

Application of GIS Functionalities in Library to Determine Marketing of Goods and Services

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Abstract: *The technologies of GIS nowadays have developed so much so that businesses that create monopoly have now run into competition. The information efficiency and consumer data accessible have made it clear that new businesses are emerging and expanding. The idea is when new products are marketed using simple location analysis and mapping, Customers find it relatively easier to buy goods and services that are closer to them and at cheaper or low price. The functionalities of GIS will help in solving the disparities between distances of sale points. It also help in making decisions of marketing promotion, the use of consumer database to define when and where to locate goods and services is paramount in boosting and easing customer behavior. People preferred to buy goods and services at a closer location of selling point rather than buying at far distance due to price differences. Consumers use maps, charts and online services to determine where goods are sold. Services can be obtained through online libraries for consumers that buy through subscription.*

Keyword: *GIS, Marketing, Mapping, Information, Libraries*

I. Introduction

Geographic information system (GIS) is a system designed to store, capture, analyze manage, manipulate, present and display georeferenced data. The GIS system is a customized one for implementation of organized set of data to transform it variably into meaningful information for decision making. GIS technology has integrated applications in to various fields of endeavor. The technology became more relevant with the advancement of GIS software which is an enterprise purposely developed to aid in solving complex environmental issues. The ability to capture data digitally has enhanced the development of GPS, open and free sources of GIS software, and computer cartography. In GIS analysis the outcome is the predictable maps use in displaying the result for necessary decision making. The existence of GIS capability as enterprise technology produces the repository called the database. The databases become necessary for gathering bulky data. This has being time when information is becoming a major product of, and foundation for, progress. Increase emphasis on data management is apparent and necessary (Kumar, 2015). GIS as computer software, always try to link geographic information on a platform to visualize what you can see on a space. Businesses have locations perhaps as store, supermarkets, warehouse or companies, the business locations are having references on a paper or maps. The customers have names, addresses and what they buy. The postal code can by geocoded, the sales point and it telephone numbers as well as the delivery routing from shops to our homes can be stored analysis in GIS. At this point the capabilities of GIS in marketing help to determine what the consumers need to affect their lifestyle. The customer is having a choice on what to buy at which sales point at what time and particular distance. The choice of the customer depend on money, time and space which are the better ways to select goods and services using common networking or spatial analysis in GIS. ArcGIS Business Analyst produces the best tools and data for the price on the market. (Pick 2007) stated that spatial technologies and GIS are impacting the productivity of business and economy. As information technologies become more interactive, mobile, internet-base had diffused into the enterprises from mainframe in late 1950s and early 1060s, while GIS appeared lately in 1970s. The reason why GIS become more relevant and caught recently in the business sector includes its high cost and perceived benefits. Spatial dataset are larger than non-spatial ones. Data directly or indirectly transferred to user when the user integrate or give meaning to the data Wilson (1981). The advanced study cited by Renz (2002) gives a more formal description as

Information= data+ meaning

Data collected when presented in a particular manner and at appropriate time improved the knowledge of a person receiving it. This enhances better and relevant decision.

II. Market Performance Model In GIS

GIS can determine the high and low market share performance through a simple model. Modeling in GIS represents the actual rental on the earth. However, it is important here to emphasize the benefits, since model deals with presentation of reality and spatial interaction, accurate revenue can be predicted from the

business flow pattern or routing (Bertuglia et al 1994). Example, using GIS to construct a model to assist in looking at new situation in businesses that are opened in particular places with the typologies to indicate share performance and change in information. (Birkin et al 1994).

HIGH SALES PER BRANCH	
TYPE 1	TYPE 2
HIGH market share	Low market share
High sales per branch	High sales per branch
Maintain status quo	Extend branch network
LOW SALES PER BRANCH	
TYPE 3	TYPE 4
Low market share	High market share
Low sales per branch	Low sales per branch
Reconfigure branch network	Rationalize branch network

Source: (Birkin 1994)

Having identified the model, the action plans can be tested using the model in a “what if?” manner. Clark and Wilson (1994). The impact of GIS on library is perceived in several ways. 80 per cent of all information held by business and the government may be geographically referenced. It refers to information such as census data, mailing addresses, facility layout, telephone numbers land use information and dedicated network of water, electric, gas, sewerage, cable, transportation and telephone system According to Phadke (2006), stated that handling such a vast data of information is a major task for the libraries as GIS find unlimited applications in many areas other than traditional one. Libraries and information societies have already realize this and have begun to gear up their effort in anticipation by initiating necessary steps in controlling information on GIS.

III. GIS in the Digital Economy

Electronic commerce is conduct of commercialize transaction on widespread through the use of internet. Most www-based that come up around 1990s estimated about 5 percent of US economy proportion that sprawl up to e-commerce can be business to consumer (B2C) or business to business (B2B). the experience of e-commerce in US has been rapidly spreading for example, retail sales grew from 0.91 percent in 2000 to 2.37 percent in 2005 (US Census 2000). Everything happens somewhere, but in marketing does it make any difference where? More often than not it does. Stores, offices, and warehouse have (customers have addresses shopping pattern and preferred travel modes. Sales representatives are assigned to geographic territories to service their accounts effectively and efficiently. Distributional pattern supply transport network have use GIS for visualization and networking. Promotion media have geographic coverage area. Cyber marketing engaged in transactions regardless of location. However, online customers can provide insight into the value, and tract their goods and services anywhere. GIS had provides that platform for easier delivery. Using GIS to address issues pertaining business problem has enable marketers to embrace the approach as it makes an important business decision. Geographic dataset are displayed where spatial component offer Fresh perspective on business information. GIS also provide tools for analyzing spatial dimension of information in business. Question like, what will I buy at which store, where are these goods or services coming from. And what are my customers’ needs. You can also use GIS to site retail or wholesale site- selection. That is from where this types of product are produce and where is it needed in large quantities, by site selection you can visualize the map and give accurate information as to where the commodities are required

IV. GIS and the Use of Library

The organization of information or knowledge is an essential preliminary to it effective exploitation and dissemination. As the quality of knowledge expands the need to organize it become more pressing. A vast number of different means of organizing information have been devised and exploited since the earliest times with the vast output of new information and ever-increasing degree of specialization in all areas of human knowledge, heavy demands are being placed on library information storage and retrieval system, which can be scarcely met by the traditional methods except with the use of IT devices. The growth of information and the dependency on it have paved the way for informative society and subsequently the knowledged society. Information has always been prime factor for the development of society and is often regarded as a vital national

resource. Library information services try to meet this objective. Information has become important part of our lives and should be available when needed. Techniques of information disbursement services are required to facilitate the user to the right information Khodeh and Dhar (2002). The technological advancement have made significant impact on the growth of knowledge and unlocking of human potentials. In library, the impact is clearly visible on information resources, services and people, Manjunatha (2007). The concept of service quality in the context of a library can be defined as the differences between user expectation and perception of services performance. in the library quality may be recognized by the customers in terms of prompt delivery or lack of error in services. Quality can also be seen as relating to the fitness of a service or product to its intended purpose or use, subject to the expectations of the customer or user. Quality becomes a big issue when libraries try to expand their scope and try to expand their scope and improve their services. The quality therefore must be in conformity with the customer's requirement or needs. This means that the quality of a service can be a definition of the customer's perception of what is good or bad, acceptable or not acceptable service, Sahu (2006).

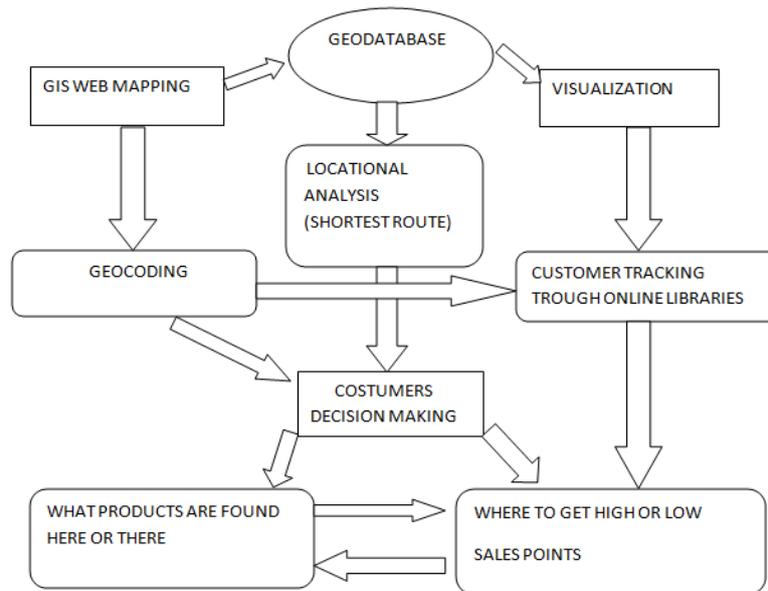
V. GIS in Marketing

According to Huff and Batsell (1997) as cited Viswanathan (2005) stated that knowledge of geographic location and extend of a market is crucial in planning and evaluating marketing strategy. Example, of how such knowledge can be used include analyzing variation in sales penetration, determining sales territories evaluation, difference in promotional response, assessing the location of new facilities, pin pointing promotion efforts, forecasting sales and analyzing market potential. Buckley (2004) suggested that geography is important to marketing share with supply and demand vary in space, points of supply and demand are spatially separate and space cost money to business. Though prior research pointed to the utility of geographic marketing knowledge, the use of geographic knowledge in marketing in the past has been limited by the lack of data as well as the tools to analyze such data. The initial impetus to the use of GIS came primarily from the public sector. Subsequently, the use of GIS in business and in marketing has grown in importance and will continue to do so in the future (Boyles 2000). The primary reasons for the growth are not only due to availability of data but also due to the interaction between a number of related human information processing factors and environmental factors. These factors include the availability of geocode data the growth of information system in general, globalization, the integration of the internet into GIS, the enhancement of both communication and the understanding of such communication when data are prescribed visually rather than when presented in form of text or tables. Consumer awareness and use of GIS has also increased withhaus, (2002). a structure consisting of people, equipment, and procedures to gather, sort, analyze, evaluate, and distribute needed, timely, and accurate information to marketing decision makers, Kotler (1997). Using mapped customer data it is then possible to pursue two important aspects of a marketing campaign. First, a site's trade area can be analyzed by representing its customer draw with concentric rings that surround the site. GIS software is available that will create distance-decay curves, identifying the percentage of customers at different radii around the store. Laiderman (1999)

VI. Methodology

Data are created in GIS by gathering most of the available and accurate data layer which can be interpolated and overlaid on the existing base map for a particular location or area. Most of the data are derived from GPS, georeferenced maps, existing database, object with known location such as customer address, use of card drawings or even published GIS data layers. This and various functionalities can be attributed within GIS software. If all the necessary GIS data layers are provided, it is easier to visualize business perspective that can assist in answering question in marketing segment. The software use to analyze business in GIS particularly for this study includes XMap 7 GIS Editor, ArcGIS 9.2, ArcView, Arcinfor, ArcEditor and satellite images

What Mapping Can Do To Your Business



GIS Business Networking Model Source: Sufiyan (2015)

The above model described the interaction of GIS capabilities toward business flow. The outcome is to find out the customer needs and their demands.

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VII. Discussion

The application of GIS on marketing really enhanced the growth and expansion of businesses as we can see in this study, new business center are displayed using GIS software to checkmate the suitability of the sales points. Most organisations are interested in analyzing regional or local markets to understand both existing performance ('what is?' analysis) and to predict the impacts of changing the distribution network in some way ('what if ?' analysis). Having used simple overlay procedures to identify target sites, the GIS literature often suggests a combination of buffer and overlay analysis to calculate store revenues for existing and new (potential) stores (see Beaumont 1991a, 1991b; Elliott 1991; Howe 1991; Ireland 1994; Reid 1993; Reynolds 1991). This works by first estimating how far consumers are willing to travel to a store (existing or potential). The result of this exercise will be either a travel time (say 20 minutes) or a distance (say no more than three miles). The second stage is then to delimit an area around that store (a buffer) that marks the limit of that time or distance. The same is applicable to the present situation in marking. The use of simple GIS analysis of buffer and overlay can to certain extend predicts the expansion and growth of new businesses at different location.

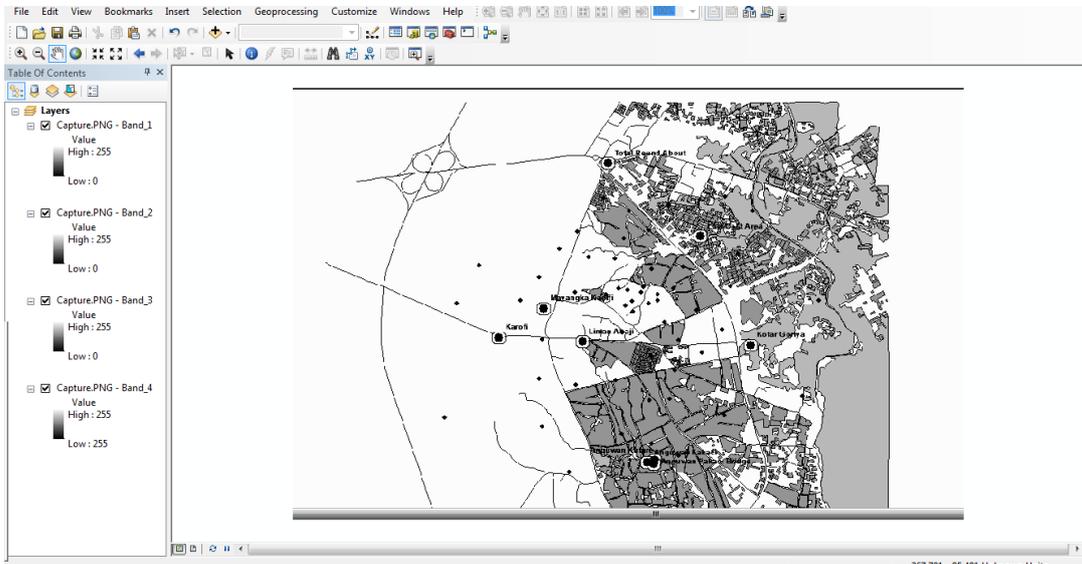
Reason for GIS enrolment in Library

- To improve research
- To improve analysis
- To add more data capability
- To add further users
- To improve display
- To add better plotters

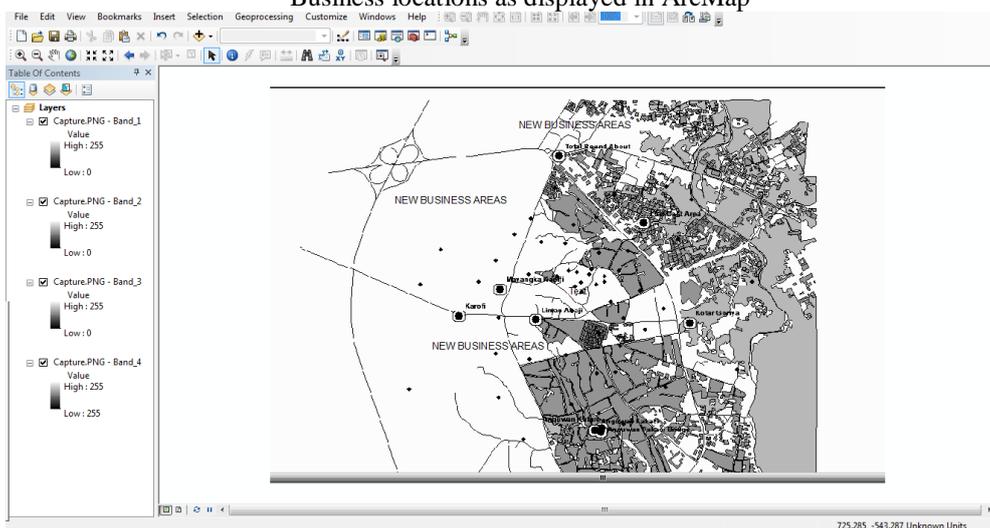
Problems encountered in using GIS in Business

- Lack of awareness about potential application
- Need for access to accurate data
- Lack of trained staff
- Financial needs
- Lack of information about GIS technology

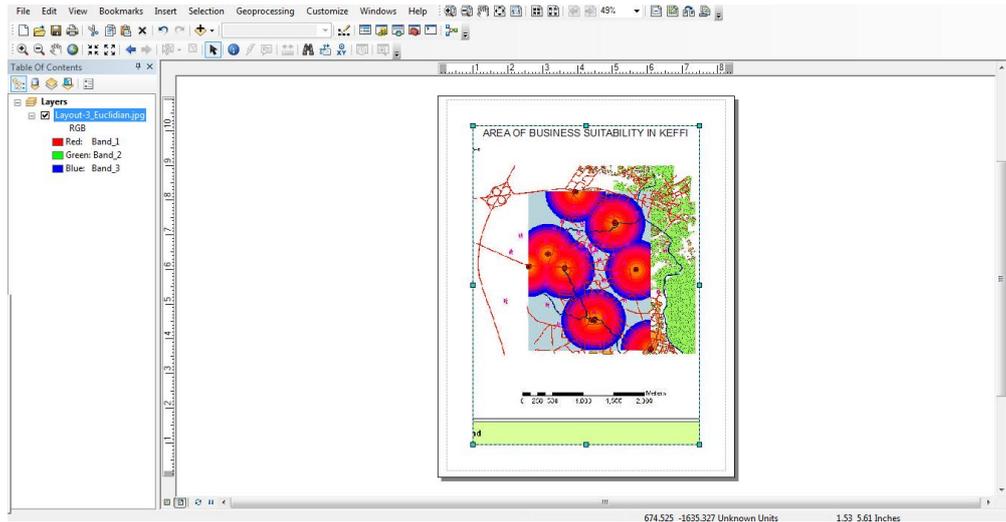
VIII. Results



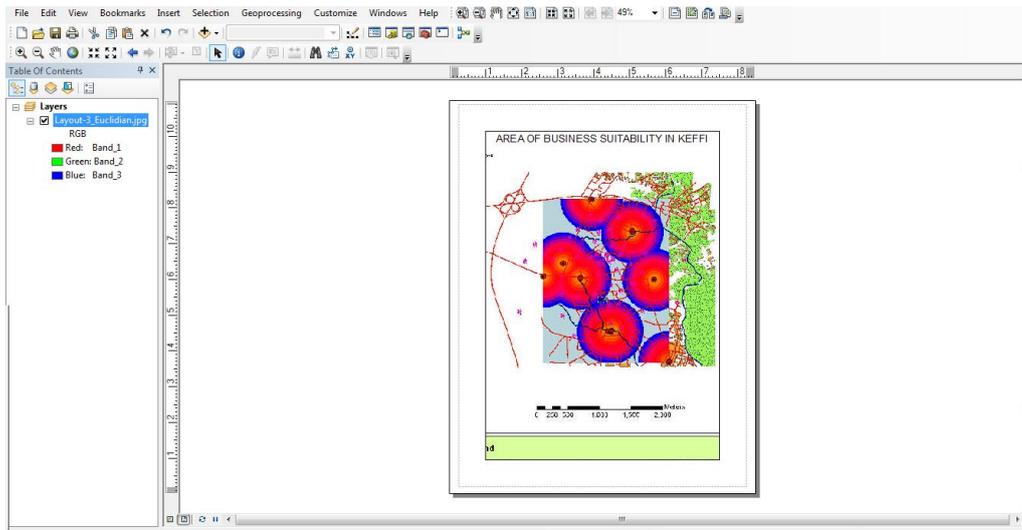
Business locations as displayed in ArcMap



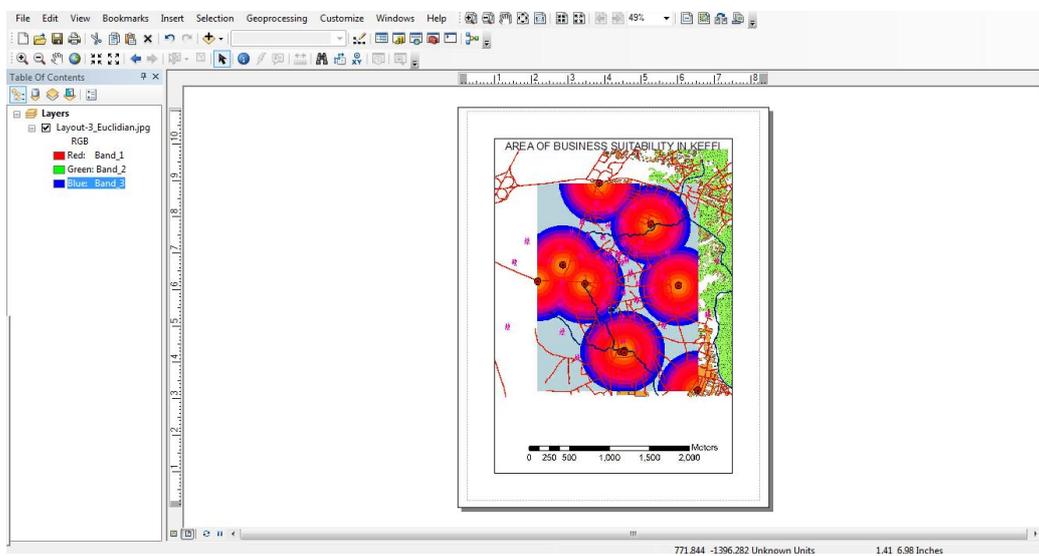
New locations showing newly open-up businesses



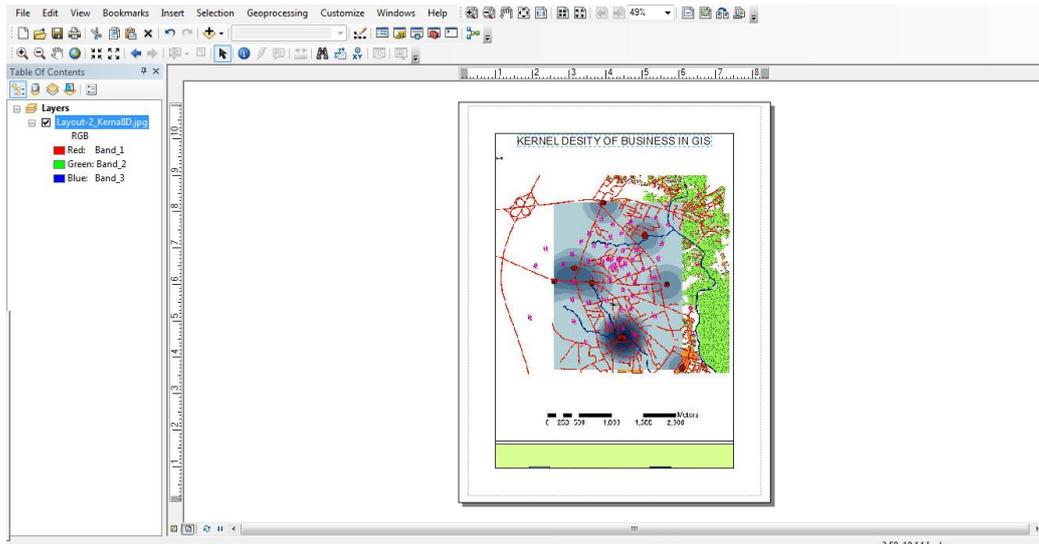
The use of GIS to depict distance locations of sales points



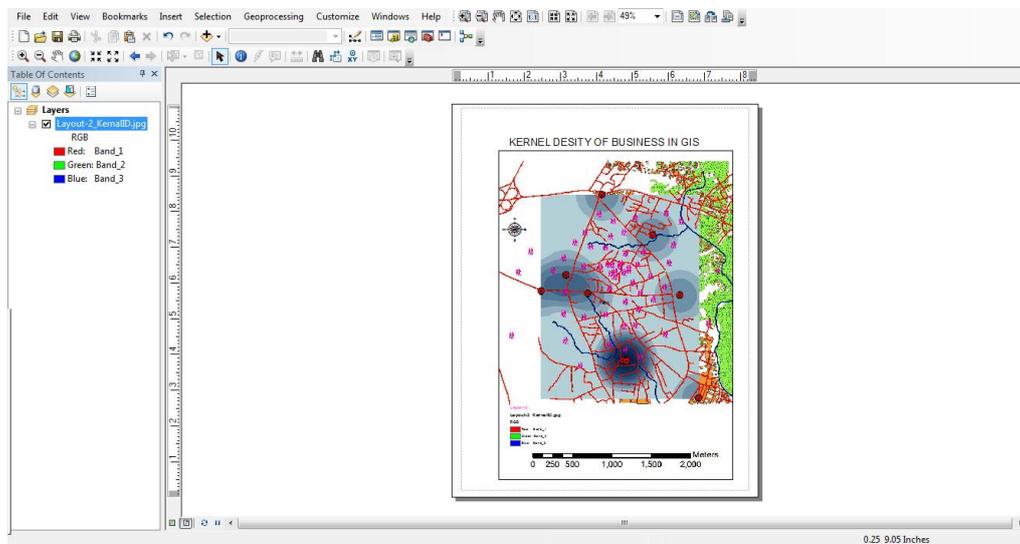
The suitability of sales points using Euclidean distance analysis



the concentration of businesses in suburb as showing above



The use of kernel density as one of the GIS functionality



The study also covered and tracked customers' information in various sales points in Nasarawa town as shown in the table below. One GIS capability is to produce geocoded data into geodatabase for simple query between the relationships of customer addresses, distances and profit gain or loss.

S/no	Cus_name	Cus_Id	Cus_Add	Sales Point
01	Musa I.	A01	Oversea	Poly gate
02	John S.	A02	Tamah	Poly gate
03	Salisu A.	B01	Student village	Tamah
04	Sumaiyya M.	C01	Keffi	Keffi Market
05	Ibrahim D	D01	Campus	Orchard
06	Aisha T.	D02	Campus	Orchard
07	Ahmed A.	E01	Library Site	Library point
08	Muhammad S.	D01	Nasarawa Town	Orchard
09	Nesson O.	E01	Library Site	Library point

Customers tracking in Nasarawa town (source field data 2015).

Item		Dist_ Sale Point		Price disparities due to distance		Increase in price
		A	B	A	B	
01	Tissue Paper	1km	2km	N60	N80	N20
02	Fresh fish	500m	2km	N100	N150	N50
03	Bread	800m	500m	N120	NN150	N30
04	Maggi	50km	500m	N250	N260	N10
05	Salt	500m	1km	N50	N60	N10
06	Sugar	50m	1km	N250	N280	N30
07	Tomatoes P	500m	1km	N50	N60	N10
08	Bottle Water	1km	2km	N70	N100	N30
09	Indomie Noodle	1km	2km	N60	N60	N0
				N1010	N1200	N190

Source: Field data (2015)

The table above described the relationship between items prices and their difference in distance. As we can see, the ability to gain profit due to the differences in commodities location is ascertain. Most people do buy goods and services closer to the source so that to avoid travelling long distance. Using spatial analysis in GIS can map out the locations that are close or far to the potential consumers. The geocoding will also ensure that customer address can be match with distance covered as well as the prices of each item being purchased.

IX. Recommendation

GIS tutorial for marketing is required for those who have interest in the in-depth relationship between GIS and business. It provides readers a broad-base, hands-on resource for learning how to use geographic information system (GIS) tools in market. It includes software exercise that supports several difference courses in the university marketing curriculum.

GIS mapping can be used to determine market segment, optimize promotion. The mapping should be displayed for users to benefit all business sectors.

GIS is a tool that has different functionalities which help to solve problem of spatial reference to perform geospatial analyses. All reference data requires specialist to handle GIS applications.

New courses concerning GIS applications to marketing and other business segment should be introduced in all business schools.

In other to promote business activities in and around the world, there is need to apply new modern technology of GIS to track demands and supply.

Provisions of fund on regular basis, government should set aside at least 10 percent mandatory budgetary allocation to academic institutions tertiary, public or private libraries disbarment as well as monitored some for judicious utilization. If this is realized, the library management should make automation top on its priority list and pursued conscientiously and is logical and beneficial end.

Teachers, lecturers, students and the public should be trained on how to use these facilities toward achieving academic excellent and economic growth. This may be through continuous orientation and the inclusion of such courses like GIS, geomarketing, geodemand and geocompetition, the use of computer for information retrieval, use internet world wide web, and IT applications need to be considered.

X. Conclusion

The ability to justify your profit base on where and when it comes from depends on the usability of the application of GIS in marketing. It supports the relationship between the buyer and what to buy which requires referenced data of the location of goods and services. Consumer items sold at closer distance from the sources are relatively found to be cheaper than those far from the source of production or supply. The idea is that, GIS display maps for customers to make choices which perhaps became paramount in taking or making good decisions. GIS maximize time and cost for the benefit of it users in depicting what to get at where and at when.

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