Corporation Lahore(MCL) wing of CDGL.

User fee is 0.11 \$ (0.092 €) for low-income people and 0.55 \$ (0.46 €) for high-income people.

5- Do you think by being dependent upon government and other department for fee recovery?

Being financially depend is frustrating sometimes as each year relying on budget from CDGL and government usually cause delay in payments to service providers. We have proposed a new revenue generation plan based on rich and poor areas. According to this proposal the increase in charges ranges from 1.0 \$ (0.84€) for low-income areas and 6.0\$ (5€) for high-income areas /month/household). Still we face opposition from political side, as they are not approving our proposal yet as they think, user fee is too high for their citizens and it may affect their vote bank for next elections.

6- Do you have any observation, problems or comments related to service provision in terms of solid waste collection?

Public awareness and willingness to pay is the biggest hindrance we face every day.

7- If any, how do you intend to solve this in the future?

We have worked with many public awareness forums and conduct awareness campaigns regularly. There are improvements however; awareness about waste management must be part of curriculum in our education system so that new generation must understand the importance of it.

8- Is there any means through which customers can access your organization and express their concerns regarding service quality of service provider?

Yes, we have a complaint cell (1139) where public call us free of charge and register their complaint. We have very transparent and quick complaint redressal system.

9- What is response mechanisms placed for citizens? (Complaint lines). How quickly do you react to complaints?

We have reserved a resolution time of each type of complaint. e.g street sweeping must be done on same day of complaint. Because no one want waste in their area. However, some complaints are of different issues where we need extra resources so therefore it may take next day as well to resolve them.

10- Has any customer satisfaction survey was done before?

No, we have not done such survey before and I think it should have been done in order to assess our performance from the point of view of people.

Title: Senior Manager Operations LWMC

Department: Operations

1- What are the current Solid Waste Collection Methods in Johar Town?

Over all, in Lahore there are two methods for waste collection i) Door to Door Collection ii) collection by containers/communal waste bins. In Johar Town area same is implemented because it is part of contract as well.

2- How you monitor solid waste collection system in Johar Town?

We have a team in each area, where our assistant managers go to the field and check the operations of service provider. They daily monitors the no. of vehicles and workers

attendance. Moreover, we have online tracking mechanism where we can track vehicles as well as we can also monitor that how much amount of tonnage they have delivered to disposal site.

- 3- How are finances managed and do you think is it adequate?

As far, I know, we receive government grants every year.

- 4- Do you have any observation, problems or comments related to service provision in terms of solid waste collection?

I think, only problem we are facing these days is the cooperation from public and sometimes vehicles of contractors takes long time in repair and maintenance. Which disturbs daily waste collection targets.

- 5- If any, how do you intend to solve this in the future?

We have been raising awareness among school going children and people through our communication department. However, changing the mind-set of people will take time and we understand this. For other problem we are communicating with OzPak officials to enhance their capacity for repair and maintenance practices.

- 6- Has such customer satisfaction survey was done before?

No, we have not done such survey before. I think LWMC must perform such survey to assess the performance of service providers in city.

Title: Manager Operations LWMC

Department: Operations

- 1- What are the current Solid Waste Collection Methods in Johar Town?

There is mechanism, of waste collection as defined in contract. Workers sweeps the area and bring waste to collection point/containers. While public, also throw their waste into these containers. Moreover, in posh areas where huge vehicles can enter, door-to-door waste collection services are provided.

- 2- What are resources for solid waste collection system in Johar Town?

Service provider is obliged to provide resources as per demand of area. I do not remember the no. of workers. However, there are 7 compactors work in both shifts in the area, along with small vehicles as well.

- 3- How are finances managed and do you think is it adequate?

We as operations department are un-aware of financial matters of company.

- 4- Do you have any observation, problems or comments related to service provision in terms of solid waste collection?

We as LWMC are responsible for managing disposal site. In rainy days we face huge queues of vehicles as due to muddy area, sometimes if any vehicle stuck then it cause waiting for other vehicles too, which indirectly effects the overall operations of waste collection in the city.

- 5- If any, how do you intend to solve this in the future?

Each year we do our preparations for such events, however a long term and permanent solution for this problem is to find a new location and develop a landfill site for future use. The current site is near to reach its capacity.

- 6- Has such customer satisfaction survey was done before?

No, we have not done such survey before. I think LWMC must perform such survey to assess the performance of service providers in city.

- 7- Is there any means through which customers can access your organization and express their concerns regarding service quality of service provider?

There is a complaint cell (1139) which is managed by a team. However, as operations department we monitor all activities. Management of LWMC and service provider can access this system where from dashboard all status of complaints can be seen. Sometimes we re-confirm from citizens one complaint is resolved.

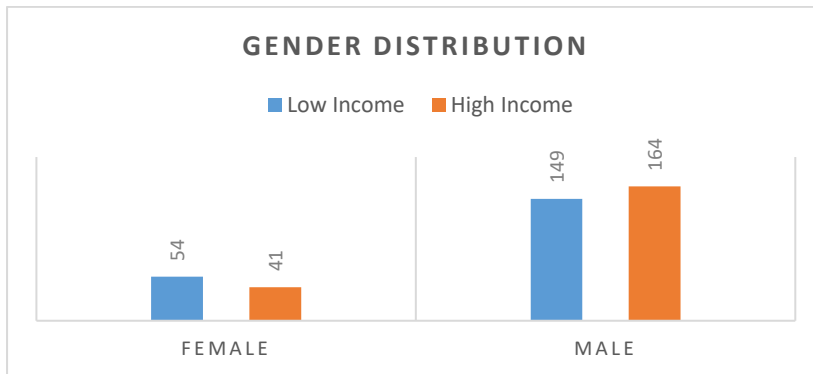
Title: Assistant Manager Operations LWMC

Department: Operations

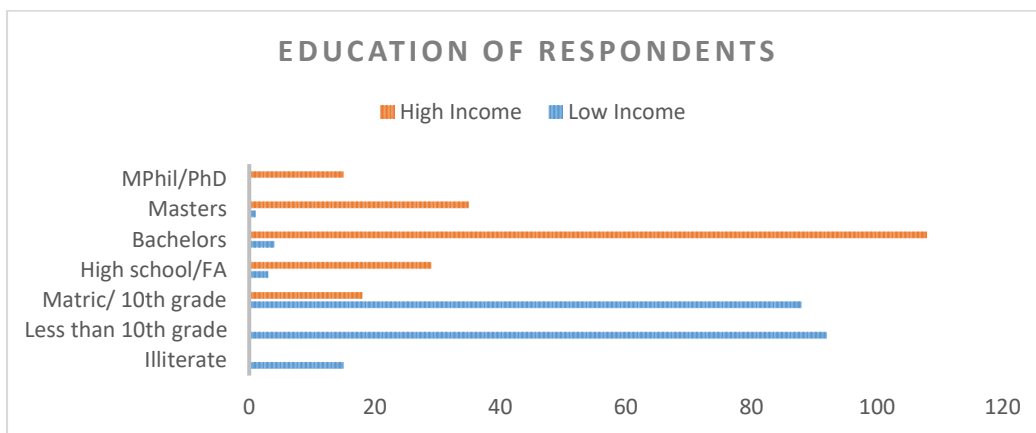
- 1- What are the current Solid Waste Collection Methods in Johar Town?
Waste collection is done daily in Lahore, because of hot and humid weather we cannot skip a day as waste starts to smell foul. Therefore, there are two modes. One is skip based container system where vehicle empties the container in it and other system is door to door. Door to door is done where affluent people live and vehicle can go. We also provide awareness to the people before starting any door-to-door service, so that people can put their waste outside their doors on time of arrival of vehicle.
- 2- What are resources for solid waste collection system in Johar Town?
There are 8 drivers and 2 helpers with each vehicle. Moreover 110 sanitary workers which are supervised by 2 supervisor. 5 -6 compactors re allocated in this area and 250 containers of 0.8m³ capacity are placed for public use.
- 3- How are finances managed and do you think is it adequate?
Our budget is granted by government each year, but I cannot comment on adequacy of it.
- 4- Has any customer satisfaction survey was done before?
I am new here, but as I know so far, there has not been such survey done before.

Annex 4: Cross Tabulation Graphs of responses

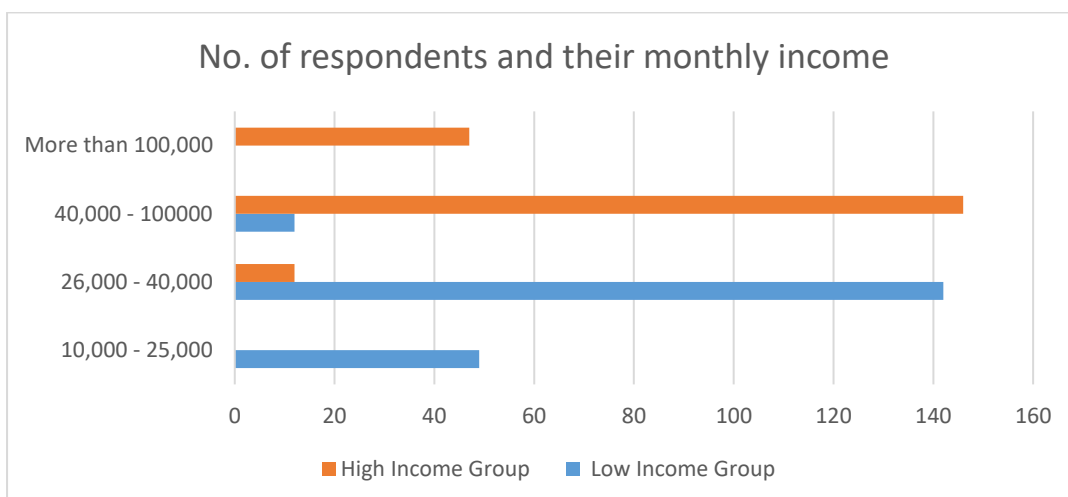
Gender:



Education:



Monthly Income:



Mode of waste collection:

Responses (%) regarding satisfaction on mode of collection by both income groups

Mode of waste collection	Not at all satisfactory	Not satisfactory	Neutral	Satisfactory	Very satisfactory
Container based	0	7	13	78	2
Door-to door	0	8	29	50	12

Responses on conduct of staff: Responses on conduct of staff:

Responses (percentage) regarding satisfaction on conduct of staff

	Not at all satisfactory	Not satisfactory	Neutral	Satisfactory	Very satisfactory
Low Income	0	4	25	65	5
High Income	2	7	23	57	11

Satisfaction on quantity of waste bins

Low Income Group					
	Not at all satisfactory	Not satisfactory	Neutral	Satisfactory	Very satisfactory
No. of Bins	0	6	33	54	6
Accessibility	0	5	36	55	3
Quality of waste bins	0	4	25	59	11
High Income Group					
No. of Bins	3	8	29	44	16
Accessibility	2	8	28	48	13
Quality of waste bins	3	7	22	53	15

Responses (Percentage) regarding satisfaction on waste bins

Quality of Vehicles

Responses (Percentage) regarding satisfaction on quality of vehicles

	Not at all satisfactory	Not satisfactory	Neutral	Satisfactory	Very satisfactory
Low Income	0	9	27	51	13
High Income	2	10	20	52	16

Repair and Maintenance:

Responses (Percentage) regarding satisfaction on repair and maintenance of vehicles

	Not at all satisfactory	Not satisfactory	Neutral	Satisfactory	Very satisfactory
Low Income Group	2	4	31	55	7
High Income Group	3	6	27	50	14

Overall service Quality:

Responses (percentage) regarding perception of overall waste collection services

	Not at all satisfactory	Not satisfactory	Neutral	Satisfactory	Very satisfactory
Low Income	1	16	9	71	2
High Income	1	15	9	66	8

Frequency of waste lifting

Responses (percentage) regarding satisfaction on frequency of waste collection

	Not at all satisfactory	Not satisfactory	Neutral	Satisfactory	Very satisfactory
Low Income	0	11	54	32	2
High Income	1	12	41	37	8

Final destination:

Responses (percentage) regarding awareness on final destination of collected waste

	Not at all concerned	Not concerned	Neutral	concerned	Highly Concerned
Low Income	1	6	32	51	9
High Income	4	5	29	45	16

Ease in complaint registration:

Responses (Percentage) regarding satisfaction on method to register complaint

	Not at all satisfactory	Not satisfactory	Neutral	Satisfactory	Very satisfactory
Low Income	1	4	41	44	9
High Income	4	4	36	43	13

Response to complaints

Responses (percentage) regarding satisfaction on response after registering complaint

	Not at all satisfactory	Not satisfactory	Neutral	Satisfactory	Very satisfactory
Low Income	0	4	20	66	9
High Income	2	7	17	60	14

Conduct of Complaint resolving staff:

Responses (percentage) on conduct of complaint resolution staff

	Not at all satisfactory	Not satisfactory	Neutral	Satisfactory	Very satisfactory
Low Income	0	6	31	55	8
High Income	2	4	29	49	15

Cleanliness level:

Responses (percentage) regarding satisfaction on overall cleanliness

	Not at all satisfactory	Not satisfactory	Neutral	Satisfactory	Very satisfactory
Low Income	1	8	62	26	2
High Income	2	8	54	28	8

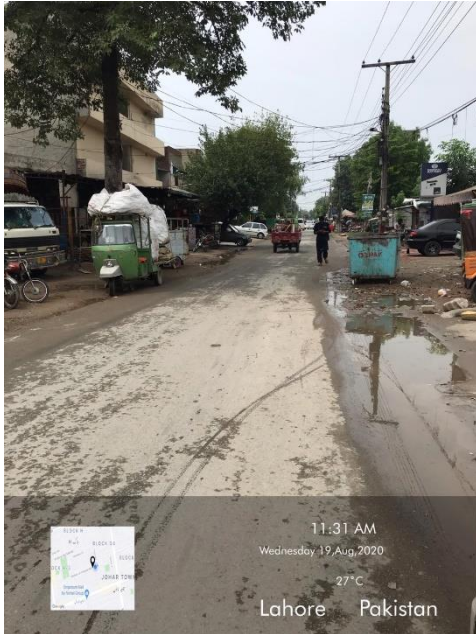
User fee

Responses (percentage) regarding satisfaction on user fee and service quality

	Not at all satisfactory	Not satisfactory	Neutral	Satisfactory	Very satisfactory
Low Income	2	1	66	27	3
High Income	3	5	58	27	7

Annex 5: Pictures

- i. Container based collection and street sweeping condition in low-income area of Johar Town

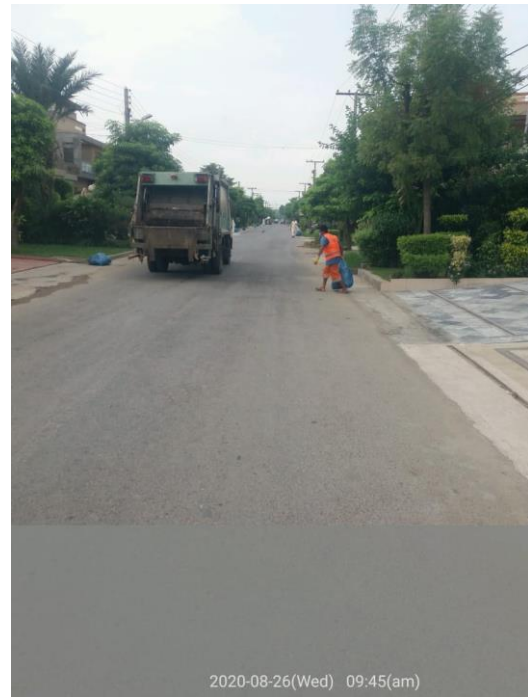


Street sweeping level at low-income area

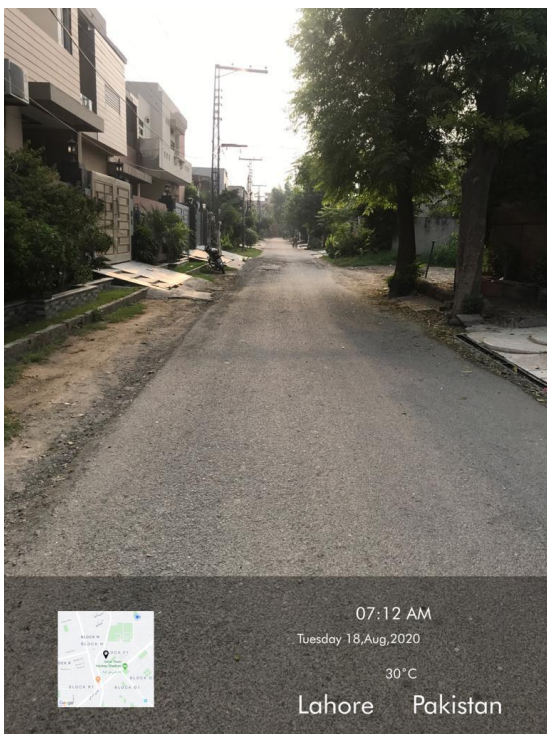


Container based collection in Low-income area

ii. Door to door collection and street sweeping condition in high-income area of Johar Town



DTD waste collection in high-income area and street cleanliness



DTD waste collection in high-income area and street cleanliness

Annex 7: Inferential analysis- Low-income group:

A. Cronbach Alpha

Reliability Statistics

Cronbach's Alpha	N of Items
.779	4

Reliability Statistics

Cronbach's Alpha	N of Items
.699	3

Reliability Statistics

Cronbach's Alpha	N of Items
.794	4

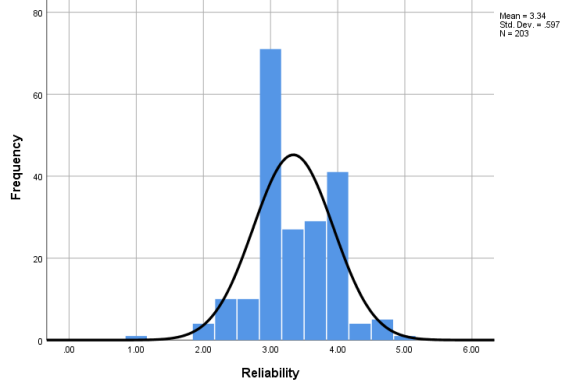
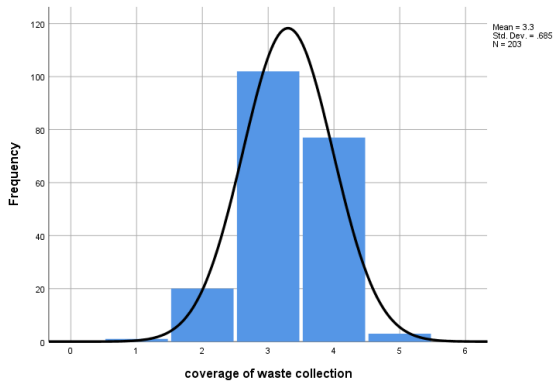
B. Correlation 1st independent Variable:

		Container based collection	Provision of infrastructure	Repair and maintenance	Conduct of staff
Container based waste collection	Pearson Correlation	1	.686**	.442**	.426**
	Sig. (2-tailed)		.000	.000	.000
	N	203	203	203	203
Provision of infrastructure	Pearson Correlation	.686**	1	.637**	.676**
	Sig. (2-tailed)	.000		.000	.000
	N	203	203	203	203
Repair and maintenance	Pearson Correlation	.442**	.637**	1	.520**
	Sig. (2-tailed)	.000	.000		.000
	N	203	203	203	203
Conduct of staff	Pearson Correlation	.426**	.676**	.520**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	203	203	203	203

Correlation 2nd independent Variable:

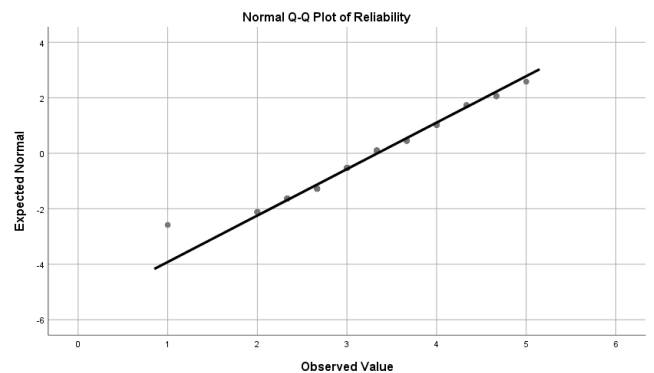
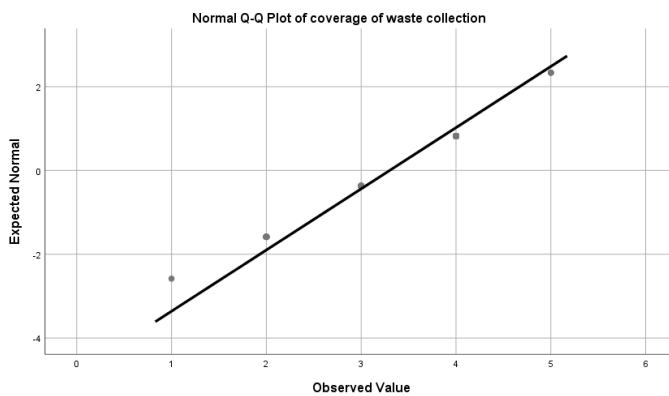
		Perception on Service Quality	Satisfaction on Responsiveness	Cleanliness level	User fee	Coverage	Reliability
Perception on Service Quality	Pearson Correlation	1	.743**	.721**	.648**	.634**	.684**
	Sig. (2-tailed)		.000	.000	.000	0.000	0.000
	N	203	203	203	203	203	203
Responsiveness	Pearson Correlation	.743**	1	.583**	.478**	.448**	.495**
	Sig. (2-tailed)	.000		.000	.000	0.000	0.000
	N	203	203	203	203	203	203
Cleanliness level	Pearson Correlation	.721**	.583**	1	.687**	.722**	.741**
	Sig. (2-tailed)	.000	.000		.000	0.000	0.000
	N	203	203	203	203	203	203
User fee	Pearson Correlation	.648**	.478**	.687**	1	.666**	.724**
	Sig. (2-tailed)	.000	.000	.000		0.000	0.000
	N	203	203	203	203	203	203
Coverage	Pearson Correlation	.634**	.448**	.722**	.666**	1	.791**
	Sig. (2-tailed)	.000	.000	.000	.000		0.000
	N	203	203	203	203	203	203
Reliable Service	Pearson Correlation	.684**	.495**	.741**	.724**	.791**	1
	Sig. (2-tailed)	.000	.000	.000	.000	0.000	
	N	203	203	203	203	203	203

C. Testing the assumptions:



Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Reliable Service/Reliability	.188	203	.000	.938	203	.000
Coverage of waste collection	.276	203	.000	.816	203	.000



Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
Coverage	Based on Mean	1.716	9	190	.088
	Based on Median	.784	9	190	.632
	Based on Median and with adjusted df	.784	9	169.326	.632
	Based on trimmed mean	1.825	9	190	.066
Reliable Service/Reliability	Based on Mean	1.958	9	190	.046
	Based on Median	1.697	9	190	.092
	Based on Median and with adjusted df	1.697	9	163.789	.093
	Based on trimmed mean	1.997	9	190	.042

D. Regression Analysis: 1st Independent Variable (Infrastructure Provision with Customer Satisfaction)

Model		Coefficients ^a				
		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.440	.321		4.491	.000
	Container based waste collection	.015	.098	-.014	-.155	.877
	Provision of infrastructure	.272	.141	.229	1.925	.056
	Repair and maintenance	.048	.077	.054	.622	.535
	Conduct of staff	.201	.094	.192	2.139	.034
2	(Constant)	1.583	.387		4.087	.000
	Container based waste collection	.009	.089	.008	.100	.920
	Provision of infrastructure	.176	.130	.147	1.350	.178
	Repair and maintenance	.089	.071	.100	1.257	.210
	Conduct of staff	.215	.086	.207	2.504	.013
	Gender	-.532	.095	-.344	-5.578	.000
	Age	-.008	.004	-.116	-1.844	.067
	Edu	-.959	.310	-.195	-3.093	.002
Income	-.006	.022	-.017	-.277	.782	

a. Dependent Variable: coverage

Model		Coefficients ^a				
		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.240	.262		4.729	.000
	Container based waste collection	.004	.080	.004	.052	.959
	Provision of infrastructure	.355	.116	.341	3.065	.002
	Repair and maintenance	-.018	.063	-.023	-.282	.778
	Conduct of staff	.182	.077	.200	2.373	.019
2	(Constant)	1.245	.316		3.942	.000
	Container based waste collection	.058	.073	.062	.796	.427
	Provision of infrastructure	.250	.106	.240	2.354	.020
	Repair and maintenance	.001	.058	.001	.012	.990
	Conduct of staff	.200	.070	.220	2.856	.005
	Gender	-.537	.078	-.398	-6.899	.000
	Age	.002	.004	.026	.436	.663
	Edu	-.412	.253	-.096	-1.627	.105
Income	-.005	.018	-.016	-.284	.777	

a. Dependent Variable: Reliable service

Regression Analysis: 2nd Independent Variable (Service Quality with Customer Satisfaction)

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.577	.211		2.729	.007
	Perception on Service Quality	.327	.102	.293	3.197	.521
	Responsiveness	-.018	.094	-.015	-.196	.845
	overall cleanliness level	.436	.075	.424	5.847	.002
	Quality & fee	.265	.067	.259	3.937	.001
2	(Constant)	.791	.270		2.931	.004
	Perception on Service Quality	.352	.097	.316	3.623	.013
	Responsiveness	-.008	.089	-.006	-.085	.932
	Cleanliness level	.409	.072	.398	5.704	.003
	User fee	.200	.065	.195	3.070	.002
	Gender	-.272	.072	-.176	-3.770	.004
	Age	-.006	.003	-.090	-2.024	.044
	Edu	-.560	.229	-.114	-2.442	.015
	Income	.009	.016	.025	.556	.579

a. Dependent Variable: Coverage

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.698	.170		4.095	.000
	Perception on Service Quality	.235	.082	.242	2.853	.513
	Responsiveness	-.070	.076	-.068	-.923	.357
	overall cleanliness level	.327	.060	.364	5.433	.005
	Quality & fee	.310	.054	.347	5.697	.003
2	(Constant)	.739	.217		3.402	.001
	Perception on Service Quality	.241	.078	.249	3.091	.211
	Responsiveness	-.063	.072	-.061	-.877	.382
	Cleanliness level	.298	.058	.332	5.164	.002
	User fee	.268	.052	.299	5.114	.001
	Gender	-.298	.058	-.221	-5.139	.003
	Age	.003	.002	.048	1.162	.247
	Edu	-.025	.184	-.006	-.135	.893
	Income	.014	.013	.044	1.065	.288

a. Dependent Variable: Reliable Service

A. ANOVA tests for 1st sub-research question:

i. Both income groups with “infrastructure provision”

Descriptives

Income Group		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
1	5	1.80	.447	.200	1.24	2.36	1	2	
2	2	2.00	.000	.000	2.00	2.00	2	2	
2	3	2.00	.000	.000	2.00	2.00	2	2	
2	20	1.50	.513	.115	1.26	1.74	1	2	
3	22	1.55	.510	.109	1.32	1.77	1	2	
3	2	1.50	.707	.500	-4.85	7.85	1	2	
3	10	1.50	.527	.167	1.12	1.88	1	2	
3	19	1.37	.496	.114	1.13	1.61	1	2	
4	65	1.48	.503	.062	1.35	1.60	1	2	
4	106	1.43	.498	.048	1.34	1.53	1	2	
4	87	1.49	.503	.054	1.39	1.60	1	2	
4	31	1.45	.506	.091	1.27	1.64	1	2	
5	16	1.63	.500	.125	1.36	1.89	1	2	
5	4	1.75	.500	.250	.95	2.55	1	2	
5	16	1.88	.342	.085	1.69	2.06	1	2	
Total	408	1.50	.501	.025	1.45	1.55	1	2	

ANOVA

Income Group	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5.394	14	.385	1.567	.085
Within Groups	96.603	393	.246		
Total	101.998	407			

ii. Both income groups with “door-to-door collection”

Descriptives

Income Group		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
1	3	1.67	.577	.333	.23	3.10	1	2	
2	30	1.53	.507	.093	1.34	1.72	1	2	
3	85	1.69	.464	.050	1.59	1.79	1	2	
4	261	1.39	.490	.030	1.33	1.45	1	2	
5	29	1.86	.351	.065	1.73	2.00	1	2	
Total	408	1.50	.501	.025	1.45	1.55	1	2	

ANOVA

Income Group	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	10.016	4	2.504	10.971	.000
Within Groups	91.981	403	.228		
Total	101.998	407			

Annex 6-Inferential Analysis-High Income Group

A. Reliability Test: Cronbach Alpha

Reliability Statistics

Cronbach's Alpha	N of Items
.886	4

Reliability Statistics

Cronbach's Alpha	N of Items
.778	3

Reliability Statistics

Cronbach's Alpha	N of Items
.896	4

B. Correlation 1st independent Variable

		DTD collection	Provision of infrastructure	Repair and maintenance	Conduct of staff	coverage of waste collection	Reliability
DTD collection	Pearson Correlation	1	.643**	.523**	.628**	.482**	.604**
	Sig. (2-tailed)		.000	.000	.000	.000	.000
	N	205	205	205	205	205	205
Provision of infrastructure	Pearson Correlation	.643**	1	.741**	.819**	.556**	.666**
	Sig. (2-tailed)	.000		.000	.000	.000	.000
	N	205	205	205	205	205	205
Repair and maintenance	Pearson Correlation	.523**	.741**	1	.685**	.487**	.558**
	Sig. (2-tailed)	.000	.000		.000	.000	.000
	N	205	205	205	205	205	205
Conduct of staff	Pearson Correlation	.628**	.819**	.685**	1	.491**	.593**
	Sig. (2-tailed)	.000	.000	.000		.000	.000
	N	205	205	205	205	205	205
coverage of waste collection	Pearson Correlation	.482**	.556**	.487**	.491**	1	.864**
	Sig. (2-tailed)	.000	.000	.000	.000		.000
	N	205	205	205	205	205	205
Reliable service	Pearson Correlation	.604**	.666**	.558**	.593**	.864**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	
	N	205	205	205	205	205	205

Correlation 2nd independent Variable

		Perception on Service Quality	Satisfaction on Responsiveness	Cleanliness level	User fee	Coverage	Reliability
Perception on Service Quality	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000
	N	205	205	205	205	205	205
	Pearson Correlation	1	.801**	.746**	.762**	.759**	.802**
Responsiveness	Sig. (2-tailed)	.000		.000	.000	.000	.000
	N	205	205	205	205	205	205
	Pearson Correlation	.801**	1	.593**	.568**	.552**	.646**
Cleanliness level	Sig. (2-tailed)	.000	.000		.000	.000	.000
	N	205	205	205	205	205	205
	Pearson Correlation	.746**	.593**	1	.755**	.766**	.779**
User fee	Sig. (2-tailed)	.000	.000	.000		.000	.000
	N	205	205	205	205	205	205
	Pearson Correlation	.762**	.568**	.755**	1	.804**	.796**
Coverage	Sig. (2-tailed)	.000	.000	.000	.000		.000
	N	205	205	205	205	205	205
	Pearson Correlation	.759**	.552**	.766**	.804**	1	.864**
Reliable service	Sig. (2-tailed)	.000	.000	.000	.000	.000	
	N	205	205	205	205	205	205
	Pearson Correlation	.802**	.646**	.779**	.796**	.864**	1

C. Regression Analysis: 1st independent Variable (infrastructure provision with customer satisfaction)

Model		Coefficients ^a		Standardized Coefficients	t	Sig.
		Unstandardized Coefficients				
		B	Std. Error	Beta		
1	(Constant)	.780	.242		3.229	.001
	DTD waste collection	.157	.076	.157	2.058	.041
	Provision of infrastructure	.091	.135	.087	.673	.023
	Repair and maintenance	.080	.079	.087	1.008	.315
	Conduct of staff	.021	.098	.022	.218	.828
2	(Constant)	.845	.348		2.432	.016
	DTD waste collection	.169	.077	.169	2.183	.030
	Provision of infrastructure	.108	.137	.104	.789	.043
	Repair and maintenance	.065	.080	.071	.818	.415
	Conduct of staff	.025	.099	.026	.256	.798
	Gender	-.172	.119	-.083	-1.444	.150
	Age	-.007	.004	-.091	-1.566	.119
	Edu	.015	.099	.009	.152	.879
	Income	.008	.023	.019	.327	.744

a. Dependent Variable: Coverage

Model		Coefficients ^a		Standardized Coefficients	t	Sig.
		Unstandardized Coefficients				
		B	Std. Error	Beta		
1	(Constant)	.702	.189		3.712	.000
	DTD waste collection	.231	.060	.261	3.877	.000
	Provision of infrastructure	.232	.106	.253	2.199	.029
	Repair and maintenance	.061	.062	.076	.995	.321
	Conduct of staff	.032	.077	.037	.415	.679
2	(Constant)	.529	.268		1.972	.050
	DTD waste collection	.239	.060	.270	4.002	.003
	Provision of infrastructure	.231	.106	.252	2.193	.029
	Repair and maintenance	.043	.061	.054	.706	.481
	Conduct of staff	.042	.076	.050	.553	.581
	Gender	-.142	.092	-.078	-1.551	.123
	Age	-.006	.003	-.089	-1.753	.081
	Edu	.105	.076	.072	1.383	.168
	Income	.025	.018	.069	1.390	.166

a. Dependent Variable: Reliable Service

Regression Analysis: 2nd independent Variable (service quality with customer satisfaction)

Model		Coefficients ^a				
		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.194	.163		1.190	.236
	Perception on quality of service delivery	.375	.094	.338	3.977	.009
	Perception on responsiveness to complaints	-.097	.078	-.089	-1.244	.215
	Cleanliness level	.288	.063	.281	4.565	.001
	User fee	.410	.065	.400	6.258	.001
2	(Constant)	.449	.220		2.040	.043
	Perception on quality of service delivery	.368	.094	.332	3.923	.003
	Perception on responsiveness to complaints	-.083	.078	-.075	-1.060	.291
	Cleanliness level	.283	.063	.276	4.521	.006
	User fee	.422	.065	.412	6.506	.001
	Gender	-.141	.078	-.068	-1.818	.071
	Age	-.007	.003	-.090	-2.408	.017
	Edu	.003	.064	.002	.052	.959
	Income	.003	.015	.009	.231	.817

a. Dependent Variable: coverage of waste collection

Model		Coefficients ^a				
		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.316	.137		2.304	.022
	Perception on quality of service delivery	.293	.080	.299	3.677	.002
	Perception on responsiveness to complaints	.032	.066	.033	.480	.632
	Cleanliness level	.245	.053	.270	4.591	.005
	User fee	.295	.055	.327	5.351	.003
2	(Constant)	.306	.184		1.667	.097
	Perception on quality of service delivery	.280	.078	.286	3.580	.001
	Perception on responsiveness to complaints	.046	.065	.048	.712	.477
	Cleanliness level	.251	.052	.277	4.809	.007
	User fee	.300	.054	.332	5.546	.002
	Gender	-.104	.065	-.057	-1.597	.112
	Age	-.005	.002	-.074	-2.081	.039
	Edu	.111	.053	.075	2.079	.039
	Income	.024	.012	.068	1.954	.052

a. Dependent Variable: Reliable Service

D. ANOVA Tests for 3rd sub research question:

i. Both income groups with “cleanliness level”

Descriptives

Income Group		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
1		6	1.67	.516	.211	1.12	2.21	1	2
2		34	1.50	.508	.087	1.32	1.68	1	2
3		236	1.47	.500	.033	1.40	1.53	1	2
4		111	1.52	.502	.048	1.43	1.62	1	2
5		21	1.76	.436	.095	1.56	1.96	1	2
Total		408	1.50	.501	.025	1.45	1.55	1	2

ANOVA

Income Group	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.932	4	.483	1.945	.102
Within Groups	100.065	403	.248		
Total	101.998	407			

ii. Both income groups with “user fee”

Descriptives

Income Group		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
1		12	1.58	.515	.149	1.26	1.91	1	2
2		13	1.77	.439	.122	1.50	2.03	1	2
3		252	1.47	.500	.031	1.41	1.53	1	2
4		109	1.50	.502	.048	1.41	1.60	1	2
5		22	1.68	.477	.102	1.47	1.89	1	2
Total		408	1.50	.501	.025	1.45	1.55	1	2

ANOVA

Income Group	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.007	4	.502	2.022	.091
Within Groups	99.991	403	.248		
Total	101.998	407			

iii. Both income groups with “perception on quality of service”

Descriptives

Income Group		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
1		7	1.57	.535	.202	1.08	2.07	1	2
2		32	1.63	.492	.087	1.45	1.80	1	2
3		118	1.42	.496	.046	1.33	1.51	1	2
4		232	1.50	.501	.033	1.44	1.56	1	2
5		19	1.79	.419	.096	1.59	1.99	1	2
Total		408	1.50	.501	.025	1.45	1.55	1	2

ANOVA

Income Group	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.812	4	.703	2.856	.023
Within Groups	99.186	403	.246		
Total	101.998	407			

