

## Customer satisfaction on supermarket retail shopping using web-based participatory GIS

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### Keywords

Customer satisfaction, PGIS, spraycan, retail shopping, simple density, supermarket

### Abstract

*Satisfaction is the post-purchase evaluation by the consumer of the overall service experience where the needs and expectations have been met or exceeded (Abubakar et al, 2001). Retailers monitor customer satisfaction to determine how to increase their customer base, customer loyalty, revenue, profits, market share and survival (CSSP, 2007).*

*To allow for customer satisfaction to be measured, the concepts of Participatory GIS can be explored. Participatory GIS (PGIS) is the use of geo-spatial information or GIS technology used by members of the public for participation in public processes that affect their lives (Tulloch, 2003). It aims to represent people's perception and knowledge by map products to facilitate decision making and community advocacy (McCall et al, 2015). PGIS involves allowing local people to create information to be fed into the GIS and subsequently analysed for in spatial decision-making which affects them (Dunn, 2007).*

*The project aimed at answering the question of customer satisfaction with supermarket retail shopping and its important determinants with the aid of participatory GIS technology. The data sets were generated from a web-based PGIS survey on Map-me platform using spray-can carried out among citizens in the city of Lagos, south-west Nigeria. The results were analysed and mapped in a GIS software. High and low clusters of satisfaction were visible, and when put to test, the global Moran's I index was 0.47 and the z-score was high at 535 which indicated a high cluster of satisfaction.*

*This research therefore, demonstrated the usefulness of GIS to gain spatial insights into the customer satisfaction with supermarket retail shopping and would also encourage the use of GIS in the conduct of customer satisfaction surveys.*

### Background and purpose of study

Satisfaction is the post-purchase evaluation by the consumer of the overall service experience where the needs and expectations have been met or exceeded (Abubakar et al, 2001). In retailing, it is believed that customer satisfaction plays a major role in the success of a business strategy (Al-Ali et al, 2015) because it is through it that firms remain, grow and develop in a successful way (Thurong, 2016). Retailers monitor customer satisfaction to determine how to increase their customer base, customer loyalty, revenue, profits, market share and survival (CSSP, 2007).

Earlier research on customer satisfaction in supermarket retail shopping had established that determinants of customer satisfaction include store atmosphere, product, service, relationship, price, convenience and brand image (Wenwei and Tongtong, 2010). Al-Ali et al (2015) added assortment, relationship with customer and store accessibility.

Retail outlet in Nigeria can be classified into Local Traditional markets, street trading and Modern Retail Outlet (MRO) (Igwe and Chukwu, 2016). The modern retail outlet is now popular in Nigeria with the re-emergence and growth of supermarkets, shopping malls, and shopping plazas. The old fashion of small retail shops is changing to bigger stores where customers have options of picking the choices of a product while having the opportunity to move around. This is a recent trend in most developing countries (Arshad et al, 2014). This rise has brought about increased competition

among the Modern retail outlet for customer patronage. It is therefore important for them to study and capture customer satisfaction and its determinant understand what they need to do to remain competitive.

Although work had been done on customer satisfaction in western or developed countries, little is known about its formulation in developing countries like Nigeria (Al-Ali et al, 2015). The few works available were carried out using customer surveys; however, just doing a survey for a sample of the customer would not give deeper answers (Baybeck, 2002). GIS technology can be used to give a better understanding of customer satisfaction by adding spatial components to the surveys and therefore giving the administrators a fuller story (Chhetri and Robert, 2014). This will allow discovery of a spatial pattern of satisfaction at different levels of aggregation which otherwise would have been missed and the visualization of the results would be friendlier. (Baybeck, 2002).

This study introduced the use of a type of GIS technology known as Participatory GIS to give insight into spatial patterns and trends and the important determinants of customer satisfaction with supermarket retail shopping in Lagos state. Participatory GIS (PGIS) is the use of geo-spatial information by members of the public for participation in public processes that affect their lives (Tulloch, 2003). It aims to represent people's perception and knowledge by map products to facilitate decision making and community advocacy (McCall et al, 2015). The design and utilization of PGIS will therefore, demonstrate how to measure, visualize and analyse customer satisfaction by collecting both spatial and non-spatial data from the public.

Data gathering methods in participatory GIS practices range from the traditional mapping tools, such as hand-drawn sketch maps, to embrace of three-dimensional models and the interpretation of aerial photographs and satellite images (McCall, 2004). Ramsey (2010) however, identified a web-based approach to implementation of PGIS. This involved utilizing the internet to connect with citizens for the gathering of the necessary data for the PGIS. These internet-based applications have the great advantage of being available to larger group among the citizens like any other pages in the web, and it helps to information quite anonymously (Khahila and Kytta, 2006). The anonymity that is provided in web-based PGIS can be advantageous because it enables 'non-threatening' interaction compared to the personal identification and confrontation of public (Dunn, 2007).

There had been many other applications of PGIS to elicit citizens perception, however, there is a dearth of work on its utilization for citizen satisfaction survey. The purpose of this study therefore, is to demonstrate the use of web-based PGIS technology to give insight into spatial patterns, trends and important determinants of the customer satisfaction with supermarket retail shopping in the city of Lagos, south-west Nigeria.

The motivation for this work is that the use of GIS in general and PGIS, in particular, to conduct customer satisfaction survey is totally a novel idea in Nigeria. This research would therefore, give insights into the customer satisfaction with supermarket retail shopping and would also encourage the use of GIS in the conduct of customer satisfaction surveys.

#### Aims and objectives

The study aimed at answering the question of customer satisfaction with supermarket retail shopping and its important determinants in the city of Lagos with the aid of participatory GIS technology.

The specific objectives of this study include:

- To develop a web-based survey using a Participatory GIS tool to measure customer satisfaction with supermarket retail shopping.
- To perform spatial analysis and determine the spatial pattern (if any) of satisfaction across the city.
- To determine, through spatial analysis, the most important determinants for customer satisfaction.

- To carry out a critical evaluation of the project

### Design and methodology

This qualitative study employed an interpretive paradigm to give insight into customer satisfaction on supermarket retail shopping using Participatory GIS technology.

The research method and analysis were carried out using the conceptual model shown in figure 1 below.

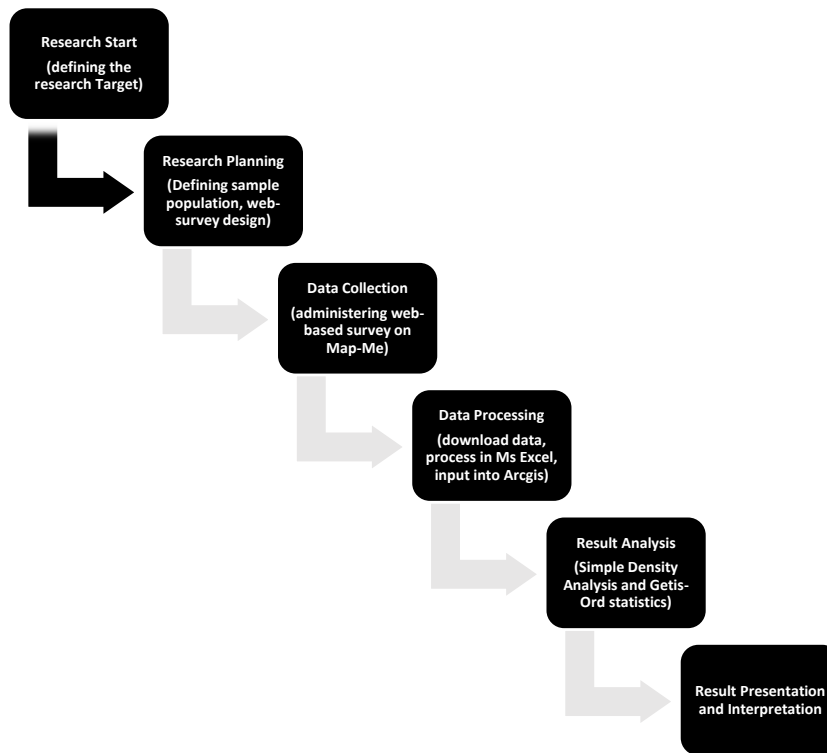


Figure 1: Conceptual Model for the research method and analysis

### Sampling

Cooper and Schindler (2006) (cited in Arshad et al, 2014) stated that a whole population can be studied by studying a sample which can be said as the base of whole population. For this study, the population included all those who have used or are customers of supermarkets. Respondents were recruited through purposive sampling method (Zolkafli et al, 2017) via emails and phone contacts. A total of 76 respondent participated in the study.

### Data Capture

Spraycan web-based Participatory Public GIS on Map-me platform (Huck et al, 2014) was used to design survey website. Spraycan captures imprecise notion of place from the public using an airbrush interface to add dots that are stored in a multi-point-attribute data format (Huck et al, 2015). This Map-me platform has been chosen because it is much easier for participant to give an idea of locations than for them to provide accurate location.

Individuals within the sample population were asked to log-on to the website to fill the questions and then use the brush to spray on a google base map of Lagos state to answer spatial questions. The questions from the Map-Me survey are given below, with one spatial question (in bold) accompanied by three non-spatial questions:

Where are the supermarkets you patronize?

How satisfied are you on a scale of 1-5 (5 being very satisfied) with supermarket retail shopping in Lagos State?

Which is the Most important factor that influences your choice from the following list: (1) Price; (2) Quality of Product; (3) Service quality; (4) Product assortment; (5) Store atmosphere; (6) store accessibility; (7) store reputation;

Which is the Least important factor that influences your choice from the following list: (1) Price; (2) Quality of Product; (3) Service quality; (4) Product assortment; (5) Store atmosphere; (6) store accessibility; (7) store reputation;

The survey question pertaining the level of satisfaction used a Likert scale of 1 to 5, where 1 will be least level of satisfaction. This facilitated the mapping of the response data (McCluskey, 2012). The results got from the individual responses to the survey was saved into different attribute tables for the blobs sprayed on the map, the users, questions and sub-questions which were downloaded into a comma separated \*.csv file.

**Analysis**

The first set of analysis was on the spatial pattern of satisfaction as indicated by the distribution of the spray itself. The attribute table downloaded from the PGIS website survey was imported into a GIS software (Dunn, 2007). A Simple Density analysis was done to create density surface to reveal the overall pattern (Huck et al, 2015). The surface demonstrated the concentration of the attribute (in this case, satisfaction) in some areas. The original spray by the individuals and the density surface generated is shown in figures 3 and 4 below.

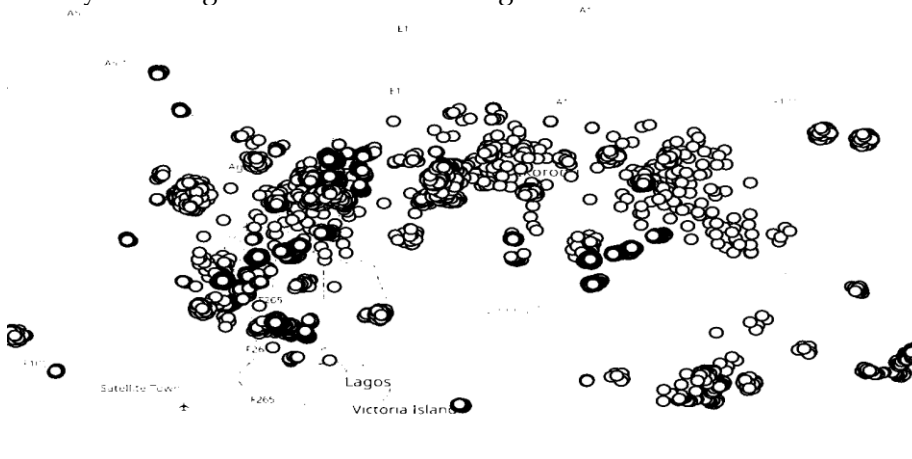


Figure 3: spray blobs from participants

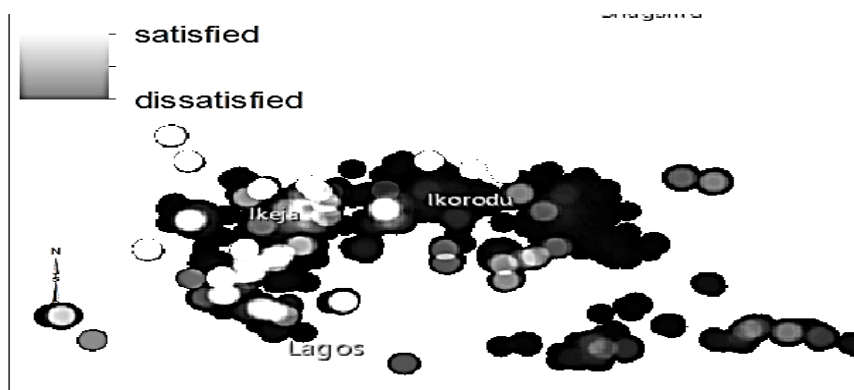


Figure 4: Density surface displaying satisfaction level from participants. Base map data taken from OpenStreetMap

In order to add additional confidence to the analysis, Getis-ord local statistics spatial autocorrelation technique (Huck et al, 2014) was used to identify statistically significant hotspots of spray patterns. The results show a Moran’s I index of 0.47 and the z score of 535 which indicates clustering and that there is a less than 1% likelihood that this clustering pattern is as result of random choice. The hotspot map generated from the Getis-ord  $G_i^*$  is shown in figure 5.

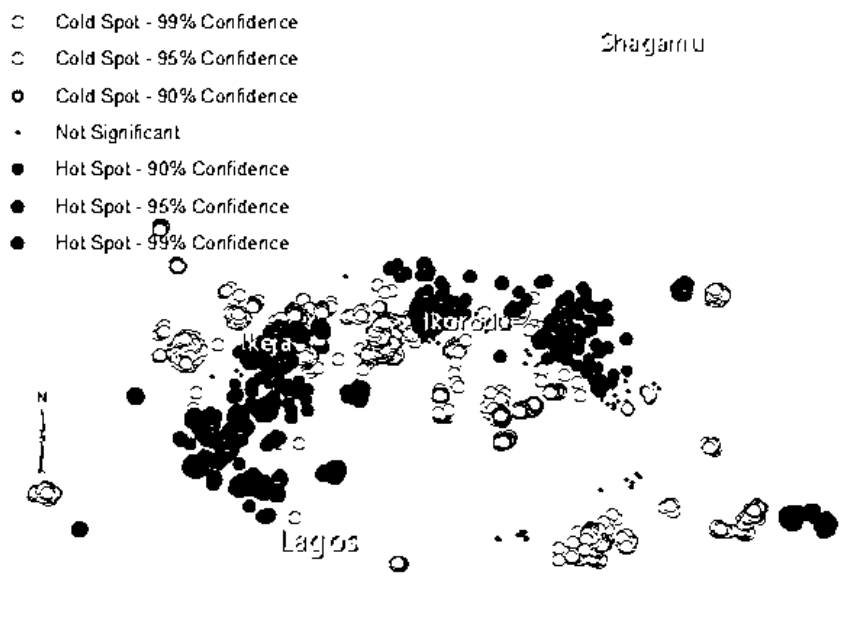


Figure 5: Hotspot map showing statistically significant hotspots of satisfaction

A qualitative analysis was carried out by consolidating the text-based responses given by the respondents on the questions of factors that influences choice of supermarket. A frequency analysis was done on the responses to determine the Most important factor and the least important determinant of choosing a supermarket to patronize (see Tables 1 and 2).

Factors	Frequency
Price	7
Product quality	17
Service quality	32
Product assortment	4
Store atmosphere	0
Store accessibility	7
Store reputation	9

Table 1: Most Important Factor of Choice of Supermarket

Factors	Frequency
Price	13
Product quality	1
Service quality	4
Product assortment	0
Store atmosphere	15
Store accessibility	17

Store reputation	26
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Table 2: Least Important Factor of Choice of Supermarket

The two results were plotted on the map based on the actual spray by the respondents as given in figures 6 and 7. This gives insight into the spatial distribution and pattern of the individual factors that were considered most and least important.

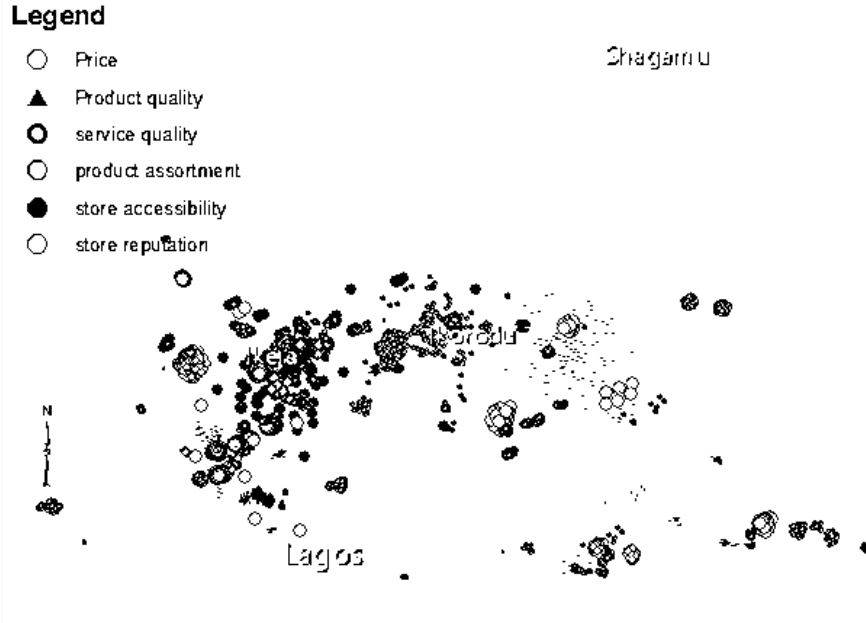


Figure 6: spatial distribution of most important factors

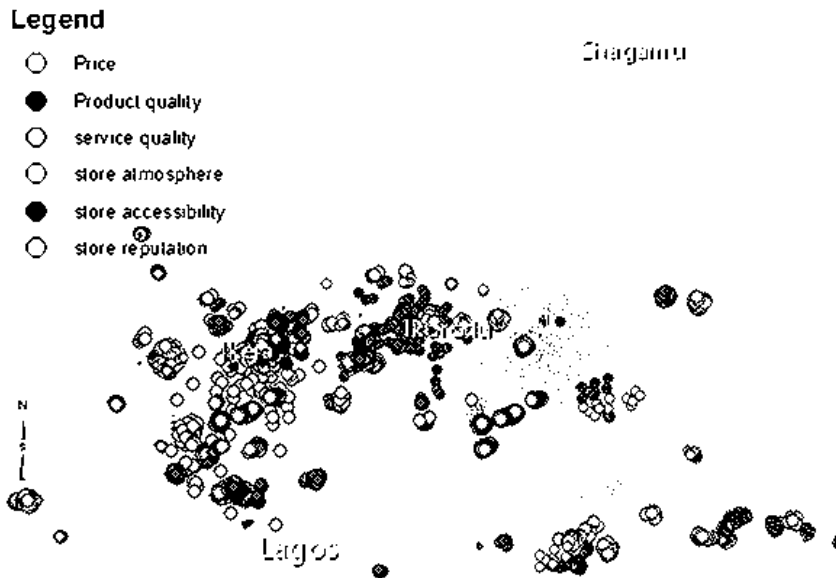


Figure 7: spatial distribution of least important factors

**Conclusion**

The study described here demonstrated how web-based Participatory GIS can be used to gain insights into spatial pattern of satisfaction and determinants of store selection among customers.

The result of the work here would indicate that approach could be used in applications that needs public participation.

The study could be extended further by adding demographic dimension to it. This would allow the spatial distribution of the different demographic classes among the customers to be mapped. The visualization and mapping would allow for deeper understanding of the perceptions of the citizens.

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