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Level of service delivery of public transport and mode choice in Accra, Ghana

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ABSTRACT

Worsening traffic congestion and air quality has been associated with the proliferation of informal operation of private microbus and minibus in African cities. It is recognised that large buses hold the promise of relieving the growing congestion of African cities if they are managed efficiently and sustainably.

It is in line with this that this study seeks to explore the reasons behind commuters' non-preference of Metro Mass Transit (MMT) for intra-city commuting in Accra, Ghana. A revealed preference survey was administered to 134 commuters to find out the reasons behind their non-preference and their perception of the level of service (LOS) delivery of the Metro Mass Transit.

The Study revealed that though Metro Mass Transit was 20% cheaper in terms of price, commuters perceived its service delivery as poor. Over-crowding of buses, non-adherence to time schedule, long in-vehicle time, perception of not getting access to seats, non-availability of bus at respondents' origins and destinations, accessibility of alternative modes and long waiting times for buses accounted for the major reasons for non-preference.

Metro Mass Transit Limited's improvement in its service attributes especially in-vehicle time, waiting time, comfort, reliability and accessibility is a means of increasing its modal share. Adherence to these is the surest way to achieving the objective of promoting mass transit in Accra by shifting people from the use of unsustainable modes such as mini-buses and taxis to the use of efficient high capacity systems as Metro Mass Transit.

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1. Background of study

The contributions of the transportation sector to the sustainability of cities have been widely recognised. It has been inseparably linked to the climate-change challenge since it is currently responsible for 13% of Greenhouse Gas (GHG) emissions worldwide and 23% of total energy-related GHG emissions (UN Habitat, 2011, cited in Cervero (2013)). Worsening traffic congestion and air quality have been associated with the proliferation of informal operators, such as the private microbus and minibus in most African cities. These mini-buses have been said to be typically composed of second-hand vehicles which are inadequately maintained; operated for long hours at low speed as well as characterised by unpredictability of routes, schedules, and fares. This presents clear disadvantages from the perspective of public interest. However, twice as many trips

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are taken by mini-buses than by large buses in most African cities (Kumar and Barrett (2008). The way forward has been a shift towards more sustainable modes of transport such as public transport and the integration of non-motorised transport.

In Accra, Ghana, the vast majority of public transport services are provided by the informal sector; a mix of buses, mini-buses (trotro) and taxis (IBIS Transport Consultants Ltd., 2005). These privately operated public transport services provide about 95% of the bulk of urban bus passenger transport in cities like Accra (Kumar, Kwakye, Girma, 2004). The only formal bus transport being provided in Ghana is by the Metro Mass Transit (MMT) Limited (IBIS Transport Consultants Ltd., 2005).

The mandate of MMT is to carry on the business of mass transportation in Ghana; in all its aspects and other businesses incidental to it, including provision of contract bus services and school bussing services. The MMT was established in response to public concerns about increasing traffic congestion and transport fares posed mostly taxis and mini-buses which dominate public transport in Ghana. In addition to this, the establishment of the Company was to bring instant relief to travellers especially in Metropolitan and Municipal areas by promoting mass transportation by re-introducing high occupancy vehicles to maximize the person-carrying capacity (Salifu, 2004). It also aims at providing services that are effective and satisfy the needs of its users through reduced travel times, journey delays and waiting times as well as travel comfort and efficiency at affordable prices. In support of government's pro-poor policy therefore, the Company charges lower fares ensuring affordability to the poor, run on routes generally considered unattractive and unprofitable by private transport operators (in terms of state of road and patronage), implantation of free bus ride for school children in uniform up to Junior High School level, as well as influencing and stabilizing transport fares throughout the country (Unpublished Report, 2011).

With the inauguration of the MMT and its provision of intra-city bus services in Accra since 2003, one would expect a change in the modal preference or choice of minibuses as the primary public transport for trips. However, Abane (2011), in a study on travel behaviour in Ghana, observed that mini-buses (trotro) operating under the umbrella of the Ghana Private Road Transport Union (GPRTU) is still the most preferred mode for trips in major cities of the country such as Accra. The Study therefore explores how the Level of Service (LOS); a quality measure describing operational conditions within a traffic stream, generally in terms of such service measures as speed and travel time, freedom to manoeuvre, traffic interruptions, and comfort and convenience (Ali, 2010) of MMT affects passengers' mode choice in Accra. Specifically, the study aims to find out reasons why commuters do not prefer the MMT buses as their primary mode of transport in Accra. The study also explores the differences in the perceptions of LOS of MMT in;

- (i) Frequent-users, Occasional-users and Non-users,
- (ii) Males and females,
- (iii) Age of travellers and,
- (iv) Average monthly income.

It must be noted that though Non-users do not use the system, they have been included in further analysis. This is find out their reasons for non-usage. As asserted by Beirão and Cabral (2007), citing Fujii and Kitamura (2003); though travel behaviour is influenced by the service level of the transport system, the dependence is not directly related to the objective service level, but is influenced by psychological factors such as perceptions, attitudes and habits. Therefore to attract more users to the public transport system, it is important to know more about the psychological factors that influence mode choice. Also asking Non-users their perceptions about public transport is important in understanding the reasons for non-use, how they would feel if they had to use public transport and what would make them switch to alternative modes (Beirão & Cabral, 2007).

The socio-demographic characteristics of a trip maker are some of the well-known factors in transport literature which has influence on mode choice. Carrion et al. (2011) observe that travellers' characteristics have been incorporated in mode choice models in order to control for (observed) heterogeneity. They also assert that the evaluation of attributes may differ across travellers, and thus the inclusion of travellers' characteristics allows for market segmentation. They also give credence to the importance of income, gender, auto ownership, age, occupation, number of licensed drivers in the household, among others. It is in line with this that the study explores the differences in the socio-demographic characteristics of respondents.

2. Methods

2.1. Participants and procedure

This study measured level of service based on variables which include reliability, frequency, accessibility, travelling time, ease of transfer, price, vehicle condition, safety, comfort and aesthetics. These 10 variables were broken down to cover a total of 19 indicators on which MMT's level of service was measured. On a Likert scale of excellent to poor, commuters assessed the level of service of MMT based on how they perceived it. This assessment was done by three categories of commuters; Frequent-users of MMT, Occasional-users and Non-users of MMT.

The MMT has four terminals (Achimota, Madina, Accra Central and Kaneshie) in Accra where all journeys start or end. Data was collected at these four main geographical areas of the city which have been revealed by Abane (2011) to control 80% of passenger traffic in the Accra metropolis. These terminals also possess most vehicles plying various destinations in and around the Metropolis.

Commuters at the selected terminals were randomly approached and asked a screening question “How often do you use MMT?” Based on the respondents’ responses, they were then categorised into Frequent, Occasional and Non-users of MMT and applicable questionnaires were administered to them. Frequent-users are defined as commuters who used the bus services every day, between 3 and 6 days a week as well as 1–2 days in a week. Category of passengers who patronised the bus services once or twice within a month or as and when the occasion arose are classified as Occasional-users. Non-users on the other hand are considered as categories of commuters who have never used the intra-city service of the MMT or used it three or more years back.

Both self-administered and researcher-administered methods were used in collecting data. Questions were read aloud in English or translated to vernacular (Akan) where respondents did not understand English. Some questionnaires were also administered on-board buses to solicit user perception. A total of 150 respondents were interviewed, resulting in 134 completed questionnaires and a response rate of 89.3%. An official from the Planning and Research Department of MMT with in-depth knowledge on the operations and service delivery of the Company was purposively sampled to acquire detailed information on the service delivery of the Company.

2.2. Materials

An interview schedule was used to collect revealed preference data from commuters. Questionnaires were pretested to avoid ambiguity. This was also to ensure that the content of the research was understood by respondents before the actual survey was conducted. An interview guide was used to collect information from the MMT as a bus service provider.

Concepts used in this study are based on reviewed literature from academic articles, journals, and books. Archived reports and academic articles are referenced in the data analysis to triangulate and valid results from field studies. These sources give various ways in which LOS attributes are measured, taking into consideration different indicators. The working definitions of these indicators are present in [Table 1](#) below.

2.3. Data analysis

Simple statistical frequency analysis was used in this study to evaluate service levels/quality. This because the main aim of the study is to explore why commuters do not prefer to use public transit in Accra. Data was edited, coded and captured using Statistical Package for Social Sciences (SPSS). It was then interpreted using frequency tables, custom tables and cross tabulations where appropriate. Charts and graphs were also generated using excel spread sheets. Some results were interpreted using statistical tests of association such as independent sample tests and Analysis of Variance (ANOVA).

Simple narrative analysis was used in interpreting the qualitative aspects of the survey. This method gives an overview of the situation as perceived by participants. With the help of excel, open-ended responses of respondents were collated and interpreted.

3. Results and discussion

3.1. Demographic and travel characteristics of respondents

Gender, age, employment status and monthly incomes of respondents were generally solicited from all respondents. In all, 134 commuters were sampled for interview. These comprised of 60 Non-users, 40 Occasional and 34 Frequent-users.

Table 1
LOS attributes and defined indicators.

LOS attribute	Indicator
Reliability	– Adherence to time schedule
Frequency	– Days and hours of service provision
Accessibility	– Availability of bus at trip origin and destination and – Distance/time taken to get to the transit station
Travelling time	– In-vehicle time – Waiting time – Walking time/distance to destination
Price	– Cost of fare
Ease of transfer	– How simple transport connections
Vehicle condition	– Physical appearance of vehicles – Mechanical condition of vehicles (how often vehicles broke down)
Comfort	– Access to seat – Crowding on the bus – Noise levels – Driver handling
Safety	– Safety from traffic accidents – Security of goods/luggage
Aesthetics	– Cleanliness of vehicles – Cleanliness of stations/waiting areas to users' senses

Table 2
Gender of respondents.

Sub groups	Count	Male (N %)	Female (N %)
Non-users	60	53.3	46.7
Occasional-users	40	55.0	45.0
Frequent-users	34	50.0	50.0

Table 3
Age by gender of respondents.

Age categories	Non-users (N %)		Occasional-users (N %)		Frequent-users (N %)	
	Male	Female	Male	Female	Male	Female
18–25	3.3	3.3	2.5	5.0	14.7	11.8
26–39	40.0	38.3	30.0	35.0	26.5	29.4
40–59	10.0	5.0	12.5	15.0	8.8	8.8
Mean age (M)	31.3		34.9		33.1	

Table 4
Monthly income range of respondents.

Monthly income range	Non-users		Occasional-users		Frequent-users	
	Count	Percent	Count	Percent	Count	Percent
Less than GHC200	6	10.0	1	2.5	15	44.1
GHC201 - GHC400	4	6.7	3	7.5	7	20.6
GHC401 - GHC600	8	13.3	3	7.5	3	8.8
GHC601 - GHC800	18	30.0	19	47.5	5	14.7
Above GHC800	24	40.0	11	27.5	3	8.8
No income	0	0.0	3	7.5	1	2.9
Total	60	100.0	40	100.0	34	100

*GHC1 = \$0.33 (Bank of Ghana, 2014).

Out of the total sample, there was an even divide between males and females each constituting 50% of the sample. This however differed on sub-group level. Table 2 gives a summary below.

Respondents between the ages of 18 and 57 years were interviewed. The minimum and maximum ages for Non-users were 23 years and 51 years. Occasional-users ranged from 22 years to 57 years. The minimum age among Frequent-users 18 years while the maximum is 51 years. Table 3 below gives a summary of mean ages and a cross tabulation of age by gender.

An analysis of the employment status of respondents show that respondents were self-employed, students, government workers or were employed by the private sector. A further analysis among the different categories of respondents indicates that almost half (47.1) of Frequent-users were self-employed whereas a high of 45% of Non-users worked in the private sector. It is further observed that Government employees were high (55%) among Occasional-users. This denotes that people with diverse backgrounds patronise the bus services.

The high number of low income earners among Frequent-users is a reflection of the fact that most of them are self-employed in the informal sector with relatively low incomes. This lends credence to the fact that commuters who frequently use MMT buses are low income earners due to the relatively low fares (see Table 4).

3.1.1. Purpose of travel by type of mode

The study revealed that respondents used different modes for varied travel purposes. Generally, travels were for economic, socio-cultural and education purposes. By mode type, taxis were mostly used for attending social events among all respondents. With the exception of Frequent-users, mini-buses were typically used for work purposes. Among Frequent and occasional MMT bus users, MMT buses were often used for social events and work purposes. Detail descriptions are depicted in Figs. 1–3 and Tables 5 and 6.

3.1.2. Combination of modes for travel

For various reasons such as avoiding traffic, difficulty in obtaining a mode directly to one's destination, fare affordability, accessibility and availability, faster travel, reaching destination on time and getting to the MMT bus stations among other reasons, some respondents do combine modes. More than half (51.7%) of Non-user respondents combined modes. Contrastingly, only about 20% of Occasional-users combined modes while there was an even split between those who combined

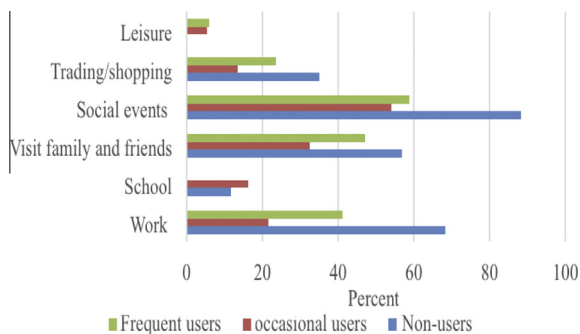


Fig. 1. Purpose of travel by taxi.

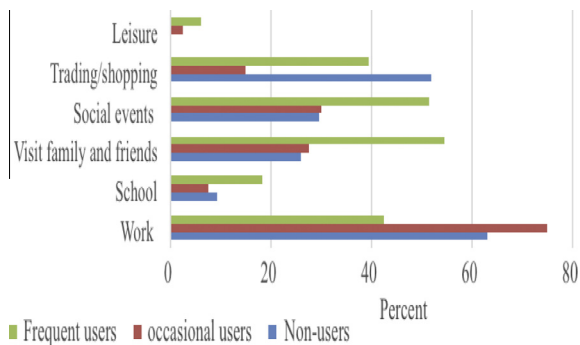


Fig. 2. Purpose of mini-bus use.

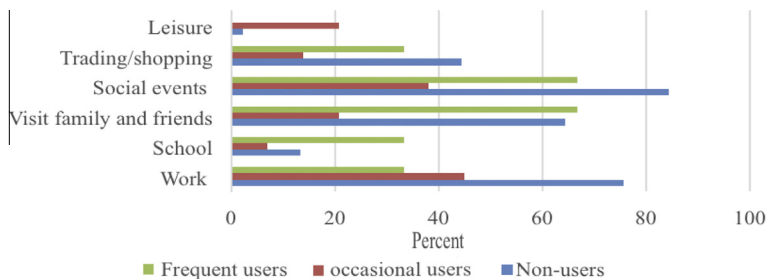


Fig. 3. Purpose of private car use.

Table 5
Purpose of travel by MMT (Frequent-users).

	Responses		Percent of cases
	N	Percent	
Work	15	25.0%	44.1%
School	6	10.0%	17.6%
Visit family and friends	10	16.7%	29.4%
Social events (e.g. funerals, church, wedding, etc.)	8	13.3%	23.5%
Market/shopping	19	31.7%	55.9%
Leisure	2	3.3%	5.9%
Total	60	100.0%	176.5%

a. Dichotomy group tabulated at value 1. (Case Percent based on multiple choice)

mode and those who did not combine modes in the Frequent-users category. The study revealed that mini-buses and taxis were the most frequently used public transport modes. This gives credence to the study by Abane (2011) on travel behaviour in Ghana that trotros (mini-buses) and taxis are the preferred modes of travel.

Table 6
Purpose of travel by MMT (Occasional-users).

	Responses		Percent of Cases
	N	Percent	
Work	16	23.2%	41.0%
School	4	5.8%	10.3%
Visit family and friends	10	14.5%	25.6%
Social events (e.g. funerals, church, wedding, etc.)	24	34.8%	61.5%
Market/shopping	15	21.7%	38.5%
Total	69	100.0%	176.9%

a. Dichotomy group tabulated at value 1. (Case Percent based on multiple choice)

The study revealed that MMT offers the lowest and stable fare (20% less) owing to the government absorption of the cost of fare for use of MMT. This notwithstanding, it accounts for a low modal share among the commuting public. It has been established by Paulley et al. (2006) that “fares and patronage of a public transport system are inversely related”. The study findings contrast the position advanced by Paulley et al. (2006). An interview with an official from the MMT revealed that the current fleet size (as at the time of study (231) of the company was inadequate to compete favourably with other modes of public transport especially mini-buses which has the highest modal share. The situation is worsened by the frequent mechanical breakdowns of MMT vehicles mostly from bad roads.

3.2. Reasons for non-preference of MMT bus services

Respondents were questioned as to their non-usage of the MMT buses. The main responses acquired from Non-users centred on over-crowding, non-adherence to time schedule, long in-vehicle time, and the perception of not getting access to a seat on the bus. Among other reasons are non-availability of bus at respondents' origins and destinations, accessibility of alternative modes, long waiting times for the bus and purpose of trips. This implies that reliability and frequency, travelling time, comfort and ease of continuity are attributes commuters greatly consider when choosing a mode of travel.

Respondents had divergent opinions when asked to rank five top-most factors that discouraged them from using MMT bus services. It was revealed that time spent in bus (36.7%), access to seat on bus (13.3%), crowding on the bus (10%), adherence to time (18.3) were the most constantly chosen discouraging factors. Walking time/distance to transit station, ease of transfer, safety from traffic accidents, security of luggage, were among the least considered discouraging factors to the use of MMT buses.

3.3. Perception of level of service delivery of MMT among commuters in Accra

Perception plays an important role in the choice of mode for travel. The use of MMT buses as primary intra-city mode may or may not be affected by the perception commuters have on its level of service. Respondents were asked to rate the services of MMT in terms of LOS factors such as reliability, frequency, travelling time, accessibility and price, ease transfers, vehicle condition, comfort, safety and aesthetics. These factors were further broken down into specific indicators to allow for easy of rating by respondents.

3.3.1. LOS perception of Non-users

According to Non-users rating, MMT performed well in terms of price, scoring a mean average of 4.0. This is succeeded by good performance in terms of safety (safety from traffic accidents $M = 2.98$ and security of goods/luggage $M = 3.02$). With the exception of driver handling ($M = 3.0$), Non-users perceived the performance of MMT in terms of comfort as below average. Crowding on the buses ($M = 1.23$) and access to a seat on the bus ($M = 1.42$), are thus poorly rated. From the perspective of Non-users, MMT services were not reliable ($M = 1.55$), fairly frequent and accessible with an almost good ($M = 2.75$) ease of transfer. Though respondents perceived waiting time at station ($M = 2.32$) and walking time/distance destination ($M = 2.45$) to be fair, MMT delivered poorly with time spent in bus ($M = 1.08$) to reach destination.

3.3.2. Perception of Occasional-users

In the opinion of Occasional-users, MMT performed averagely in some LOS factors and fair to poor in other service factors. Price was the LOS factor in which MMT was rated as very good ($M = 4.53$). Occasional-users rated MMT's service delivery as fair when reliability, accessibility and aesthetics are considered. MMT was however rated good when it came to safety, vehicle conditions, ease of transfer and some aspects of comfort (driver handling).

On the other hand, respondents were not happy about services they received in terms of crowding on bus ($M = 1.63$), and time spent in bus travelling ($M = 1.35$). Thus these indicators were rated as poor. Respondents asserted that it takes longer time for them to get to their destination due to the fact that the buses stopped frequently and most often unnecessarily to allow passengers alight and board. Especially during peak hours, more passengers are allowed to board even when the buses have reached their maximum capacities; thereby increasing the level of crowdedness on the buses.

3.3.3. Perception of Frequent-users

Comparatively, respondents who patronised the services of MMT on frequent basis did not differ extensively from occasional and Non-users even though from their perspective, MMT's performance in most service indicators was above average. In terms of safety, frequency of service, ease of transfer, vehicle conditions and some aspects of comfort (driver handling and access to seat), MMT's service delivery was considered close to very good by Frequent-users. Similar trends are observed when cost of fare and crowding on buses are considered. However, Frequent-users differed slightly in opinion on waiting time. Whereas, Occasional and Non-users rated waiting at station as fair ($M=2.58$ and 2.32 respectively), 55.9% of Frequent-users revealed that waiting times were very long (waiting time exceeding 20 min) and as such a poor score ($M=1.65$). Table 9 below gives a comparative LOS rating by all user categories.

3.3.4. Perception of all respondents (Non-users, Occasional-users, Frequent-users)

From the above observations (refer to Tables 7–9) there are not a lot of significant differences in perception among the sub-groups on many attributes. However, significant differences are observed between Non-users (Table 7) and Frequent-users (Table 9) when noise level on buses is taken into consideration. Another significant difference is noted between Non-users and Frequent-users on the attribute of cleanliness of the waiting areas. While a small percentage of Non-users (5%) perceived noise levels on buses to be poor, more than half (52.9%) of Frequent-users perceived noise levels to be poor. This suggests that because Non-users do not use the buses they may not have actually experienced the level of noise; whereas Frequent-users have a feel of noise levels because they use the buses.

A similar trend is observed between Non-users and Frequent-users on the attribute of cleanliness of waiting areas. A higher percentage (38.2) of Frequent-users compare to a lower percentage (13.3) of Non-users perceived waiting areas to be poor. This could possibly be attributed to the actual experience of Users than that Non-users.

3.4. Perception of MMT's LOS and mode choice

The relative importance of quality attributes in affecting public transport demand is to a large extent dependent on user demographics, personal situations and previous experiences with public transport services (Redman, Friman, Gärling, & Hartig, 2013). Table 10 depicts the differences or otherwise in the perception rating of MMT among the three groups of respondents.

The test results from a one-way ANOVA, indicated that there are significant differences in how Frequent, Occasional and Non-users perceived the level of service of the MMT in terms of reliability ($F(2,133)=14.707$, $p<0.05$; frequency ($F(2,133)=38.683$, $p<0.05$; in-vehicle time ($F(2,133)=45.388$, $p<0.05$; waiting time ($F(2,133)=14.346$, $p<0.05$; cost of fare ($F(2,133)=10.529$, $p<0.05$; seat access ($F(2,133)=61.056$, $p<0.05$; crowding ($F(2,133)=7.700$, $p<0.05$; and safety ($F(2,133)=17.346$, $p<0.05$. There was however no significant difference among respondents in how they perceived accessibility (in terms of availability of bus at origins and destinations) $p=0.288$; aesthetics (cleanliness of vehicles and waiting areas) $p=0.425$ (0.653).

An independent-samples t -test was conducted to compare the differences in perception of males and females on the LOS delivery of MMT. The test revealed that there was no significant difference between males and females on all the LOS indicators except for scores between males ($M=2.32$, $SD=0.96$) and females ($M=2.32$, $SD=0.96$); $t(132)=-2.66$, $p=0.009$ on

Table 7
Perception of LOS rating by Non-users.

LOS factors	Service attributes	Mean score	Std. deviation	Valid percent				
				Excellent	Very good	Good	Fair	Poor
Reliability	Adherence to time schedule	1.55	.87188	1.7	1.7	10.0	23.3	63.3
Frequency	Days & hours of operation	2.43	.56348	0.0	1.7	41.7	55.0	1.7
Accessibility	Availability at trip origin and destination	2.43	.53256	0.0	0.0	45.0	53.3	1.7
	Distance to station	2.28	.52373	0.0	0.0	31.7	65.0	3.3
Travelling time	Time spent in bus	1.08	.53016	1.7	0.0	0.0	1.7	96.7
	Walking time to dest.	2.45	.67460	0.0	6.7	35.0	55.0	3.3
	Waiting time	2.32	.56723	0.0	1.7	31.7	63.3	3.3
Price	Cost of fare	4.0	.58222	16.7	66.7	16.7	0.0	0.0
Ease of transfer	Ease of continuity with different mode	2.75	.54072	0.0	3.3	70.0	25.0	1.7
Vehicle conditions	Physical condition	2.82	.53652	0.0	3.3	78.3	15.0	3.3
	Mechanical condition	2.8	.57637	0.0	6.7	68.3	23.3	1.7
Comfort	Access to seat on bus	1.42	.64550	0.0	0.0	8.3	25.0	66.7
	Crowding on bus	1.23	.46456	0.0	0.0	1.7	20.0	78.3
	Driver handling	3.0	.82339	3.3	21.7	48.3	25.0	1.7
Safety	Noise level	2.33	.60132	0.0	1.7	35.0	58.3	5.0
	Safety from accidents	2.98	.59636	1.7	11.7	70.0	16.7	0.0
Aesthetics	Security of luggage	3.02	.62414	3.3	8.3	76.7	10.0	1.7
	Cleanliness of vehicle	2.72	.71525	3.3	0.0	66.7	25.0	5.0
	Cleanliness of waiting area	2.2	.65871	0.0	0.0	33.3	53.3	13.3

Table 8

Perception of level of service rating by Occasional-users.

	LOS indicators	Mean score	Std. deviat.	Valid percent				
				Excellent	Very good	Good	Fair	Poor
Reliability	Adherence to time schedule	2.55	.87560	2.5	7.5	42.5	37.5	10
Frequency	Days & hours of operation	2.56	.81296	2.6	10.3	30.8	53.8	2.6
Accessibility	Availability at trip origin and destination	2.53	.90547	0	15	35	37.5	12.5
	Distance to station	2.73	.93336	2.5	15	45	27.5	10
Travelling time	Time spent in bus	1.35	.73554	0	2.5	7.5	12.5	77.5
	Walking time to dest.	3.13	.72280	2.5	22.5	62.5	10	2.5
	Waiting time	2.58	.87376	0	10	52.5	22.5	15
Price	Cost of fare	4.53	.75064	65	25	7.5	2.5	0
Ease of transfer	Ease of continuity with different mode	3.00	.64051	0	20	60	20	0
Vehicle conditions	Physical condition	3.00	.78446	0	27.5	47.5	22.5	2.5
	Mechanical condition	3.08	.76418	0	30	50	17.5	2.5
Comfort	Access to seat on bus	2.3	.96609	5	7.5	12.5	62.5	12.5
	Crowding on bus	1.63	.77418	2.5	0	2.5	47.5	47.5
	Driver handling	3.64	.81069	7.5	61.5	17.9	12.8	0
Safety	Noise level	2.28	.71567	0	10.5	12.5	72.5	5
	Safety from accidents	3.55	.90441	17.5	30	42.5	10	0
Aesthetics	Security of luggage	3.73	.90547	20	42.5	27.5	10	0
	Cleanliness of vehicle	2.48	.90547	2.5	10	30	47.5	10
	Cleanliness of waiting area	2.33	.88831	0	12.5	22.5	50	15

Table 9

Perception of level of service rating by Frequent-users.

	LOS indicators	Mean scores	Std. deviation	Excellent	Very good	Good	Fair	Poor
Reliability	Adherence to time schedule	2.41	1.30541	5.9	17.6	23.5	17.6	35.3
Frequency	Days & hours of operation	3.76	.88963	23.5	35.3	35.3	5.9	0
	Availability at trip origin and destination	2.73	1.22402	5.9	20.6	32.4	17.6	20.6
Accessibility	Distance to station	2.71	.97014	0	17.6	52.9	11.8	17.6
Travelling time	Time spent in bus	2.53	.96091	5.9	2.9	41.2	38.2	11.8
	Walking time to dest.	2.68	1.06517	2.9	14.7	50	11.8	20.6
	Waiting time	1.65	.91725	2.9	0	11.8	29.4	55.9
Price	Cost of fare	4.56	.74635	70.6	14.7	14.7	0	0
Ease of transfer	Ease of continuity with different mode	3.85	.92548	26.5	38.2	32.4	0	2.9
Vehicle conditions	Physical condition	3.62	.77907	14.7	35.3	47.1	2.9	0
	Mechanical condition	3.62	.85333	11.8	47.1	35.3	2.9	2.9
Comfort	Access to seat on bus	3.62	1.25565	32.4	20.6	32.4	5.9	8.8
	Crowding on bus	1.88	1.20012	2.9	11.8	11.8	17.6	55.9
	Driver handling	3.79	.76986	11.8	61.8	23.5	0	2.9
	Noise level	1.65	.81212	0	2.9	11.8	32.4	52.9
Safety	Safety from accidents	3.88	.76929	20.6	50	26.5	2.9	0
	Security of luggage	3.59	1.01854	14.7	47.1	26.5	5.9	5.9
Aesthetics	Cleanliness of vehicle	2.65	1.17763	2.9	23.5	32.4	17.6	23.5
	Cleanliness of waiting area	2.15	1.13170	0	17.6	17.6	23.5	38.2

availability of buses at trip origins and destinations. As elsewhere discussed, the strategic location of most MMT terminals at major marketing centres, allow for increased patronage of traders, especially market women. Thus the observed significance between males and females.

For effects on whether there are significant differences in age categories in perception of MMT's LOS, a one-way ANOVA was conducted. The results revealed insignificant differences in age for most LOS indicators ($p > 0.05$). Significant differences are however observed in LOS factors such as Frequency; travelling time (time in bus); walking time/distance to destination; waiting time at station and ease of transfer respectively.

A Tukey post hoc test showed significant differences existed for instance between age category 18–25 ($M = 2.5$, $SD = 0.9$, $p = 0.043$) and age category 40–59 ($M = 3.2$, $SD = 0.9$, $p = 0.043$) as well as between age group 26–39 ($M = 2.6$, $SD = 0.8$, $p = 0.012$) and age group 40–59 ($M = 3.2$, $SD = 0.9$, $p = 0.012$) in rating of walking time/distance to destination. The ability to reach ones destination on time is an important factor for mode choice. The significant difference observed among these age groups can be attributed to the fact that students, government and private employees fall within these age categories. Therefore considering the distance one who have to walk to reach their destination especially during peak hours is important.

Table 10
ANOVA results of respondents perception of MMT's LOS.

LOS variables	ANOVA						
	LOS indicators		Sum of squares	df	Mean square	F	Sig.
Reliability	Adherence to time schedule	Btn groups	29.410	2	14.705	14.707	.000
		Wtn groups	130.985	131	1.000		
		Total	160.396	133			
Accessibility	Days and hours of operation	Btn groups	41.710	2	20.855	38.683	.000
		Wtn groups	70.626	131	.539		
		Total	112.336	133			
	Availability at trip origin and destination	Btn groups	1.283	2	.642	1.258	.288
		Wtn groups	99.433	131	.749		
		Total	97.098	133			
Distance to transit station	Btn groups	6.216	2	3.108	5.013	.008	
	Wtn groups	81.217	131	.620			
	Total	87.433	133				
Travelling time	In-vehicle time	Btn groups	47.227	2	23.613	45.388	.000
		Wtn groups	68.154	131	.520		
		Total	115.381	133			
	Walking time/distance to destination	Btn groups	10.983	2	5.492	8.497	.000
		Wtn groups	84.666	131	.646		
		Total	95.649	133			
Waiting time at station	Btn groups	16.761	2	8.380	14.346	.000	
	Wtn groups	76.523	131	.584			
	Total	93.284	133				
Price	Cost of fare	Btn groups	9.702	2	4.851	10.529	.000
		Wtn groups	60.357	131	.461		
		Total	70.060	133			
Ease of transfer	Ease of continuing trip with a different mode	Btn groups	27.023	2	13.511	28.773	.000
		Wtn groups	61.515	131	.470		
		Total	88.537	133			
Vehicle conditions	Physical condition/appearance of vehicle	Btn groups	14.241	2	7.120	15.288	.000
		Wtn groups	61.013	131	.466		
		Total	75.254	133			
	Mechanical condition of vehicles	Btn groups	14.521	2	7.260	14.323	.000
		Wtn groups	66.404	131	.507		
		Total	80.925	133			
Comfort	Access to seat on bus	Btn groups	105.345	2	52.673	61.056	.000
		Wtn groups	113.013	131	.863		
		Total	218.358	133			
	Crowding on bus	Btn groups	9.832	2	4.916	7.700	.001
		Wtn groups	83.638	131	.638		
		Total	93.470	133			
Driver handling	Btn groups	17.136	2	8.568	13.176	.000	
	Wtn groups	84.533	130	.650			
	Total	101.669	132				
Noise level on the bus	Btn groups	11.233	2	5.616	11.665	.000	
	Wtn groups	63.073	131	.481			
	Total	74.306	133				
Safety	Safety from traffic accidents	Btn groups	19.177	2	9.588	17.346	.000
		Wtn groups	72.413	131	.553		
		Total	91.590	133			
	Security of goods/luggage	Btn groups	14.150	2	7.075	10.391	.000
		Wtn groups	89.194	131	.681		
		Total	103.343	133			
Aesthetics	Cleanliness of vehicle	Btn groups	1.420	2	.710	.862	.425
		Wtn groups	107.923	131	.824		
		Total	109.343	133			
	Cleanliness of waiting area	Btn groups	.644	2	.322	.428	.653
		Wtn groups	98.640	131	.753		
		Total	99.284	133			

Btn = Between, Wtn = Within.

Lastly, a one-way ANOVA test revealed differences in the perception of various income groups on LOS factors such frequency (days and hours of operation), travelling time (time spent in bus, walking time/distance to destination, waiting time and comfort (access to seat, cleanliness of vehicles). Using seat access as an example, A Tukey post hoc test showed

Table 11
Independent samples test (gender).

	Levene's test for equality of variances		t-test for equality of means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. error difference	95% Confidence interval of the difference	
								Lower	Upper
Adherence to time schedule	.864	.354	-.392	132	.696	-.07463	.19034	-.45114	.30189
			-.392	130.643	.696	-.07463	.19034	-.45118	.30192
Days and hours of operation	3.958	.049	-1.415	132	.159	-.22388	.15819	-.53680	.08904
			-1.415	131.054	.159	-.22388	.15819	-.53682	.08906
Availability at trip origin and destination	4.246	.041	-2.656	132	.009*	-.38806	.14610	-.67706	-.09906
			-2.656	121.903	.009*	-.38806	.14610	-.67728	-.09884
Distance to transit station	.715	.399	.425	132	.672	.05970	.14052	-.21826	.33766
			.425	130.230	.672	.05970	.14052	-.21829	.33769
Time spent in bus	1.038	.310	.092	132	.927	.01493	.16153	-.30459	.33444
			.092	128.884	.927	.01493	.16153	-.30466	.33451
Walking time/distance to destination	.102	.750	.101	132	.919	.01493	.14707	-.27599	.30584
			.101	131.997	.919	.01493	.14707	-.27599	.30584
Waiting time at station	.099	.753	.824	132	.411	.11940	.14487	-.16716	.40597
			.824	131.524	.411	.11940	.14487	-.16717	.40598
Cost of fare	.284	.595	-1.192	132	.235	-.14925	.12520	-.39691	.09840
			-1.192	131.887	.235	-.14925	.12520	-.39691	.09840
Ease of continuing trip with a different mode	1.541	.217	-.846	132	.399	-.11940	.14112	-.39855	.15974
			-.846	131.908	.399	-.11940	.14112	-.39855	.15974
Physical condition/appearance	1.531	.218	.688	132	.493	.08955	.13022	-.16804	.34714
			.688	128.208	.493	.08955	.13022	-.16811	.34721
Mechanical condition (breakdowns)	.028	.867	.221	132	.826	.02985	.13525	-.23770	.29740
			.221	131.997	.826	.02985	.13525	-.23770	.29740
Access to seat on bus	2.969	.087	-.943	132	.347	-.20896	.22147	-.64705	.22914
			-.943	130.738	.347	-.20896	.22147	-.64708	.22917
Crowding on bus	4.444	.037	-.927	132	.356	-.13433	.14492	-.42099	.15233
			-.927	121.193	.356	-.13433	.14492	-.42122	.15257
Driver handling	2.400	.124	.553	131	.581	.08435	.15261	-.21754	.38624
			.554	127.337	.581	.08435	.15239	-.21720	.38590
Noise level on the bus	1.978	.162	-.576	132	.565	-.07463	.12947	-.33072	.18147
			-.576	129.830	.565	-.07463	.12947	-.33076	.18151
Safety from traffic accidents	.022	.882	-1.570	132	.119	-.22388	.14259	-.50594	.05818
			-1.570	131.682	.119	-.22388	.14259	-.50595	.05819
Security of goods/luggage	.065	.799	-.587	132	.559	-.08955	.15267	-.39156	.21245
			-.587	131.481	.559	-.08955	.15267	-.39157	.21246
Cleanliness of vehicle	.000	.992	.952	132	.343	.14925	.15671	-.16074	.45924
			.952	131.380	.343	.14925	.15671	-.16075	.45926
Cleanliness of waiting area	1.900	.170	-.598	132	.551	-.08955	.14964	-.38555	.20645
			-.598	130.299	.551	-.08955	.14964	-.38559	.20648

* Significant difference.

significant differences existed for instance between respondents who earned less than GH¢200 ($M = 3.0$, $SD = 1.5$, $p = 0.010$) and those who earned above GH¢800 ($M = 1.8$, $SD = 1.2$, $p = 0.010$).

All respondents in this study generally agreed that MMT's services ranked averagely with respect to driver handling, safety from traffic accidents, ease of transfer, security of good/luggage, physical and mechanical conditions of vehicles and seat access. In about eight of the indicators covering aspects of reliability (adherence to time schedule), frequency (hours and days of operation), accessibility (availability of bus at trip origins and destinations, walking time/distance to transit station), travelling time (time spent in bus, walking time/distance to destination), aesthetics (cleanliness of vehicle, and waiting areas); commuters perceptions were on the lower note, scoring MMT as fair. Its poorest performance indicator was hinged on the level of crowding on buses, waiting times and noise levels.

It was observed that Non-users of MMT perceive their services to be unreliable, fairly frequent and accessible in addition to being perceived as having a longer in-vehicle time. However, some Non-users are of the view that MMT performs well when safety from traffic accidents, security of goods/luggage and driver handling are considered. The perception of Occasional-users are similar to Non-users, adding that crowding on buses makes MMT's services poor. On the other hand, Frequent-users concurred with Non-users and Occasional-users on the poor performance of MMT when it comes to crowding and cost.

Considerable differences however existed in how Frequent-users rated MMT's service delivery on most indicators. They again scored above average to very good on indicators such as safety, frequency, ease of transfer, vehicle conditions, driver handling and access to seat. Differences are also pronounced when waiting time an important component of travelling time was considered. Whereas Frequent users considered it as poor expressing long waiting times for buses, Occasional and Frequent-users rather perceived it to be fair. This is largely because Frequent-users have more contact with the service than the other categories. Supported further with a one-way ANOVA test as depicted in Table 11, it can be said that the differences in the perception of users contributed to their level of use of MMT, thus either frequently, occasionally or not at all.

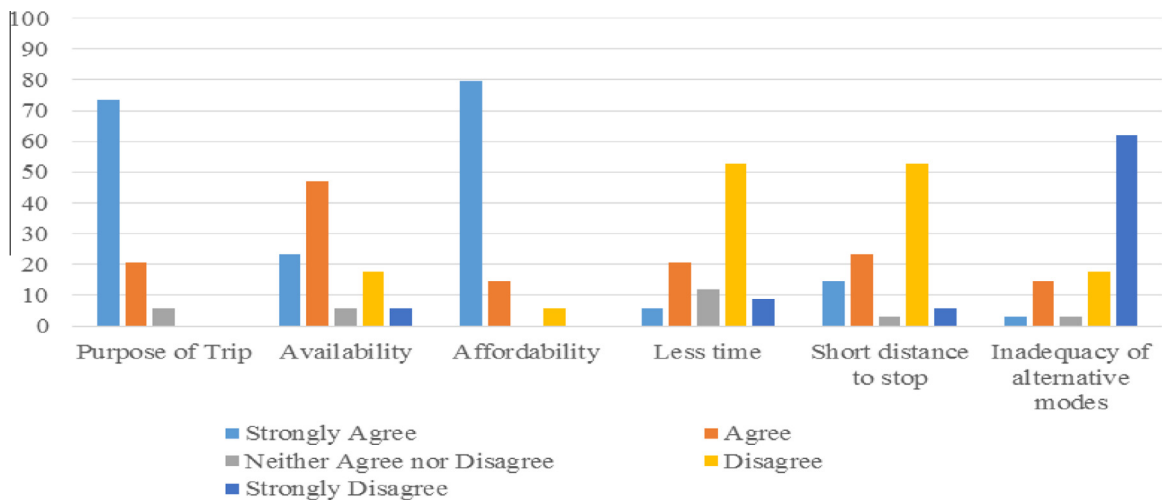


Fig. 4. Reasons for MMT use by Frequent-users.

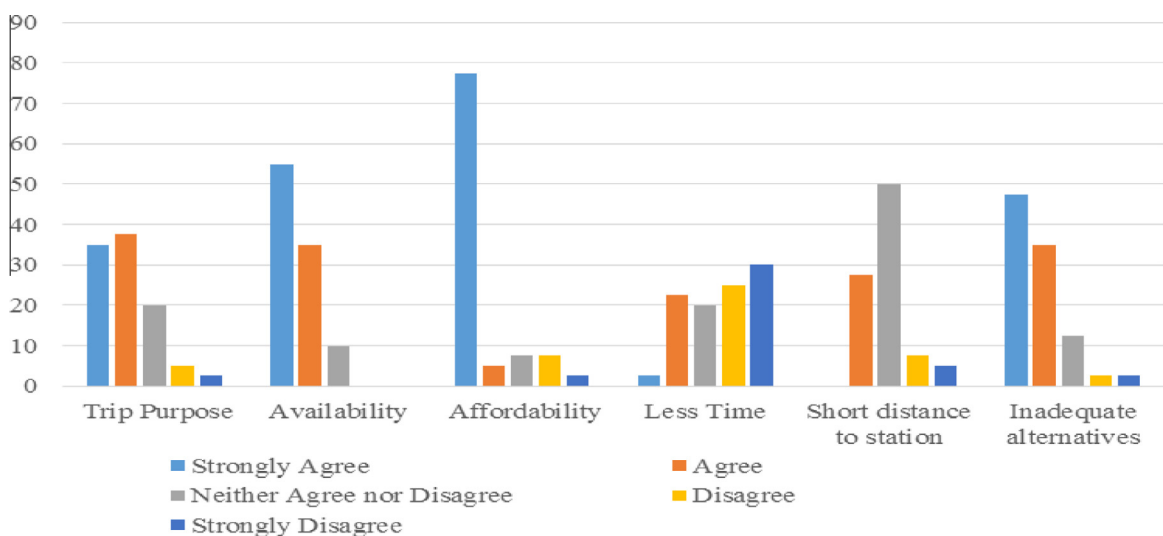


Fig. 5. Reasons for MMT use by Occasional-users.

Table 12
ANOVA results age categories.

ANOVA		Sum of squares	df	Mean square	F	Sig.
Adherence to time schedule	Btn Groups	3.051	2	1.525	1.270	.284
	Wtn Groups	157.345	131	1.201		
	Total	160.396	133			
Days and hours of operation	Btn Groups	5.687	2	2.843	3.493	.033*
	Wtn Groups	106.649	131	.814		
	Total	112.336	133			
Availability at trip origin and destination	Btn Groups	2.382	2	1.191	1.607	.204
	Wtn Groups	97.051	131	.741		
	Total	99.433	133			
Distance to transit station	Btn Groups	2.914	2	1.457	2.259	.109
	Wtn Groups	84.519	131	.645		
	Total	87.433	133			
In-vehicle time	Btn Groups	5.537	2	2.769	3.302	.040*
	Wtn Groups	109.843	131	.838		
	Total	115.381	133			
Walking time/distance to destination	Btn Groups	6.369	2	3.185	4.673	.011*
	Wtn Groups	89.280	131	.682		
	Total	95.649	133			
Waiting time at station	Btn Groups	9.989	2	4.995	7.855	.001*
	Wtn Groups	83.295	131	.636		
	Total	93.284	133			
Cost of fare	Btn Groups	.102	2	.051	.096	.909
	Wtn Groups	69.958	131	.534		
	Total	70.060	133			
Ease of continuing trip with a different mode	Btn Groups	7.168	2	3.584	5.770	.004*
	Wtn Groups	81.369	131	.621		
	Total	88.537	133			
Physical condition/appearance of vehicle	Btn Groups	3.069	2	1.535	2.785	.065
	Wtn Groups	72.184	131	.551		
	Total	75.254	133			
Mechanical condition of vehicles	Btn Groups	1.501	2	.750	1.238	.293
	Wtn Groups	79.425	131	.606		
	Total	80.925	133			
Access to seat on bus	Btn Groups	8.592	2	4.296	2.683	.072
	Wtn Groups	209.766	131	1.601		
	Total	218.358	133			
Crowding on bus	Btn Groups	.486	2	.243	.342	.711
	Wtn Groups	92.984	131	.710		
	Total	93.470	133			
Driver handling	Btn Groups	4.008	2	2.004	2.668	.073
	Wtn Groups	97.661	130	.751		
	Total	101.669	132			
Noise level on the bus	Btn Groups	2.119	2	1.060	1.923	.150
	Wtn Groups	72.187	131	.551		
	Total	74.306	133			
Safety from traffic accidents	Btn Groups	.304	2	.152	.218	.804
	Wtn Groups	91.285	131	.697		
	Total	91.590	133			
Security of goods/luggage	Btn Groups	1.351	2	.676	.868	.422
	Wtn Groups	101.992	131	.779		
	Total	103.343	133			
Cleanliness of vehicle	Btn Groups	3.766	2	1.883	2.337	.101
	Wtn Groups	105.577	131	.806		
	Total	109.343	133			
Cleanliness of waiting area	Btn Groups	3.119	2	1.560	2.125	.124
	Wtn Groups	96.164	131	.734		
	Total	99.284	133			

* Denotes significant LOS indicators; Btn = Between, Wtn = Within.

3.5. Increasing patronage of MMT

The underlining objective of measuring LOS by transit providers is to improve the service quality attributions considered important to customers and to attract more users. In spite of reasons given for not using MMT, there was a general consensus among Non-users to shift to the use of MMT, if factors which discouraged them from patronising the services are improved.

The study therefore tasked respondents to identify the top five factors Non-users would consider most important to their use of MMT. It was revealed that of all the LOS factors being assessed, in-vehicle time (time spent in bus travelling), access to seats, level of crowdedness on bus, adherence to time schedules and price; topped the list of most important factors. This implies that for MMT to increase its patronage, it needs to focus first on these aforementioned important factors to attract Non-users.

3.6. Reasons for use of MMT bus services

The study also sought to find out the factors which influenced the use of MMT from its users. It was revealed that as high as 79.4% of Frequent-users strongly agreed to the patronage of MMT bus services due to its fare affordability. Another 73.5% also strongly agreed that trip purposes contributed to their patronage. Most users (55.9%) patronised MMT for trading/shopping purposes. Due to their large capacities and space for luggage as well as the strategic locations of most MMT terminals to major marketing centres, it is not surprising that it is patronised mostly by traders and market women. For most Occasional-users, the use of MMT was largely due to its affordability and availability at their origins and destinations. Figs. 4 and 5 give graphical details.

In spite of the factors that influence users (both Frequent and Occasional) to patronise MMT certain factors also discourage their preference of the MMT buses. Among the 34 Frequent-users, 16 respondents (47.1%) had issues with the service delivery of MMT. Out of these 16 respondents, 15 (93.6%) were displeased about waiting times at the stations, hence identifying it as a discouraging factor. In all, about 81.3%, 75.0%, 68.8% chose time spent in bus, crowding on bus and noise levels

Table 13
Post hoc tests (age categories).

Multiple comparisons Tukey HSD							
Dependent variable	(I) Age categories	(J) Age categories	Mean difference (I – J)	Std. error	Sig.	95% Confidence interval	
						Lower bound	Upper bound
Days and hours of operation	18–25	26–39	.62468*	.23820	.026	.0600	1.1894
		40–59	.59294	.28364	.096	–.0795	1.2654
	26–39	18–25	–.62468*	.23820	.026	–1.1894	–.0600
		40–59	–.03174	.20350	.987	–.5142	.4507
	40–59	18–25	–.59294	.28364	.096	–1.2654	.0795
		26–39	.03174	.20350	.987	–.4507	.5142
Time spent in bus	18–25	26–39	.59143*	.24174	.041	.0184	1.1645
		40–59	.65882	.28786	.061	–.0236	1.3412
	26–39	18–25	–.59143*	.24174	.041	–1.1645	–.0184
		40–59	.06739	.20653	.943	–.4222	.5570
	40–59	18–25	–.65882	.28786	.061	–1.3412	.0236
		26–39	–.06739	.20653	.943	–.5570	.4222
Walking time/distance to destination	18–25	26–39	–.09015	.21794	.910	–.6068	.4265
		40–59	–.63059*	.25952	.043	–1.2458	–.0154
	26–39	18–25	.09015	.21794	.910	–.4265	.6068
		40–59	–.54043*	.18620	.012	–.9818	–.0990
	40–59	18–25	.63059*	.25952	.043	.0154	1.2458
		26–39	.54043*	.18620	.012	.0990	.9818
Waiting time at station	18–25	26–39	–.57033*	.21051	.021	–1.0694	–.0713
		40–59	–.99294*	.25067	.000	–1.5872	–.3987
	26–39	18–25	.57033*	.21051	.021	.0713	1.0694
		40–59	–.42261	.17985	.053	–.8490	.0037
	40–59	18–25	.99294*	.25067	.000	.3987	1.5872
		26–39	.42261	.17985	.053	–.0037	.8490
Ease of continuing trip with a different mode	18–25	26–39	.70588*	.20806	.003	.2126	1.1991
		40–59	.62588*	.24776	.034	.0385	1.2132
	26–39	18–25	–.70588*	.20806	.003	–1.1991	–.2126
		40–59	–.08000	.17776	.894	–.5014	.3414
	40–59	18–25	–.62588*	.24776	.034	–1.2132	–.0385
		26–39	.08000	.17776	.894	–.3414	.5014

* The mean difference is significant at the 0.05 level. (Table displaying some examples where significance exists in LOS indicators.)

Table 14
ANOVA results income categories.

ANOVA		Sum of squares	df	Mean square	F	Sig.
Adherence to time schedule	Btn Groups	5.304	5	1.061	.876	.500
	Wtn Groups	155.091	128	1.212		
	Total	160.396	133			
Days and hours of operation	Btn Groups	13.304	5	2.661	3.439	.006
	Wtn Groups	99.032	128	.774		
	Total	112.336	133			
Availability at trip origin and destination	Btn Groups	3.600	5	.720	.962	.444
	Wtn Groups	95.833	128	.749		
	Total	99.433	133			
Distance to transit station	Btn Groups	1.643	5	.329	.490	.783
	Wtn Groups	85.790	128	.670		
	Total	87.433	133			
In-vehicle time	Btn Groups	18.448	5	3.690	4.872	.000
	Wtn Groups	96.933	128	.757		
	Total	115.381	133			
Walking time/distance to destination	Btn Groups	11.396	5	2.279	3.463	.006
	Wtn Groups	84.253	128	.658		
	Total	95.649	133			
Waiting time at station	Btn Groups	23.215	5	4.643	8.482	.000
	Wtn Groups	70.068	128	.547		
	Total	93.284	133			
Cost of fare	Btn Groups	7.060	5	1.412	2.869	.017
	Wtn Groups	63.000	128	.492		
	Total	70.060	133			
Ease of continuing trip with a different mode	Btn Groups	5.977	5	1.195	1.853	.107
	Wtn Groups	82.561	128	.645		
	Total	88.537	133			
Physical condition/appearance of vehicle	Btn Groups	7.171	5	1.434	2.696	.024
	Wtn Groups	68.083	128	.532		
	Total	75.254	133			
Mechanical condition of vehicles	Btn Groups	5.862	5	1.172	1.999	.083
	Wtn Groups	75.064	128	.586		
	Total	80.925	133			
Access to seat on bus	Btn Groups	22.538	5	4.508	2.946	.015
	Wtn Groups	195.820	128	1.530		
	Total	218.358	133			
Crowding on bus	Btn Groups	2.662	5	.532	.750	.587
	Wtn Groups	90.809	128	.709		
	Total	93.470	133			
Driver handling	Btn Groups	5.483	5	1.097	1.448	.212
	Wtn Groups	96.187	127	.757		
	Total	101.669	132			
Noise level on the bus	Btn Groups	5.470	5	1.094	2.034	.078
	Wtn Groups	68.836	128	.538		
	Total	74.306	133			
Safety from traffic accidents	Btn Groups	2.822	5	.564	.814	.542
	Wtn Groups	88.767	128	.693		
	Total	91.590	133			
Security of goods/luggage	Btn Groups	2.573	5	.515	.654	.659
	Wtn Groups	100.770	128	.787		
	Total	103.343	133			
Cleanliness of vehicle	Btn Groups	10.004	5	2.001	2.578	.029
	Wtn Groups	99.339	128	.776		
	Total	109.343	133			
Cleanliness of waiting area	Btn Groups	2.877	5	.575	.764	.577
	Wtn Groups	96.407	128	.753		
	Total	99.284	133			

Btn = Between, Wtn = Within.

Table 15

Post hoc tests (income categories).

Multiple comparisons Tukey HSD									
Dependent variable	(I) Average monthly income	(J) Average monthly income	Mean difference (I – J)	Std. error	Sig.	95% Confidence interval			
						Lower bound	Upper bound		
Days and hours operation	Less than GHC200	GHC201 - GHC400	.45455	.30072	.658	-.4155	1.3246		
		GHC401 - GHC600	.66883	.30072	.234	-.2013	1.5389		
		GHC601 - GHC800	.90693*	.23149	.002	.2371	1.5767		
		Above 800	.74402*	.23564	.024	.0622	1.4258		
		No income	.95455	.47811	.350	-.4288	2.3379		
		Above 800	-.21053	.46237	.997	-1.5483	1.1273		
Time spent in bus	Less than GHC200	GHC201 - GHC400	.11039	.29751	.999	-.7504	.9712		
		GHC401 - GHC600	.89610*	.29751	.036	.0353	1.7569		
		GHC601 - GHC800	.89610*	.22903	.002	.2335	1.5588		
		Above 800	.83971*	.23313	.006	.1652	1.5142		
		No income	.93182	.47302	.365	-.4368	2.3004		
		GHC201 - GHC400	Less than GHC200	-.11039	.29751	.999	-.9712	.7504	
	GHC201 - GHC400	GHC401 - GHC600	.78571	.32891	.168	-.1659	1.7374		
		GHC601 - GHC800	.78571*	.26856	.046	.0087	1.5627		
		Above 800	.72932	.27207	.086	-.0579	1.5165		
		No income	.82143	.49337	.557	-.6061	2.2489		
		Waiting time at station	GHC601 - GHC800	Less than GHC200	.77922*	.19472	.001	.2158	1.3426
				GHC201 - GHC400	.92857*	.22833	.001	.2679	1.5892
GHC401 - GHC600	.78571*			.22833	.010	.1251	1.4464		
Above 800	.22180			.16565	.763	-.2575	.7011		
No income	1.64286*			.38715	.001	.5227	2.7630		
Above 800	Less than GHC200			.55742	.19821	.062	-.0161	1.1309	
Mechanical condition (breakdowns) of vehicles	Less than GHC200	GHC201 - GHC400	.40260	.26181	.641	-.3549	1.1601		
		GHC401 - GHC600	.54545	.26181	.303	-.2121	1.3030		
		GHC601 - GHC800	.54545	.20154	.081	-.0377	1.1286		
		Above 800	.59809*	.20515	.047	.0045	1.1917		
		No income	.54545	.41625	.779	-.6589	1.7498		
		Access to seat on bus	Less than GHC200	GHC201 - GHC400	.24026	.42286	.993	-.9832	1.4638
GHC401 - GHC600	.81169			.42286	.395	-.4118	2.0352		
GHC601 - GHC800	.78788			.32552	.157	-.1540	1.7297		
Above 800	1.13876*			.33136	.010	.1800	2.0975		
No income	1.20455			.67231	.475	-.7407	3.1498		
Noise level on the bus	Less than GHC200			GHC201 - GHC400	-.41558	.25071	.562	-1.1410	.3098
		GHC401 - GHC600	-.34416	.25071	.743	-1.0696	.3813		
		GHC601 - GHC800	-.51082	.19300	.094	-1.0692	.0476		
		Above 800	-.58852*	.19646	.038	-1.1569	-.0201		
		No income	-.27273	.39861	.983	-1.4261	.8806		

* The mean difference is significant at the 0.05 level. (Table displaying some examples where significance exists in LOS indicators.)

on bus respectively as part of the top five discouraging factors to the use of MMT bus even though they still patronise it. Occasional-users also disclosed similar problems. A vast number (94.9%) of them settled on time spent in bus as a major issue when it came to discouraging factors. Additionally, crowding on bus (76.9%), access to seat (69.2%), cleanliness of waiting areas (51.3%), noise levels on bus (48.7%), waiting time at stations (35.9) and cleanliness of vehicles were among the top-most discouraging factors identified by Occasional-users.

4. Recommendations and conclusion

It was the objective of this study to explore why commuters in Accra do not prefer to use public bus for commuting. By this, the study sought to answer a main research question of how commuters' perception affects their choice or preference for MMT, the only formal bus service running in the city of Accra. Specifically, the study sought to answer questions on the travel characteristics of commuters in Accra, their perception of LOS of MMT among different user categories; Frequent-

Table 16
Important factors to improve MTT use.

	Responses		Percent of cases
	N	Percent	
Important factors for MMT use			
Adherence to schedule	11	18.30%	18.30%
Days and hours of operation	1	1.70%	1.70%
Availability at trip origin and destination	2	3.30%	3.30%
Time spent in bus	19	31.70%	31.70%
Walking time/distance to station	1	1.70%	1.70%
Cost of fare	4	6.70%	6.70%
Mechanical condition of vehicle	7	11.70%	11.70%
Access to seat on the bus	7	11.70%	11.70%
Crowding on the bus	3	5.00%	5.00%
Driver handling	1	1.70%	1.70%
Safety from traffic accidents	1	1.70%	1.70%
Cleanliness of vehicle	1	1.70%	1.70%
Physical condition of vehicle	2	3.30%	3.30%
Total	60	100.00%	100.00%
a. Dichotomy group tabulated at value 1 (1st most important factor)			

users, Occasional and Non-users. Most importantly, the study sought reasons from Non-users as to their non-usage to make recommendations for service improvement in public transportation in Ghana in general and Accra in particular.

Results of the study revealed that though MMT was 20% cheaper in terms of price, commuters perceived its service delivery as poor. Over-crowding of buses, non-adherence to time schedule, long in-vehicle time, perception of not getting access to seats, non-availability of bus at respondents' origins and destinations, accessibility of alternative modes, long waiting times for buses accounted for the major reasons for non-preference.

These findings fall in line with what has been established by literature. For instance, [Tyrinopoulos and Antoniou \(2013\)](#) found in a study that crowding, followed by service unreliability were key discouraging factors for public transit use. [Redman et al. \(2013\)](#) also observe that reliability is a key quality attribute in addition to attributes such as frequency, fare prices, and speed of public transport service, which can attract car users. Furthermore, [Beirão and Cabral's \(2007\)](#) also confirm that if the public transport service is unreliable, has a low frequency or lack of comfort, people are likely to shift to using cars because they do not perceive public transport as a viable alternative to them. Lastly, [Polat \(2012\)](#) add that the longer journey times turns to be, the increase in the tendency for the search of alternative transport modes increases as it is shorter for some transport modes than it is for others.

In support of government's pro-poor policies, MMT is incapable of making profitable gains because, its patronage is highly anchored on the fares charged and on running on routes deemed unattractive by other public transport modes. This affects its ability for example to increase its fleet size to improve availability, repair mechanical faults and improve level of service delivered. Even though the MMT Limited perceives itself to be performing well, it is recommended that it considers the perception of commuters on the desired level of service to attract more users. This is because commuters, especially Occasional and Non-users unanimously agreed to shifting and increasing their frequency of MMT use if factors that discourage their usage were improved. It is therefore necessary now more than ever for the MMT Limited to first improve on its travel time especially in-vehicle time and waiting time at their various terminals. Subsequently, comfort on buses (seat access, crowding and noise level) should be improved to make the MMT buses more attractive to commuters. Furthermore, commuters consider reliability and accessibility of MMT's buses as important to their choice as a primary intra-city mode; as such the need for and hence their improvement. Lastly, improving on the cleanliness of its vehicles and waiting areas would give an added advantage in attracting commuters (see [Tables 12–16](#)).

All these can be achieved if the MMT Limited reviews its pricing system. This is because pricing is fundamental to the operation of public transport; forming a major source of income to their operation. Increasing MMT's fares to correspond to improved service delivery would go a long way in attracting customers and eventually increasing its modal share.

Conclusively, achieving the objective of promoting mass transportation in Accra demands a shift from the use of unsustainable modes such as mini-buses and taxis to the use of efficient systems such as high capacity buses like MMT. This will reduce the traffic congestion and inefficient use of road space, contributing eventually to ensuring sustainable transportation in Accra.

5. Strengths and limitations of the study

This study aims at exploring how commuters' perception of level of service of public transport affects their mode choice. It particularly considers how the situation affects the use of Metro Mass Transit, a mass transportation system in Ghana.

The study was undertaken in Accra, the capital of Ghana which is rapidly urbanising and experiencing some of the negative effects of urbanization in terms of traffic congestion and its resultant effects. The study used survey research strategy to sample commuters to assess their perception of the level of service of the Metro Mass Transit Limited (MMT), a public bus

company in Accra. The study has its strengths in assigning reasons to the non-preference of MMT's services, in addition to rating the Company's level of service delivery from the perspective of commuters.

The study only focused on the intra-city bus service among the three services (intercity service, intra-city service and rural services) run by the MMT. This is because of the traffic situation experienced within the metro and municipal areas of Accra.

Though a study of this nature requires large samples to statistically generalise results, the survey limited the number of respondents due to limited resources; especially that of time. The study was also biased in sample due to the sampling procedure. As such unequal number of respondents for the sub-groups were interviewed.

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