ISSN 0024-9521
IJG Vol. 41, No. 2, December 2009 (137 - 148)

INDONESIAN JOURNAL OF GEOGRAPHY

MODEL FOR LOCATION DEVELOPMENT OF ATM BANKING SERVICE IN URBAN AREA

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ABSTRACT

The research aims to design a determination model for the locations of ICT based economic service particularly the ATM (Automatic Teller Machine) service. The initial step of this research was to compile a database of the ATM service use by respondents in Bekasi City. The data base covered the locations of the ATMs the respondents visited and their reasons for choosing those locations. The next step was to perform the network and spatial analysis by using ArcView GIS 3.x to determine the optimal service locations. The research result shows that: 1) The locations of ATM placement were mostly found in areas of trade and service, industry and regular residence, 2) The orientation of ATM location development required by the people was on regular and irregular residence considering the short distance, 3) In determining optimal ATM locations attention must be paid to the parameter of distance between the location and trade and service areas as well as the regular residence. The use of network analysis is indeed helpful in developing model of the service location in the determination of optimal service area.

Keywords: location model, information and communication technology, urban economy service

INTRODUCTION

The urban economic service is fundamental for tom fulfil citizen needs. The location factor becomes the main consideration for the economic service provider; likewise, it is another consideration for the users of the economic service. Big and metropolitan cities are the concentrations of large scale economic service with large service coverage.

Provision of the economic service requires space and people movement to access the service. One of the problems in some big cities is the extensive use of street space for activities which often causes traffic jam and eventually results in inefficient usage of movement time and cost.

Nowadays, Information and Communication Technology (ICT) has developed rapidly, so has the provision of banking economic service in terms of ATM facility. Bekasi residents use ATMs to perform banking transactions and payments of telephone, electricity and water bills. The use of ICT in accessing the economic service, particularly banking, shows the reduction of movement to all features of ATM service dominantly located 5 km away. In the same study in the city of Yogyakarta, reducing the distance to ATMs is dominated by the range of 1-5 km [*Rachmawati,* 2009]. The findings should be followed by a research which aims to design a model of ATM location development so as to be adopted as a method to place the optimal service area.

City center known as Central Business District (CBD) is one of the destinations for people to perform many activities. In relation to location, geographers and location analysts emphasize selection for actual location or activity location or mostly on the market selection [*Lloyd dan Dicken,* 1976]. Much information of the tendency for selection of economic service location is interesting to analyze further related to the rapid development of economic service centers along with the application of information and communication technology.

A spatial behavior pattern describes the people movement in space. [*Short,* 1984] suggests that people continuously move, either in short distance as temporary relocations such as to go to work, shop, or in long distance such as to go on a vacation out of town. [*Schonfelder and Axhausen,* 2002] state that the complexities of urban movement and the failure of transportation strategy show that the transportation policy needs the support from an indepth analysis on the routine and dynamics of individual movement behaviour. In this case, different movement actors differ significantly. Poor people with limited transportation will have less accessibility to facilities, goods and services. Some researches explain the presence of trade off between activity duration and movement time. People will have to choose between farther movement with shorter time to do a certain activity

or shorter movement and longer time to do activities [*Timmermans et al.,* 2002]. Later in this research, there will be an analysis on how people movement reduces in terms of time and destination aspects related to the use of ICT based service. Timmermans's advice on how to understand that place influences the pattern of activity movement is worth further investigating.

Cities undergo rapid development in many aspects; one of them is the rapid development of information technology. Urban people adjust themselves quickly to the changing life style, including the high technology life style. [*Sohn et al.,* 2002] analyze the influence of information technology on the urban spatial structure, particularly on the tendency of the distribution pattern of the urban economic activity in Chicago, including the manufactural economy, retail and service sectors. The result suggests that the influence of information technology gives effects on the distribution of the urban spatial structure which is more concentrated than distributed on local scale in Chicago. What [*Sohn et al.* , 2002] deliver indicates that the use of information technology gives much influences on the pattern of citizen economic activities related to the selection of the economic activities location which eventually influences the development of the urban spatial structure.

THE METHODS

The study was conducted in Bekasi City as an area located in Jakarta suburban. The primary data was collected through structured interview to 100 ICT user households controlled by the use of ATM. The data of location coordinate of the residence and the visited ATMs were taken by using GPS (*Global Positioning System*). The data from the interview result were processed with SPSS (*Statistical Package for the Social Science*) and the descriptive analysis. Network analysis and spatial analysis were conducted with *ArcView GIS 3.x* [Ormsby and Alvi, 1999], [*Fotheringham and Rogerson,* 2005], [*Longley, et al.,* 2005]. The analyses aim to determine the optimal service area for ATMs.

Fig. 1 shows the research flowchart indicating that inputs from this research are the base map, map of land use/space, ATM location map and respondents data. The land use/space map describes settlement area and trade and service area. Respondent data are associated with locations where the respondents live and targeted ATMs and the distance between them. The next task is to prepare the area of trade and service layer that was created in 1000 m buffer, the housing area, basic map and location of respondents and then proceed with the network analysis to produce maps of ATM services area. Spatial analysis from the ATM services area map is carried out to produce an optimal ATM service area map and a map of the new development area for the ATM locations.

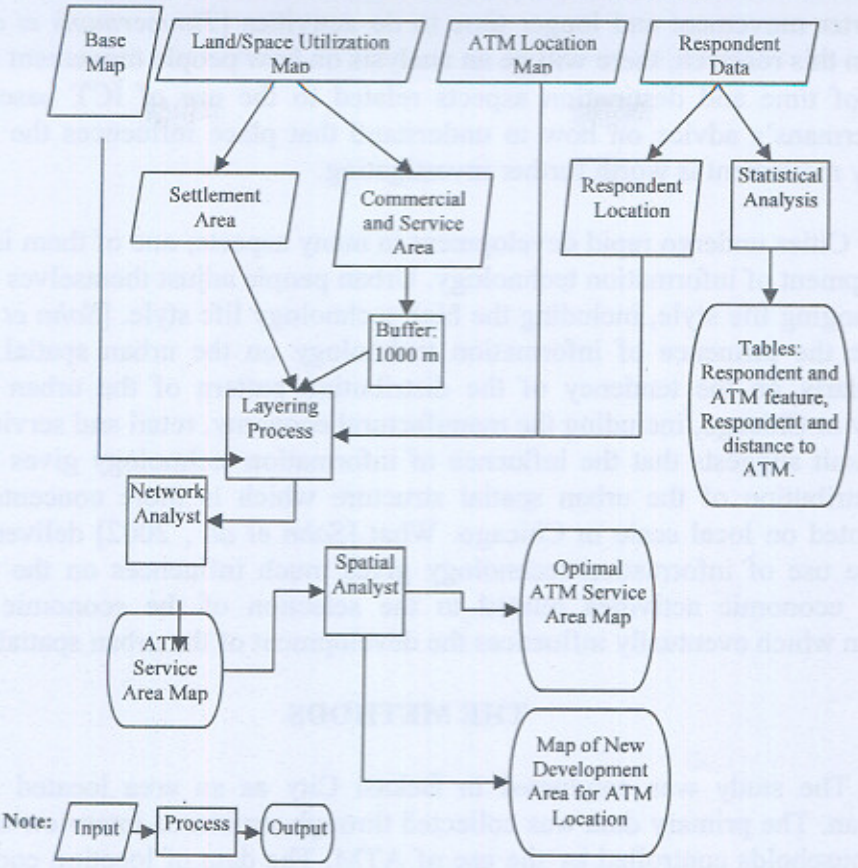

Figure 1. Research Flowchart

RESULTS AND DISCUSSIONS

The Use of ATM Service

The use of ICT in banking sector includes ATM and e-banking (SMS banking, phone banking, internet banking). The survey result shows that the use of ATM is the highest among the other ICT base banking services. It is similar to results of the research by [*Rachmawati,* 2009]. ATM can be used for banking transactions such as cash drawing, balance check, transfer, inquiry history and credit card bill payment. The most frequent transaction performed by customers with their ATM card is cash drawing. In its development, ATM transactions has extended along with the cooperation with Telkom, PDAM, PLN and cellular operators presented in the additional features such as the payments of telephone , electricity, and water bill, postpaid cell phone credit bill, reload service and online flight ticketing. The variation of ATM service features chosen by respondents can be observed in Table 1.

Table 1.Percentage of Household Respondents Based on the ATM Features

No.	ATM Features	Number of Respondents
1	Cash drawing, balance check, transfer, credit card bill payment	100
2	Telephone bill payment	25
3	Electricity bill payment	23
4	Cell phone bill payment	6
5	Cell phone reloading payment	4
6	Online airplane ticketing	3
7	Water bill payment	2

Source: Survey Result, 2008
*Note: respondents may give more than one answer

Respondents' reason for using ATM dominantly is that it makes the transaction easier and more practical because customers do not have to queue or go to bank. Another reason for using ATM is to save time [*Rachmawati,* 2005]. It results in the distance change in accessing the banking economic services as shown in Table 2. The distance change can be measured by subtracting the distance before by after using ATM. A positive figure indicates the increase in distance which means that the distance taken is farther.

Table 2. Percentage of Distance Change According to Respondents of Each ATM Service Feature

No	Distance Change	Percentage of Respondents of Each ATM Service Feature (%)						
		Cash drawing, balance check, transfer, credit card bill payment	Telephone bill payment	Electricity bill payment	Cell phone bill payment	Cell phone reloading payment	Online airplane ticketing	Water bill payment
1	Distance decreases	32	44	43	67	50	0	50
2	Distance remains	19	12	4	0	0	0	0
3	Distance increases	9	28	30	0	50	0	0
4	Abstain	40	16	22	33	0	100	50

Source: Survey Result, 2008

From Table 2 it can be inferred that ATM use of each service feature has the tendency of decreasing instead of increasing distance (abstains are ignored). The biggest percentage which suggests the decreasing distance is on cell phone bill payment feature. It can be stated that ATM use is more profitable for customers given the decreasing distance. Accessible ATM location becomes a necessity for customers. Thus, it is important to develop a model to determine ATM optimal service area.

The research result shows that ATMs, which were provided by nine banks, were most frequently used by customers as shown in Figure 2. Some of the ATMs are centralized in Bekasi City center, while some others are spread in each sub-district of Bekasi city. Some 44 ATM locations were most frequently visited by the 100 respondents. ATM facilities are not always found close to the related bank. Instead, they are found in several trade centers or mini markets.

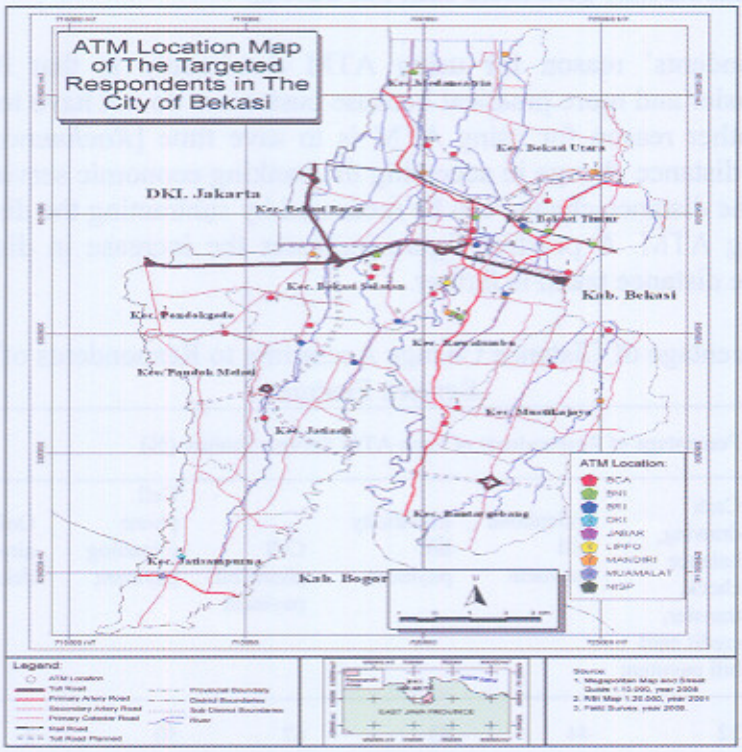

Figure 2. Map of ATM Locations Visited by Respondents in Bekasi City

Orientation of ATM Development Locations

Attention should be paid to the locations required by the people who use these ATMs when developing ATM locations. Placement of each ATM service in a particular location is based on the consideration that it can serve a very big number of consumers and not merely limited to those living close to the location. To

perform the analysis spatial data in the form of ATM locations map to the space utilization in Bekasi City were taken. From the map analysis, information on the points where to place ATMs on space utilization was found.

Based on the spatial analysis, the most frequent ATM locations visited are the areas of trade, service and industry (Fig.3). This is due to many economic activities undertaken by the residents such as working, shopping, and recreation. Trade and service areas also have positive value to serve as ATM placement locations for these areas are usually located in strategic location that are accessible by people who want to use the ATM facility.

ATMs which are located at well-ordered (regular) settlements are also regularly visited by people following those located in the trade and industrial areas (Fig. 4). This is due to the fact that regular settlement areas tend to have higher economic level compared to that of the irregular settlement areas. The survey results show that most respondents wanted to use the ATMs in their surroundings. Thus the consideration of the settlement distance is decisive for the ATM locations.

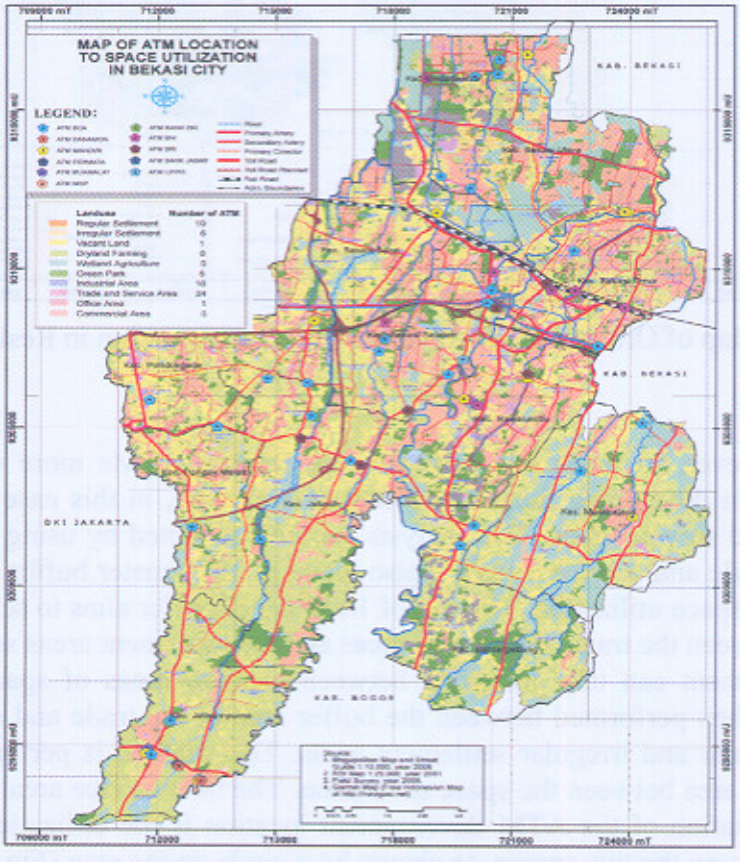

Figure 3. Map of ATM Locations to Space Utilization in Bekasi City

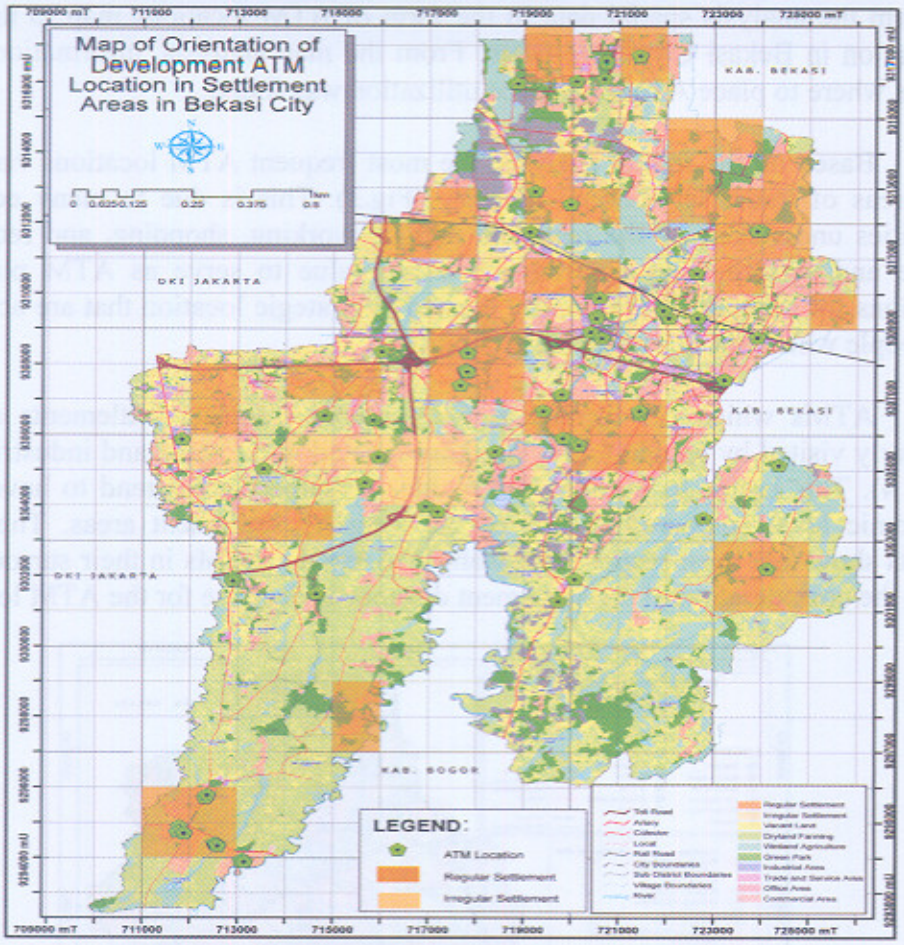

Figure 4. Map of Orientation of ATM Development Location in Residence Areas in Bekasi City

However, to make the utilization of existing ATMs more optimal other parameters in developing the ATM locations are taken, in this case by involving the trade and service areas. The analysis can be conducted by using the next map (Fig. 5). Trade and service areas are also made in 1000-meter buffer as the service areas of the space utilization. The use of 1000-meter buffer aims to serve to strike a balance between the trade and service areas and the settlement areas so that the new ATM placement can take locations between the two areas of space utilization. Overlay is then performed between the buffer area of the trade and services areas and the regular and irregular settlement areas. This method is performed to get a new service area between the space utilization. The new service area which is used as the orientation of the ATM development location is the utilization area of the overlay between the two spaces, as shown by a circle on the map (Fig. 5).

The overlay of the location area can be used as the location for the development of new ATMs only if there is no, or few, ATMs are provided there. Regular settlements have more locations to accommodate development of ATM services compared to the irregular settlements.

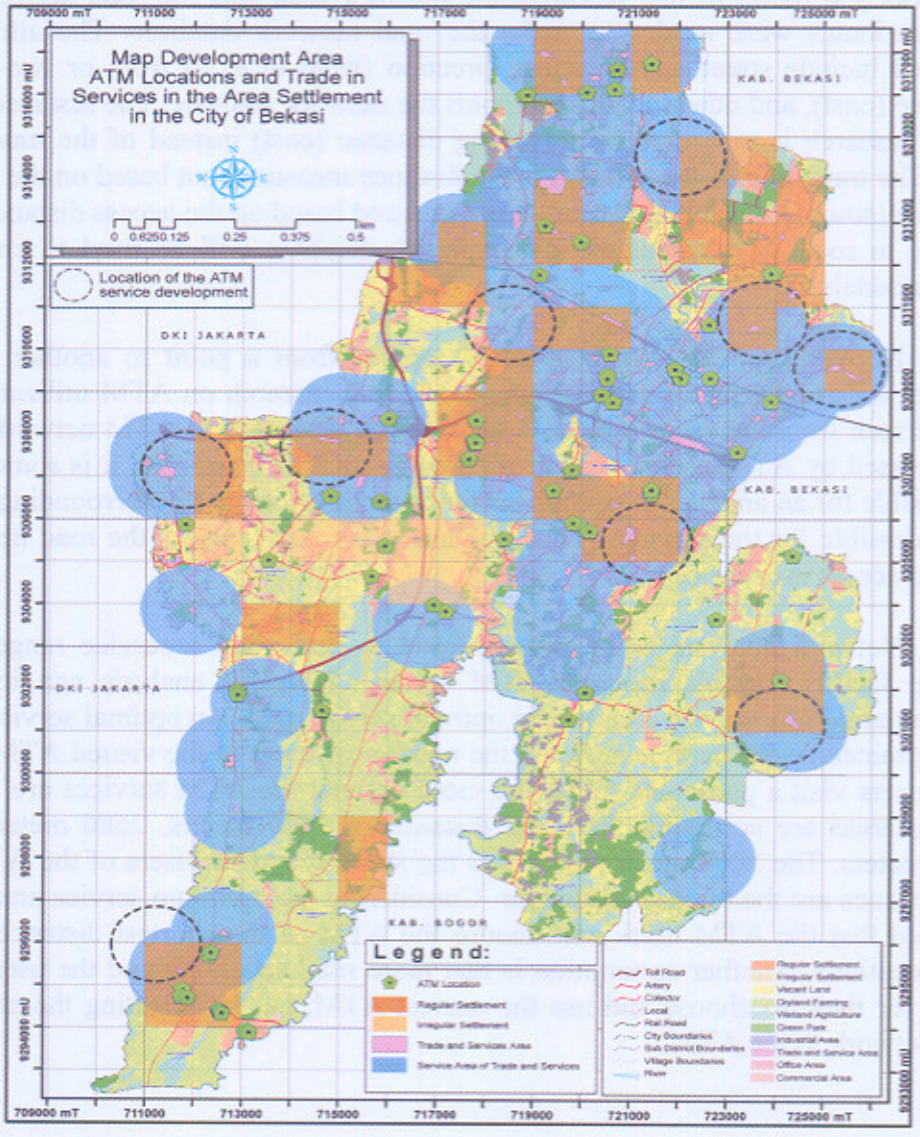

Figure 5. Map of ATM Development Locations and Trade in Services in the Area Settlement in the City of Bekasi

Model Formulation for Service Development with Network Analysis

Network analysis requires a complete database on a network that will be used [*Fischer,* 2003], [*Ormsby and Alvi,* 1999]. Network database should contain complete information about a network, such road, pipeline, telephone cables networks and more. In this research, the network used was the road network, so road attributes were needed to make the road network database. The attributes required include street names, street direction (from to & to from or two-way), distance (cost), and others that can support the network analysis. The distance used in the research is measured by travelling distance (cost) instead of the travelling time. The travelling distance (cost) is the distance measured not based on the actual distance (straight distance), instead, it is measured based on the access distance of a service to road. If the network is completed, database will be used to create a network analysis.

Network can be explained as the access from a point to another point, through a particular network [*Fischer,* 2003]. In a research on ATM utilization, it can be seen from the users' access to the visited ATM. Not all ATM networks can be accessed by ATM users because of barriers, such as rivers. So, it is sometimes impossible for an analysis to use the buffer or range although the surrounding areas are accessible for the services. Thus, the analysis must consider the road network used to access the services.

Network analysis is an analysis used to determine a service range of a service facility, in this research ATM service. Network analysis can lead to determination of a service area and an optimal service area. An optimal service area is determined by the service area and the number of users of the visited ATM. The more users visit a particular ATM, the more optimal the ATM services are. ATM service areas are accessible from the distance of 1000 meters, 2500 meters and 5000 meters. The 1000 meter distance is the shortest and the users of the ATM in this distance are the biggest in number. Considering the optimum service area, it is assumed that the ATM users will choose the ATM of the shortest distance from their locations. Another assumption is that more road access around the users, the easier for them to choose and use the nearest ATM, i.e. by selecting the shortest road network to the ATM.

Service areas can be used to analyze ATM users and service locations that users fail to reach. From the result of the network analysis, a number of ATM users who failed to reach the ATM service at the maximum distance (5000 meters). This is caused by the limited road network around the users. Thus, it is assumed that the users use the ATMs close to their residence. Another possibility is that the ATM user is already served by another ATM. There is a service area with some ATM services overlapping. With the optimal service area, ATM users will select the ATM with the easiest and nearest road access although there are two overlapping service areas.

CONCLUSION

Based on the study result, several conclusions can be drawn: 1) ATM locations are mostly found in trade and service areas, industrial areas and regular residence, 2) The orientation to develop ATM locations required by people is more on the regular and irregular residence considering the short distance, 3) The determination for optimal ATM location must made by paying attention to the parameter of its distance to the regular residence, 4) The use of network analysis helps the determination of the model to develop the service location through the determination of optimal service area and the service area.

ACKNOWLEDGEMENT

This paper is part of PhD research at Faculty of Geography, Gadjah Mada University. Thanks is due to the Directorate of Higher Education of the Government of Indonesia and The University of Gadjah Mada who provided funding under HIBAH BERSAING 2007/2008 scheme.

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