Transforming Customer Postal Address into Spatial Address for Demographic Analysis: A Case of Non-Contractual Customers in Seberang Perai, Pulau Pinang of Malaysia

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Postal address is one of important data that potentially used for trace, capture and used together with customer demographic, such as location, residential, income level, education level, transportation, and so on. The customer postal address is a touch point to analyzing demographic where it is vital important to the business, especially to prospecting their profitable customer. From literature review survey, the business has been used survey intensively as main sources for gathering demographic information about customer, including non-contractual customer, also called non-database customer. However, some problem will rise during joint used of home postal address, specifically, refers to un-match problems between home postal address of non-contractual customer (from the survey) with spatial data address (road and street data). These un-match problems may create un-accurate value in analyzing customer demographic background when current location of customer takes into account. The objective of the paper is to discuss some issues regarding un-match between home postal address of non-contractual customer and spatial address. Secondly, this study will introduce a procedure on how to solve these problems where at the end results on 100 percents match between these two data. The method of this study is by using iToughMap as an application for transforming customer postal address into spatial address. To operating this work, data survey of non-contracting customer will use as a source of home postal address, while road and street data were obtained from government agency. This study will be applied specifically on the location of Seberang Perai, Pulau Pinang in Malaysia. One of result indicates that perfect match between postal address with spatial address has produced when hundred percent match has resulted. At the end, some recommendation will pointed out for future research on how improvising the accuracy, timeliness, and precision of information of non-contracting customer by utilizes spatial and non-spatial data.

JEL Codes: M3, M31 and M15

1. Introduction

Fundamentally, customer information as well as demographic background is a source to measure the business performance, including lifetime value of business. Demographic information such as income level, family background, education level, types of job, religious, and many more always used by the firm to understand about customer view on product or services that offers to the marketplace. For strategic purposes, business must manage and maintain their customer information as well as important in sustaining relation of business-customer for future value of business profitability. In fact, business must monitor any change on current value, customer feeling, behavior, loyalty, and anything related to retaining the customer to deal with

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business for long term range. The used of demographic information is critical because business profitability and long term customer engagement actually has close relationship. These premises as above are reflects to customer value changes over time, and the value is increasing over time (Gilbert 2007). In fact, customer values were expected to initially increase as the firm grows and later decline when the firm reaches a critical mass or maturity. In perspective of customer value, the value of customer information on future activity is a key metric for any business activity (Glady, Baesens & Croux 2009). Therefore, customer information is important for business especially for predicting customer0based value, as well as for understands their behaviour, perception and experiences.

Practically, there are two types of customer value, where is identified as tangible and intangible value of customers. In other words, customers provide tangible value to a firm through direct purchases but they also provide intangible value through network effects or word of mouth. It is quite possible that some customers have low tangible but high intangible value (Gilbert 2007). In higher level, consumers have great power to revolutionizing their relationships to the business. The empowered consumer is no longer a vague concept, but a reality is that changing the face of commerce. Thus, the smartest companies try to figuring out on how to build relationship with customer to increase their revenues and in future to spurs growth. It is not easy to manage the customer profitability because retailer needs to struggle with the key issues regarding their customers (Fabel, Sonnenschein, Sester & Golestan 2008). For that, these issues are includes how the retailers can best serve the customers while retaining a fair profits; how the retailers stand out in a highly competitive environment where consumers have so many choices; and how the retailers grow up their business while retaining a core of loyal customers (Berman & Evans 2007). Based on these researchers, profiling the customer background is one way to explore customer value for understand their demographic background, behaviour, purchasing activities, change of need, and potential income sources for future.

In customer market view, consumer market and spending will projected to rise up in many countries including Asia region. There are no longer just passive partners in a world economy dominated by the United States, Europe and Japan. Beside that, countries like China, India and Brazil represent increasingly robust consumer markets. In addition, the emerging economies will account for more than half of global consumption by 2025, adjusted for differences in purchasing power. As exampled, compound annual growth rate (CAGR) for the Big Six (B6) countries as well as Brazil, China, India, Mexico, Russia and South Korea, projecting to climbed up from USD 7,579 billions in 2005 to USD 24,799 billions by 2025, which is overall equally to 6.1%. For G6 countries, as well as France, Germany, Italy, Japan, United Kingdom and United States year, CAGR also predicting consistency grew about 2.3 %, where as shift from USD 13,106 billions in 2005 to USD 20,565 billions in 2025 (Fabel, Sonnenschein, Sester & Golestan 2008). With regard to these premises, customer background is important step to get better understand on current need of market orientation.

This, this study is aimed to highlight postal address as one of important data that potentially used for trace, capture and used together with customer demographic, such as location, residential, income level, education level, transportation, and so on. The customer postal address is a touch point to analyzing demographic where it is vital important to the business, especially to prospecting their profitable customer. From literature review survey, the business has been used survey intensively as main sources for gathering demographic information about customer, including non-

contractual customer, also called non-database customer as (Gilbert 2007). However, some problem will rise during joint used of home postal address, specifically, refers to un-match problems between home postal address of non-contractual customer (from the survey) with spatial data address (road and street data). These un-match problems may create un-accurate value in analyzing customer demographic background when current location of customer takes into account.

The objective of the paper is to discuss some issues regarding customer information, specifically on un-match between home postal address of non-contractual customer and spatial address. Secondly, this study introduce a procedure on how to solve these problems where at the end results on 100 percents match between these two data.

2. Literature Review

Managing customer information is important for retails store because of many reasons, especially to the business performance. Researchers as well as Carrie 2009, Fader 2009, Epstein, Friedl and Yuthas 2008, Gilbert 2007, Berger, Eechambadi, George, Lehmann, Rizley and Venkatesan 2006, Adams 2005, Bell, Deighton, Reinartz, Rust and Swartz 2002, Berger and Nasr 1998, and many more doing their research on customer value and business profitability. Customer is an asset to the business (Gupta & Lehmann 2003) and retailers must now how to valuing their customers that contributes the business performance (Gupta, Lehmann & Stuart 2004). Therefore, understanding customer information is a must basic step for ever retail store before marketing department initiate on how to use customer's information in targeting, retaining, satisfying, and maintaining their customers.

Customer information is plays important role in business survivability. Most of researchers such as Baum and Singh 2008, Berman and Evans 2008, and Long, Trouve, and Blackmore 2005, believe that customer is crucial part that contributes to retailer profitability for a short and long term business life cycles. In fact, Baum and Singh (2008) noted that understanding crucial customer touch of point and the most important expectations of customer are first step in establishing high-quality and effective customer services. Recently, Accenture (2007) points out that today's consumers are more demanding and also more diverse. These trends have created a consumer who is also more empowered compared to before. In addition, Berman and Evans (2007) believe that loyal customers are the backbone of a business and for that, four factors must to keep when manage customers are customer base, customer services, customer satisfaction and loyalty programs and defection rates. Overall, business must regularly analyze their customer's information with finally to identify the core customers or its best customers that can contribute to the business success. However, using historical data as such as from customer database is not to much help because information of customer is always change in the marketplaces.

Valuing customers is a central issue of any commercial activity. The value of an individual customer is important for the detection of the most valuable ones, which deserve to be closely followed, and for the detection of the less valuable ones, to which the company should pay less attention. At the aggregated level, a marketing campaign targeting a group of customers can be budgeted more efficiently when the value of this group is known. Customers are an important asset, and as such, have to be precisely valuated (Glady, *et al.,* 2009). However, there are some problems between information from customer database with 'fresh data' from the survey including un-match between them. This is because of information from database is not really updated as it in reality.

Managing customers information are identifies as strategic factors for retailer success, moreover, will reflect a strategic planning on customer relationship management that is fully aligned with their business objectives and an operating model that is standardized, streamlined and globally implemented by their global layout. Fabel *et. al.,* (2008) explain retailers should be setting high response to differentiate different face of customer then lead them to tackle the challenges of globalization successfully. However, specifically, in some case, business cannot estimate a specific segment of customer, as called non-database customer. Reinartz and Kumar (2000) had mention it is not clear whether some of the findings observed in a contractual setting hold good in non-contractual scenarios, where relationships between a seller and a buyer that are not governed by a contract or membership. As support, Jahromi, Sepehri, Teimourpour and Choobdar (2010) coined that although different studies have focused on developing a predictive model for estimate customer lifetime value under contractual settings, performing in a non-contractual setting in which customer churn is not easy to define and trace, has always been neglected in such investigations. One of major problem is the information about non-database customer has not available to business as long as customer not registered as their membership in any marketing programme.

Specifically, under non-contractual setting, there are exit a specific group of customer, called "Free Customer" where they are freely to do any purchasing or travelling to the store without any agreement and agenda, even they are never tied by any marketing scheme that establish by the business, as well as membership card scheme, joint credit card of hypermarket with the Bank, debit card scheme, society programme, and so on. "Free customer" also has no attention on establish any contact or relationship with the business. The data about "Free Customer" is totally not available to hypermarket business, as implication, hypermarket has no capability to evaluated them. Thus, hypermarket has no attention to estimate "Free Customer" contribution to lifetime value of business because of lacking on information regarding their personnel information, as such location, purchasing activity, behavior, and many more. Here, the un-match problem between postal address and spatial address will arisen when postal address is change accordingly to the change in size of population, expansions of housing, re-define name of road and street, and so on.

3. The Methodology and Procedure

The method of this study is by using iToughMap as an application for transforming customer postal address into spatial address. To operating this work, data survey of non-contracting customer will use as a source of home postal address, while road and street data were obtained from government agency. Meanwhile, ArcView software (GIS) will used to integrate and match between customer postal address with spatial-based address. This study will be applied specifically on the location of Seberang Perai, Pulau Pinang in Malaysia.

Then, geocoding process will used to pointing the location of respondents where current postal address will apply for it. Geocoding is the process by which adding point locations defined by street addresses, or others address information, to the map. It's the computer equivalent of pushing pins into a street map (ESRI 2002). All of the address must be in term of point of longitude and latitude, as required by ArcView Software. To do the convert process, online application will be used to get the accurate location of the address.

4. The Findings

By entering street name, town and state, manually, this application will helps to find the longitude and latitude as represent in the real world. Figure 1 show how the longitude and latitudes can trace by this online device, by using 3 steps and Table 1 is example of the results.

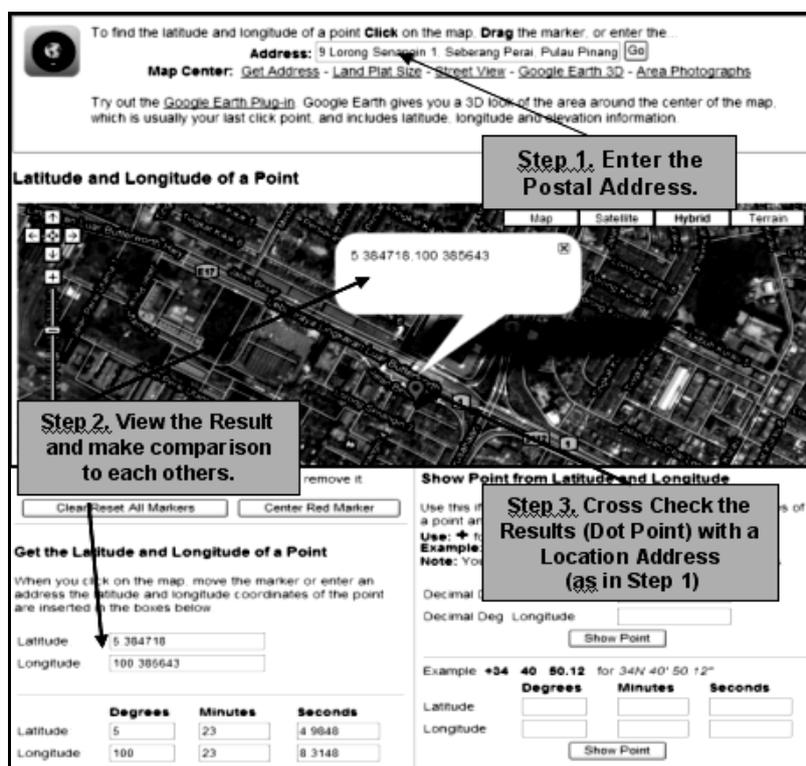**Figure 1: The Progress of Searching Longitude and Latitude by iTouchMap.**

Table 1: Postal Address with Longitude and Latitude.

Address	Alias	Postcode	Residentna	Town	District	Latitude	Longitude
182 Lorong Tenggiri 27	Lorong Tenggiri 27	13700	Seberang Jaya	Perai	SPT	5.38936310	100.4024764
24 Pintas Sembilang 14	Pintas Sembilang 14	13700	Seberang Jaya	Perai	SPT	5.40177500	100.3996560
2 Tingkat Talang 1	Tingkat Talang 1	13700	Seberang Jaya	Perai	SPT	5.38291500	100.3889960
42 Tingkat Kikik 5	Tingkat Kikik 5	13700	Seberang Jaya	Perai	SPT	5.38993200	100.3805140
52 Lintang Talang 6	Lintang Talang 6	13700	Seberang Jaya	Perai	SPT	5.38204410	100.3901034
58 Tingkat Kikik 6	Tingkat Kikik 6	13700	Seberang Jaya	Perai	SPT	5.38832400	100.3823650
35 Lengkok Kikik 3	Lengkok Kikik 3	13700	Seberang Jaya	Perai	SPT	5.39258300	100.3813370
49 Lorong Perai Utama 4	Lorong Perai Utama 4	13600	Taman Perai Utama	Perai	SPT	5.38539900	100.3802740
22 Lorong Senangin 2	Lorong Senangin 2	13700	Seberang Jaya	Perai	SPT	5.38566400	100.3845820
151 Jalan Mohd Saad	Jalan Mohd Saad	12300	Taman Bagan Jermal	Butterworth	SPU	5.42858400	100.3798910
146 Lorong Melur 14	Lorong Melur 14	12300	Taman Bagan Jermal	Butterworth	SPU	5.43298540	100.3839315
19 Jalan Pangsapuri Emas	Jalan Pangsapuri Emas	12300	Taman Mas	Butterworth	SPU	5.42881200	100.3833140
141 Tingkat Kurau 4	Tingkat Kurau 4	13700	Taman Chai Leng	Perai	SPT	5.38785800	100.3916790
17 Lorong Senangin 1	Lorong Senangin 1	13600	Seberang Jaya	Perai	SPT	5.38471800	100.3856430
39 Lorong Kikik 3	Lorong Kikik 3	13600	Seberang Jaya	Perai	SPT	5.39280600	100.3829030
67 Lorong Kikik 6	Lorong Kikik 6	13600	Seberang Jaya	Perai	SPT	5.39311600	100.3842140

Figure 2 show result of adding coordinate into map where the view containing all the points defined in table. Arcview automatically maintains the relationship between a theme created in this way and the tabular data it is based on, so that changes to the tabular data are reflected in the map.

Figure 2: Results of Adding Coordinate into Map.
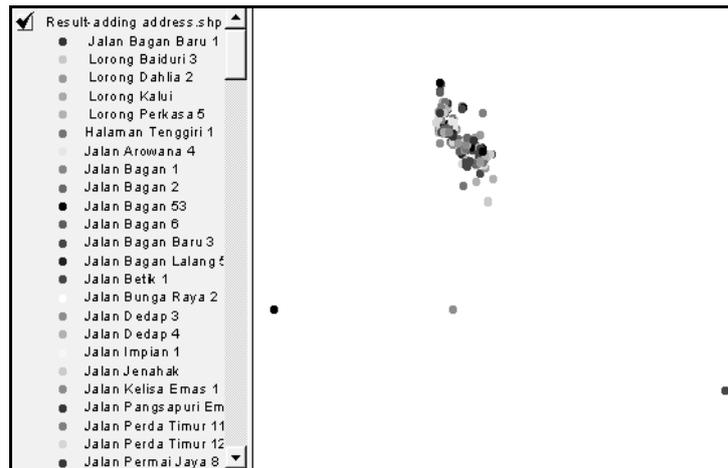
After completing the process of adding the coordinate into spatial based, geocoding and georeferencing process will be applied on the data. Through the process, non spatial data (postal address) from survey will locate on the spatial data which is based on street and road data. Basically, geocoding process has involved spatial data and tabular data of free customer demographic background. By using some part of layer from demographic background map, as such street, residential or village and town, individual postal address from tabular data will geocode onto it.

For the first examine on georeferencing of location, there are some problem in mitch-match the data of postal address with the spatial data of road and street for Seberang Perai. As result, only 20 percents of postal address is suited to the spatial data, other rest 80 percents is having no match. To solve this problem, spatial data will check one by one, and then followed by updating process on it. This part is important because spatial data of road and street that used is uncovering the latest postal address on free customer location. This process is similar to Bossler (2002) where opinioned that the data cleaning, checking, and modifications can exceed ordinary data quality assurances because both the attribute and spatial data need to be individually checked and often modified, but also they need to be compatible with each other and with the GIS software.

After this process has been completed, the geocoding and georefereencing will runs again and as a result it has 92 percents have match. Other 8 percents has problem specifically in contradiction of grammatical error. For example, from survey data postal address of Jalan Seri Arowana is spelling in the true word, however in spatial database the name that used is Jln Sri Arawona. ArcView cannot match beetwen this address and for that spatial database will modified for get the wright name, as similar to what have from survey data. After make the data cleaning, checking and some modification, so this result 100 percent of postal address is matching with street and road, which called perfect match.

At the end, all of data have a match each other as shows in Figure 3. It means that results of geocoding process are indicated 100% of the data are well-match. In addition, by view the data in individual setting (unique value), all of location of free customer will visualized, as shows in Figure 4. Thus, the spatial data of address now is ready for used in further works, as for visualized demographic of respondents, customer activity and customer behaviour, and others.

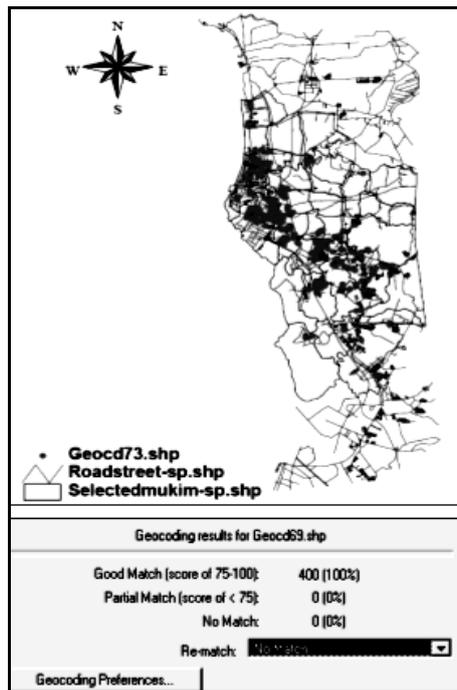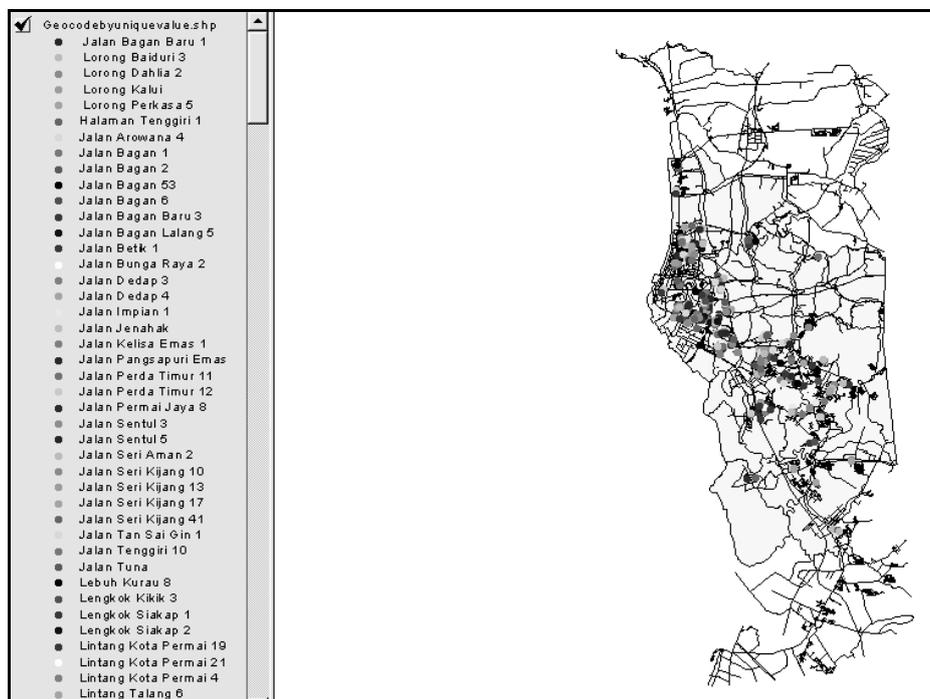**Figure 3: A Result of Geocoding Process.**

Figure 4: A Result of Individual Address in Pin-Points View.

In term of contribution to body of knowledge, especially in customer lifetime value, this study will provide new method for handle non-spatial data of postal address of non-database customer where it is critical to any business. By transforming postal address into spatial-based address it will be benefits for prospecting the profitable of 'free customer' and guiding them on improvising the accuracy, timeliness, and precision of information regarding customer in the real marketplace.

5. Summary and Conclusions

Customer information, especially on non-database customer is always create major problem in estimate the accurate location of customer where also can affects on precision of prospecting business profitability. To get more precise about customer, traditional ways is not necessary now where it cannot solve and supply accurate method in integrate spatial and non-spatial data of postal address. Thus, combination of GIS-iTough Map is one of solution for any kind of customer postal address. In advance, GIS view as high priority technology because GIS supply an indispensable analysis tool (Miller 2007). This support by ESRI (2007) that noted GIS is one of platform for analyse customers in every stage, and ability to integrate, view, and analyze data from geography view specifically different location of customers in countries as well as stated in previous literature review.

In advance, ESRI (2002) noted that customer knowledge is critical to the success of any business. The more retailers know about customers, distributions, demographics, psychographics, and density, the more profitable to business. It is important to keeping inventory on-hand based on customer purchase information, reduce unneeded inventory, and provide a better merchandise mix specific to a store location. Thus, it's important to utilize the customer information because it has some impacts on retailer profitability. Due to profitability estimation based on customer information, precise information is vital important that is can supply by GIS. GIS provide accurate, currently, and update information about market situation and customer locations that lead to development of customer spatial informational database. GIS can realize the customer's valuation precisely, as well as the important of customers as business asset.

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