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Location decentralization due to the use of information and communication technology: empirical evidence from Yogyakarta, Indonesia

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In the past, population movement and location of service centres were influenced by the accessibility and land value factors, whereas the impact of the use of Information and Communication Technology (ICT) has not emerged as reported in many studies. This research aims to analyse the decentralization of location of economic services due to the use of ICT from theoretical and empirical view. The study would examine the evolution of the theories of urban spatial structure, ranging from the theory of urban system, spatial distribution of land value in urban area, and decentralization of urban service centres as consequences of the use of ICT. Empirical study is gained from case study data collected through in-depth interview. The research shows that the use of ICT gives a significant impact on the location decentralization of many ICT-based offices. Location decentralization of economic services and residential areas away from the urban centre has moved toward the urban sprawl area. However, selection for residential and business location has considered the availability of access to ICT.

Key Words*: Location, Decentralization, Information and Communication Technology.*

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Introduction

High accessibility level in urban area encourages service centralization in urban area (Ley, 1983 in Hall, 1998; Bourne, 1971; Chapin and Kaiser, 1979). Retailing zone resides in city centre while residential zone is far away from city centre, i.e. in suburban (Bourne, 1971) because of the high land value and land

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rent in city centre (Bourne, 1971). This phenomenon shows the tendency of residential decentralization in suburban due to the high land value factor in city centre. This was confirmed by the Bid Rent Model and Zone Land Use City from Retcliff (Garrison et al. in Chorley and Haggett (1963) which describes that retailing zone located in the city centre which is characterized by very intensive use of land, the greatest accessibility to maximum benefit by attracting consumers. Retailing function is able to pay the high rent of land in this zone, because the cost of transport becomes cheaper. While the residential zone is located far from the centre of the city (suburbs) by the value of the land and the density is lower but the cost of transport is more expensive.

Good accessibility from downtown to the suburbs also push the residential area developed in suburb as noted by Hoyt that the role of accessibility expand wholesale light manufacturing areas, followed by a low class residential zone workers, expand the residential zone of the medium class and high class residential location close to the area with high accessibility. While the theory proposed by Harris and Ullman argued about the role of accessibility besides characterized by railway, ring road and port, also illustrates the Outlying Business District (OBD) which serves the medium and high class residential that far away from the city centre and was instrumental in attracting the other functions such as shopping centres and office buildings nearby residential suburb as a residential zone.

Residential decentralization is followed by suburbanization of business activities due to inexpensive land value factor (Stilwell, 1995) and retail relocation in residential location (Sohn, 2005). Based on the above explanation, it can be observed that accessibility and land value factors affect the location of economic services as proposed by Burgess, Hoytt, Harris and Ullman, Retcliff, Knos, Berry, Alonso (Bourne, 1971; Chapin and Kaiser, 1979; Ley, 1983 in Hall, 1998; Yunus, 2000).

Lately, the use of information and communication technology grows rapidly. Information and Communication Technology (ICT) has been used in the provision of economic services such as electronic shopping (e-shopping) and electronic payment system (e-banking). ICT use in economic service provision is likely to give influence to the centrality of population mobility in accessing the services and stimulate the locations of economic services. Decentralization affected by the use of ICT has been proposed by several experts and researchers in industrial and commercial based countries particularly in Europe. In Indonesia, for the time being, the concept has not emerged so that a research needs to be conducted. The purpose of this research is to study the location decentralization due to ICT use from either theoretical or empirical point of view.

There are some theories studying the distribution of economic services locations. A theory explaining city centre as central business district is suggested by Burgess, Hoyt and Harris and Ullman, known as the Traditional Models of Urban Structure which describes the regularity of land us pattern (Ley, 1983 in Hall, 1998; Bourne, 1971; Chapin and Kaiser, 1979). Central Business District in this concept consists of the nucleus called the RBD (Retail Business District) in which the predominant services are related to department stores, office buildings, banks, hotels, and theatres in the highest accessibility level.

Centralization of economy services is confirmed by theories related to land value such as urban land economics, the pattern of land value, urban land value surface, urban land use pattern which are consecutively proposed by Retcliff, Knos, Berry, Alonso (Bourne, 1971). Those theories explain that the location of city centre is characterized the highly intensive land use and the largest accessibility (ring road and radial road are influential), high land value and high land rent. Retailing zone located in this area is related to the potential shoppers, and the ease to visit the location. In the other hand, residential zone, situated far from the city centre (suburban area) and having the lower land value and density yet more expensive transportation cost. Suburbanization of business activities due to inexpensive land value is proposed by Stilwell (1995), while retail relocation on residential location is proposed by Sohn (2005).

Related to the use of information and communication technology, Alonso and his Theory of History (Yunus, 2000) has actually observed the decentralization symptom due to the rapid change of technology. Alonso highlights both changes of technology i.e. in transportation and communication which encourage society movement out of urban area. It is explained in this theory that the increasing living standard of society formerly lived close to CBD accompanied by the declining environmental quality enforce the propulsion to move to suburban and the perspective that communication technology makes personal contacts not necessarily face to face. However, communication technology described by Alonso in the era of 50s is limited to the use of telephone services.

Research Method

Theoretical study is based on the theories on urban spatial structure and urban system (periods of 1923-1945), spatial distribution of land value (periods of 1949-1964) and decentralization concepts (periods of 1994-2006). There has been a lack of theories and concepts relevant to the study during the period 1964-1994. Thus the discussion on the related theories and concepts of urban structure will then would jump to theories emerged after 1994. Empirical study is based on a case study. In this regards, Yogyakarta Urban Areas is taken as a single case, considering the fact that this city maintains the main function as education and retail service centre in which the use of information and communication technology is commonly practiced.

Data is collected through in-depth interviews to 40 ICT user cases taken through a snowballing method. The technique is seen to be very precise in terms of effectiveness in getting the unit case in accordance with the criteria expected. As stated by Bryman (2008) that through snowball sampling, researchers conducted initial contact with a small group of people who are relevant to the research topic and then use this to establish contact with each other so that in this method is no longer required sampling frame. The sample is of course not a random one, therefore, the general picture of the population may not be well represented (Becker 1963 in Bryman, 2008). Furthermore, this research leads more on the Explanatory Case Study as a method to compare the theories/concepts to the reality (Yin, 2009). Explanatory case study is different from the explanatory research. An explanatory research examines the causal

relationship between two or more phenomena with the aim to test whether one or more independent variable affect one or more dependent variables (Dane, 1990) while for the case study explanations were focused on the unique appearance of the case (Bryman, 2008). In reviewing the case information is captured in detail, depth and explorative in nature. Activity in the in-depth interview would be ended when no new information is encountered that could clarify the phenomenon under study.

The analysis performed in this study is qualitative in nature, although in the case study analysis one can also use quantitative analysis, or a combination of both (Yin, 2009 and Gerring, 2007). Qualitative analysis is primarily to assess the utilization of information and communication technology, purpose and reason for the use and terms of site selection. The analysis focused on cases with information relevant to the determination of the location and decentralized locations.

Research Result and Analysis

Decentralization of Economic Service Encouraged by Urban Sprawl

Theories related to the location distribution of economic service and society movement suggested by Burgess, Hoyt and Harris and Ullman (Traditional Models of Urban Structure) at around 1923-1945 is currently affecting the condition of big cities in Indonesia. These big cities are characterized by the important role of city centre as the central business district. However, due to limited availability of space in the centre of the city led to the process of urban sprawl. Urban sprawl in Yogyakarta Municipality is shown by the development of residential areas, university campuses and retail services toward the suburban area (Rachmawati, 2005). The development of retails in the suburban area has grown beyond the city borders following the development of new residences in the area.

Apparently the urban sprawl process as suggested by Stilwell and Sohn takes place in Yogyakarta Municipality. Stilwell (1995) explains that urban sprawl is characterized by the suburbanization of business activities particularly due to the inexpensive land value beyond the city borders. In this extent, Stilwell emphasizes on the land value factor. On the other side, still related to urban sprawl, Sohn (2005) draw a conclusion that retail relocation toward suburban is in order to be close to the residential location. Either Stilwell or Sohn has not mentioned the role of ICT in this decentralization. Likewise, the initial phenomenon of business activity relocation to suburban in the case of Yogyakarta Municipality is associated with the urban sprawl.

The consequence of urban sprawl on the outskirts of the city is the shifting from non-built up area into built up one. Local governments anticipate the location of urban sprawl by retaining the existing fertile volcanic farmland. However it is not easy to implement considering the existing pace of land use change towards the periphery of urban development and the weak of the control of the local government. In the case of the development of the city of

Yogyakarta, the northern outskirts of the city especially in Sleman District, has experienced the most rapid growth compared to other regions, characterized by the establishment of shopping malls, university campuses and housing. While the development of trade and services sectors of the economy (the malls and hotels) are predominant in the region, Sleman District Government seeks to control the use of space in accordance with the spatial plan, one of which is maintaining the protected area of the catchment residential development. Meanwhile in the southern part of the city, the local government of Bantul District has further protected agriculture lands, and prohibited the development of modern shopping centres to the region in order to avoid unfair competition between local traditional traders and the modern shopping facilities.

Decentralization of Economic Services Due to the Use of ICT

Decentralization due to ICT use, in this paper, is related to the development of economic service location in suburban area, residential location and office complexes. Rachmawati (2005) views ICT use enables economic services and agencies to be located not only in city centre but also in the suburban area. Rachmawati's premise is based on the survey result of 1,000 urban households on ICT use and usage purposes. It is mentioned that ICT (telephone, hand phone, ATM) can be utilized for electricity, water and telephone payment. Similarly, banking transaction can be performed by means of ICT either from home or ATM. Rachmawati (2005) also observes that there is a growing tendency of the new shopping manner performed without having to go to the department store but by means of telephone or internet. Change on the mode of payment, banking transaction and item purchase will give consequences on movement, time and transportation cost reduction (Rachmawati and Rijanta, 2012; Rachmawati 2013).

Data from the in-depth interview further support what is reported by Rachmawati that ICT use shows the phenomenon of declining function and frequency in the tendency of the use of face to face or conventional bank services (Rachmawati, 2009; Rachmawati and Rijanta, 2012; Rachmawati 2013). Related to its function, banks are currently functioned more to serve administrative matters such as opening and closing account, complain handlings, credit proposal assessment, and overseas transfer. Related to frequency, current customers rarely use bank except for transactions of great nominal (transfer, deposit and cash drawing) due to the nominal limit for transfer, deposit, and cash drawing via ATM. Some banking services have been substituted by e banking which are considered more practical and stated by some individual cases to have reduced movement distance, time and cost (Rachmawati and Rijanta, 2012). Under such condition, it is considered that the development of bank does not necessarily in the CBD location, but in suburban area.

Several additional banking services, particularly those related to the payment of electricity, clean water, and telephone services payment, require improvement in terms of service provision either through ATM or e banking so that service users can access through both services (Rachmawati, 2009; Rachmawati and Rijanta, 2012; Rachmawati, 2013). Payment location will still be needed in the areas which have not been penetrated by ICT, for instance, in rural area, conventional service location/ office is still necessary.

Figure 1. The office location is not in a strategic location, in the dense residential neighbourhood, and local street in suburb area (Individual Case 9)

Individual Case 40, respondent is the director of an advertising company. The business is located in an urban area yet in a residential neighbourhood unstrategic for business activity. However, due to ICT support, ordering and marketing run well, as suggested by the case: "Order and offer are performed via internet. Telephone is utilized to call relations, call and be called by clients, receive and offer orders to clients. Service serving to facilitate society via ICT is more appropriate than having to go to sidewalk."

Individual Case 10, the case is a CEO (Chief Executive Officer) of a creative industry company in ICT sector comprising IT book publication, IT consultant, and software production. The business is located on a distant suburban area (kilometre 14). The selection of office location is based on accessibility easiness, access to urban area, internet facility, telephone and hand phone coverage. According to the respondent, due to ICT support, the area develops not only nationally but also internationally. Clients service is on call or email.

Individual Case 24, the case is the director of an ICT company who also owns side-business in interactive game developer. The office is located out of suburban area (rural-urban) namely Wedomartani Village, Ngemplak Subdistrict, Sleman Regency. According to the case: "Internet connection and such communication as hand phone and single-numbered telephone support work."

Individual Case 15, case is an employee of IT sector in a furniture company. The business location is un-accessible since it is in distant suburban and set in neighbourhood path. However, the business sector managed by this company has utilized ICT for marketing and leaves business location off debate.

Some cases above show that the location of the office does not have to consider the strategic locations but can be located on the outskirts of town and away from the city centre. This is indicated by the location of the office is not close to major roads and not a location close to the route followed by public transport. However, its location in a residential neighborhood or even residential neighborhood and not in the business district area.

Furthermore, this paper will analyze the role of ICT as another factor worth considering in the selection of residential location. Data of in-depth interview result is complicated to use to show the decentralization symptom of residential

Retail economic service is of necessary, particularly the presence of malls, supermarkets and department stores due to society culture factor which makes shopping activity as a form of refreshing, tourism and leisure activity. In this case, online shopping activities are mainly practiced on the purchase of electronics, fashion and books. Conventional physical visit, contact and direct observation to the items in shopping are still the main mode of transaction. The location of retail development is directed more on residential location and business centre in the city.

Related to the Traditional Models of Urban Structure suggested by Burgess, Hoyt and Harris and Ullman, of the three models, the most appropriate one for the condition of the research area is the Multiple Nuclei Theory by Harris and Ullman. In this theory, CBD acts as the Activity Centre Area in which retails are located, while the suburban area which acts as residential development zone retains OBD or retails that serve suburb due to its function as Residential Suburb Zone. Therefore, the determination of retail location still considers the aspect of population number served (threshold) and service range, as explains in Christaller's and Losch's theories related to the Central Place Theory and Economic of Location. Therefore, it can be put forward that the connection between ICT uses to the consideration in determining retail location is weaker than to bank location. Retail services in this research area tend to lead to suburban area due to urban sprawl factor caused by the moving residential location in suburban due to spatial limit in urban area and the high land value.

Referring to the concepts of urban land economics, the pattern of land value, urban land value surface, urban land use pattern which are consecutively proposed by Retcliff, Knos, Berry, Alonso, locations in city centre are characterized by the highly intensive land use, high land value and high land rent, which make retailing zone located in this area is related to the potential shoppers. However, since the acceleration of urban sprawl process of the research area is triggered by the presence of ring road, then, the development of residential zone in suburban area highly increases, with the locations, which is not too distant from the city centre, with the increasing land value and population density. The tendency is that retails (malls, supermarkets and department stores) develop according to the pattern of residential development and is not concentrating in city centre. What is mentioned by Anas et al. (1998) in Schwanen (2001) that ICT has kept deconcentration of shopping centres from being clearly shown in this research.

Nevertheless, some concepts related to decentralization proposed by Bleeker (1994) in Hall (1998); Stilwell (1995); Castells (1996), Graham and Marvin (1996) in Hall (1998), particularly on the decentralization of company/office location due to the presence of information and communication technology, can be explained by the research result through the following cases:

Individual Case 9, respondent is the director of an ICT marketing company. The office is not located in the city centre or a strategic location (close to the arterial roads) but in a dense residential and campus neighbourhood in suburban area (5 kilometres away) on the side of neighbouring road. With the support of ICT, the office is able to serve item order and purchase as well as marketing, as suggested by the respondent: "With the support of ICT (telephone, hand phone, internet) everything becomes mobile, there is the ease in communication and marketing."

Figure 2. Business location is in the not accessible place and neighbourhood street in suburb area (Individual Case 15)

location due to ICT. The data is not strong enough in showing the symptom considering that out of 40 cases, most of them have the long life history of staying for five to ten years even longer, when ICT was not well-developed compared to today. In general, in selecting residential location, cases keep the availability and easiness of ICT access out of consideration. This is probably because the residential location has been inhabited since years ago when ICT was not as well-developed as today. It is important to note that ICT, particularly hand phone and internet, was growing popular in Yogyakarta since 1995s.

Nevertheless, in individual case 18 and individual case 38 it can be analyzed that the selection of residential location in both cases reinforces the phenomenon of residential location selection influenced by ICT. It is important to explain here that in both cases the selection of residential location each occurs since one and three years ago when ICT has developed, so the selection for residential location could be considering the ICT availability factor, as stated by cases of both cases below:

> "Finding a residence with trouble-free internet connection is based on the reason that without the internet, there is nothing much to do. Without the internet, I cannot breathe." (Individual Case 18)
> "Related to ICT are Mobile Phone and GPRS reception for internet access." (Individual Case 39)
> There is one case (Individual Case 8) which in process of moving to a new location where ICT becomes a consideration in location selection, as stated by the following case:
> "… faster 3G, more ATM and better Mobile Phone signal … when searching for the residence (location), ICT was the main factor." (Individual Case 8)

Supporting environmental factors, inexpensive land value, accessibility, and history/culture are the dominating reasons for residential selection. Environmental factor in the form of quiet and less crowded atmosphere, pleasant air, distant from urban area, surrounded by vast farming land are the most important factors mentioned by many household cases. Accessibility factor is shown by the strategic business location, narrowness with public facilities such as hospitals and schools, easiness access to places, nearness to workplace, shopping area, urban area, campuses, airport and parents (family). History factor relates to inherited land/ housing or inborn dwelling (Table 1).

The data show that the theories explaining the location of service centre influenced by land value i.e. Retcliff, Knos, Berry, Alonso (Bourne, 1971; Yunus, 2000) delivered in the era of 1949-1964 do not appear predominant in this research result. In this case, only 2 (two) cases suggest that the selection of residential location relates to the inexpensive land value. Of the three great theories developed in 1920-1945 known as the Traditional Models of Urban Structure consists of Concentric Zone Model (Burgess), Sectoral Model (Hoyt), and Multiple Nuclei Theory (Harris and Ullman) (Ley, 1983 in Hall, 1998; Bourne, 1971; Chapin and Kaiser, 1979), it seems that Harris's and Ullman's theory related to the role of accessibility (the presence of road and other means of transportation such as harbor and airport) and the presence of outlying

Table 1. Reasons for Residential Selection

Reasons		Total number of cases
1.	Environmental factor	8
2.	Inexpensive land value	2
3.	Accessibility	25
4.	History / culture	10
5.	ICT	2

bussines district (OBD) which serves medium & high class residential also becomes another reason in location selection (this is described in 4 individual cases i.e. 8, 22, 39, 7, 14). Of the three great theories, the environmental factor which serves as the basic reason in determining the residential location is also significant in 8 individual cases i.e. 1, 3, 9,10, 14, 15, 26, 33. Good environment describes the situation in the zone of better residences (zone 4 in Burgess's Concentric theory), High Class Residential (zone 5 in Hoyt's Sector Theory and zone 5 in Harris's and Ullman's Multiple Nuclei Theory).

For the time being, no theory explains the selection of residential location influenced by ICT use. Therefore, this research can be used as a contribution of new thought on the need of ICT consideration as one of the determining factors in residential location. The power of ICT is supported by the statements of 35 percent cases who decide to move provided that ICT service is not available. The number shows how powerful the influence of ICT need upon one's decision to move considering that moving is not an easy decision. As many as 20 percent other cases decide to move but tend to search for other alternatives in order to get ICT service. If both percentages are combined then there are 55 percent people who are addicted to ICT.

The history theory proposed by Alonso in its relationship with the change of communication technology which encourages society movement in the era of 1950s cannot be supported by the condition in Yogyakarta Urban Areas. In Alonso's theory it is shown that the presence of telephone which substitutes face to face communication into long distance communication encourages people to live in suburban area. Although ICT is currently developing proved by the presence of mobile phone and internet, this does not urge the phenomenon of society movement to suburban. In Yogyakarta Urban Areas, however, ICT has become a worth considering factor in selecting residential location.

Conclusion

Decentralization location due to ICT use in Yogyakarta Urban Areas begins to emerge related to the locations of ICT based offices. Decentralization of location of economic service such as banking and retail is related more to the urban sprawl compared to ICT. Along with the increasing ICT based service use it is predicted that in the future ICT will become the determining factor in the decentralization of economic services. Similarly, the decentralization of residential location is also related more to the urban sprawl than to ICT. However, the selection for residential location begins to consider the aspect of ICT presence.

Thus the information and communication technology factors are important to consider in determining the location, in addition to the accessibility factor, environmental factor and the price of land, as the theory has been widely discussed. This study contributes to the repair location theory that in earlier time only influenced by aspects of land values, the role of accessibility and the environment as proposed in the classical theory which has been discussed in this paper. Currently need to begin to incorporate aspects of the effect of the use of information and communication technologies in location theory.

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