

New Landscape of Poverty Management in Land Information System

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토지정보를 이용한 빈곤관리의 모델

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ABSTRACT

Estimation and indication for spatial distribution of living quality and poor condition associated with land and house's access as a basic human need has been imperative questions and predicaments while it is required to boost digital economic development and consolidate social maturity. Although modern IT and sophisticated GIS/LIS technologies are used to examine spatial analysis of population location-patterns, land uses and development, and environmental degradation, etc, it still might remain immature step to figure out the causations and results of poverty in space and time. In this research, a new approach to poverty management is explicated by using 6 parameters as a major tool for assisting poverty monitoring concerning the poor who are very unpredictable in space and could be regarded as renegades in the Internet age. In addition, it expounds a new approach and conceptual idea for poverty management to notify spatial location of the digital divide when poverty reduction is closely concerned with sustainable goal of land information.

KEYWORDS: LIS, Poverty, Digital Divide, Internet Model

요 약

디지털 기술의 발전과 사회 경제적인 성숙을 추구함과 더불어 주택과 토지에 대한 소유 및 접근은 공간적 분포의 삶의 질과 빈곤을 평가하는데 있어 매우 중요하고 어려운 문제이다. 첨단 IT 기술과 매우 향상된 지리 및 토지정보 시스템이 공간적 인간 정주문제, 토지이용과 개발, 환경악화 등을 분석하는데 이용되고 있지만, 시공간 차원에서 발생하는 가난의 원인과 결과를 이해하는데 있어 초기연구 단계에 있는 듯 싶다. 이 연구는 육하원칙 인자를 이용하여 공간적 위치의 가난을 해석하고자 하였다. 또한 정보격차로 인하여 생기는 가난한 환경을 토지정보의 공간적 개념과 연계하고 빈곤을 해소하는 관점에서 새로운 모델을 제시하였다.

주요어: 토지정보, 빈곤, 정보격차, 인터넷 모델

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INTRODUCTION

A wide variety of efforts for poverty alleviation have increasingly been spotlighted at national and international societies while sustainable developments and livelihoods are playing a major role in contribution to poverty eradication focused on the poor who live in marginalized areas. The broad goal of poverty alleviation is to develop individual, family and community capacities to improve their livelihood systems (UNDP, 1997). However, there might be several question marks and stalemates when interpreting a poverty profile as to who and where poor people are, what poverty looks like and why they are poor. The information for developing poverty profile comes from census data, household survey, statistical analysis of income/consumption, and others. Additional factors associated with lifetime poverties and anti-measures as to when they are poor and how they can escape from vicious cycle of poverty must be necessary to be added to poverty profile when carrying out socio-economical and information (or Internet) poverty mapping in the context of actor-based interpretation.

The digital divide is, today, considered to be socio-economic and technical gap between information haves and have-nots causing individual and group future income's capacities that would lead to geographic concentration and convergence of the Internet's investment. The digital divide tends to extend to the socio-economical divide showing geographical focus and disparity of local or regional wealth. Thus, actors who are inaccessible to the information and communication technology (ICT) and Internet or who are not proficient in using and operating these tools are going to become

steadily disadvantaged and could not enjoy a premium on higher skills and e-commerce enabling to accelerate income gap as a new type of poverty indicators.

In this research, we illustrate the flows of interdisciplinary communications between land information and the Internet model towards digital equity or welfare as to how we can survey and collect informations on poverty causality and what we can improve decision-making of poverty controls through the Hexad model. Although many different analyses and solutions for poverty intensifications have put an emphasis on socio-economical and environmental symptoms of poor circumstances, there might be difficult to suggest a concrete framework of poverty management since multidimensionality of poor variances differs from country to country. In this research, a new approach to poverty management based on the Hexad model is proposed to shed light on six factors for the causations and results of poor discourses. In addition, the Web-based environment will not only give us more dynamic ways of self-descriptions about our living conditions, but also illustrate geographic distribution of the digital divide towards buildings of digital opportunity.

CURRENT WORKS AND CHALLENGES

Many people in developing regions are still faced with civil or religious conflicts and environmental risks or natural disasters and continue to steadily increase in the poorest areas of the world where they need house, land, clean waters, sewerage, food and income. Poverty measures of human needs and future desires in developing countries might be

based upon conditions of their holdings or access to foods and, affordable lands and shelters. While getting pleasure from surplus world food cultivations, malnutrition is still growing in Africa and Eastern parts of Asia because they have not sufficient agro-technologies to cope with more food demands and might be too poor to purchase what they need. In the process of economic growth and development, there are inevitably lucrative games of interests and technological hegemonies to maintain their geographical influences on commercial monopoly. It is manifest that this leads to local, regional and international disparities of extremely marketable dominations and technological intensities. The side-effects of these intensifications are frequently undermining social solidarities and unities as an evidence of massive capital concentrations, keeping urban slum and land degradation as well as housing shortages. These surroundings and phenomena would often lead to negative colors and tones of social integrations and inevitable disparity of living qualities. Many research works have examined a wide variety of symptoms of poverty with regard to lacks of income and assets (UNDP, 2001; World Bank, 2001), food insecurity and poverty (Swaminathan, 2000), soil and land degradation (Ballayan, 2001), real estate of human well-being (Lee, 1997; Robin, 1997), ICT and Internet inequality and poverty (Panos, 1998; Heeks, 1999; Rodriguez and Wilson, 2000; Kenny et al., 2001), information and poverty (Spink and Cole, 2001), knowledge networks and geographic dispersion (Willard, 2001), poverty and sustainable development (Markandya, 2001; Singh and Gilman, 2000), and urban poverty management (Akinyemi, 2001) and poverty mapping (Henninger, 1998)

in GIS. Traditionally, poverty is a major cause of food insecurity (Narian, 2001) and lacks of agro-ecological technologies (Altieri, 1999) in developing nations.

Since major issues and concerns of multinational aspects of poverty vary from country to country and are also changing and modifying, it is still hard to address structural causes of poverty and its effects. Because poverty is quite related with other concepts, particularly socio-economic and technological developments enabling a community and household to alleviate poverty and improve their empowerments within different dimensions of human well-beings. Many theories and models have long articulated the real truth of socio-economical and cultural problems. This paper does not deal with conventional approaches to multidimensionality of poverty, but puts an emphasis on causal mechanisms between the digital divide and poverty around a central pivot of land information.

Figure 1 offers some ideas and raises questions about diverse human needs that would be regarded as poverty indicators, ranging from economic poverty and social exclusion to technical gap. Economic poverty begins with understandings of asset-based or income-based measure of poverty considering income's affordability for production and consumption as a basic needs indicator in spatial dimensions of poverty (Hentschel et al., 1998). It often causes the economic divide or income divide. This economic poverty has serious impacts on individual educations and employments. Those who appear to be social exclusion(Castel, 1995) or isolation(DiMaggio et al., 2001) in digital society could rarely enjoy economic gains and socio-cultural

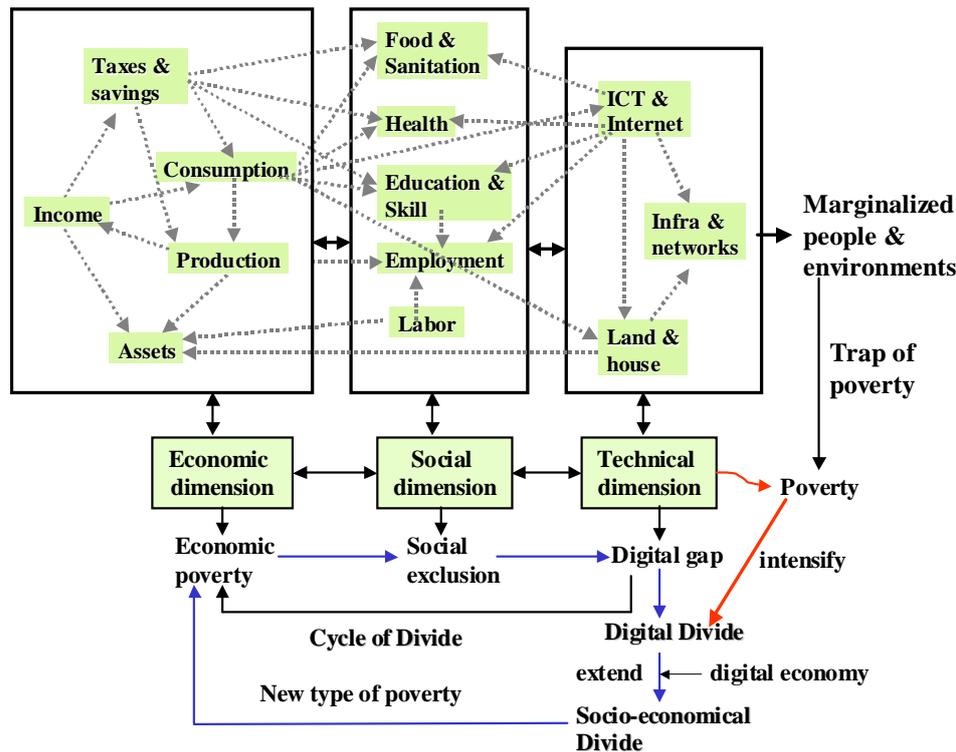


FIGURE 1. Causal mechanisms between the divide and poverty

benefits. These two negative influences could give rise to technical gulf or the digital divide with regard to lacks of access to computers, Internet and other electronic utilities, and shelters as evident differences based on race (Hoffman and Novak, 1999), gender (Hafkin and Taggart, 2001), demography and geography (NTIA, 1999), economic status (Dasgupta et al., 2001), and physical ability (ETRI, 1997).

Since there is a danger and risk that marginalized people or groups in society are inaccessible to the information and communication technologies (ICTs) and the Internet, the digital economy could widen poverty gap and triggers a new type of poverty. Those who remain in the wrong side of the digital divide due to lacks of income, education, computing and infrastructure

facilities and high burdens of rents are caught in trap of poverty and a double or triple-bind divide (Schmidt, 2001).

This is hard to make it possible to clearly circumscribe the scope of digital divide because information poverty coming from unemployment, low quality of education and skill, and living burdens of land and house's access could lead to a distorted socio-economical divide. The digital divide is a multifaceted nature that appears to be more than an issue of inequality, and should be contemplated for ensuring equality of opportunity in economic, social, educational, political and technical and infra-structural systems. Obviously, access to ICT is the real motivations why developing countries and the poor need to leapfrog across

the digital divide (DOT Force, 2001).

From the point of view of land management, the poor may have difficulties in access to land and house as well as public infrastructure services than middle and upper-income households (Komives et al., 2001). There are growing recognitions of the importance of land reform to make a direct impact on poverty (Drimie and Mbaya, 2001) through targeted resource transfers as a vital instrument for readdressing the inequalities in access to economic opportunities. Most governments allow people to access to properties not only to make more productive use of their interests, but also to provide appropriate guideline of assets' transactions as well as to equalize the opportunity of information shares. However, poor people who do not have access to assets might be caught in poverty trap (Jalan and Ravallion, 1997) arising from traditional economic games and theories. They often fail to get out of poverty because they are uneducated and lack capital-skills being unable to purchase lands. Due to the credit market imperfections (Deininger and Binswanger, 1998), they often do not get the opportunity to utilize their innate ability.

However, it is manifest that data on the distribution of lands would understate the degree of inequality because land is considered as homogeneous asset of uniform quality that is available to everyone. In other words, measures of land concentration are measures of inequality in surface area, but are not measure of inequality in the values of land as a productive asset (Griffin and Ickowitz, 1997). Deininger and Squire(1996) mention that possession of land can be a major determinant of an individual's productive capacity and their

ability to invest in agrarian societies and highly dense population areas where land is a major asset. Given the fact that the degree of inequality for land redistribution leads to wealth gaps in some African societies (Sibanda, 2001; Selebalo, 2001), we may reconsider traditional aspects of land conflicts and dilemma how land information correlated with the improvement of sustainability for the poor. Land information management is not only to support land administration, associated with land ownership, valuation, and registration that are significantly important for individual properties, but also to boost collection and dissemination of information on land. Land information management benefits from the Internet, at the same time, influences upon Internet application in real estate management.

Few works and studies frameworks might have been done with regard to causal relationships and consequent results between the digital divide and poverty based on the concept of cadastral surveying to be focused on six parameters of poverty profile. Furthermore, current poverty mapping or poverty information management might not fully considerate vicious impacts of the Internet's interactions with land information that are seriously related with our socio-economic and human capital. In addition, there are few clear evidences between land information and ICT and Internet as to how they could impact on poverty intensification.

The Internet technologies play an important role in improving human life around the world, but there are also widening the gap between the rich and the poor. It might be now crucial questions and tasks to examine reasons and results of poverty trap as to what an integrated poverty management system looks like and how

it can contribute to smooth and tendering cares for low-income classes in conjunction with Internet-based land information system.

LAND INFORMATION APPROACH TO POVERTY MANAGEMENT

1. Role of land information for the poor

Although poverty is not a new problem, we can rarely eradicate shadows of economic justices resulting from huge income gaps and information poverty among people. Even though many efforts and resources are discussing the way of poverty alleviation, the problem is getting worse and become social and political obstacles in some countries. It is very difficult to tackle problematic issues of multi-dimensional aspects of poverty because poverty eradication ranges from social welfare to political wills, economic development, infra-structural access and land-related matters. Meanwhile, we are still wrestling with finding an appropriate solution for relative poverty and observing that abrupt and rapid improvement of marginalized areas through provision of infrastructure, and land and housing developments would have resulted in skyrocketing land and rent prices and ultimately in the exclusion of the poorest actors or groups from the settlements in our metropolitan areas. An important effort of poverty reduction is considered to be a process of poverty transition as long as marginalized poor actors could obtain their shelters in urban areas. In developing land information systems and enhancing government institutions, responsibilities of sustainable land tenures and administrations around a central role of land information system can facilitate a

feasible way of decision making's process (Barnes, 1994) aimed at improving the situation of the poor in marginal lands, if this information is provided for geographical targeting of the spatial clustering of the poor. Because individual poor actor's characteristics are essential for explaining most of the community or local poverty and are used to interpret measures of poor causality.

Judging from our land and housing problems, and their speculations, it is very easy to understand the majority of people who are eager to get their home ownerships causing socio-economical highlights and showing extreme possession of land parcels by specific working classes. With regard to the economic function of land, it has productive factors for residential use, business and manufacturing plant use, etc and keeps the purchasing power for the future just like bank deposits, bonds and stocks. The main reason why the land is used as asset is that we have long experiences of drastic land prices and speculative iteration in real estate markets. Surely, most of them might expect that lands and houses are still a popular asset and they can easily get something as actual capital investment and economic gains. In fact, the poor generally have access only to areas that have higher risks for health and environmental safety. Poor actors continuously look around for appropriate locations and living conditions corresponding to their household income's affordability of payment for land and housing rent, and transportation costs.

Therefore, there are needs for improving our considerations of land information and poor interpretation's process. The relationship of land and poverty is unquestionable to be

continuously discussed throughout the long history, given the prevalence of poverty in rural areas and even in urban metropolitans. Lacks of land and rural poverty are generally observed to coexist (Ravallion and Sen, 1994; Malik, 1998). Generally three forms of interventions are suggested to improve the access of the poor to land. These are redistribution of ownership rights, regulation of tenancy contracts and the role of land registration (IFAD, 1992).

Governments pay attentions to serious disharmonies and inequalities of individual or group incomes and unbalances of social benefits, and undesirable concentrations of land ownerships, etc. It is hard to estimate exactly what it is a good guideline of social equilibrium and sustainable land management (UN-FIG, 1999; Grant et al., 1999) for anti-poverty measurement as to who they are the poor, and where they do live now, and how we can investigate poor conditions over time, etc. Because poverty measurements tend to be subjective and are often pertinent to living quality of housing status and land ownerships associated with social and cultural circumstances and economic developments. Improvement in land titling and registration system within the framework of land information system can benefit tenure security of the poor in Asian and Africa countries (Adams, 2001), who have difficulty in establishing legal ownership of the land and are located in marginal land increasing natural resource degradation (Anderson, 1999). This is why information on individual poor actors associated with spatial and temporal changes of their holdings and properties, and causal mechanisms of their behaviors and its affects are required to explain household and local

poverty's circumstances.

Many economists have relied on household incomes or expenditures normalized for differences in household-specific prices and demographics. Economic supports for the poor have a crucial role in alleviation of poverty regarding as traditional and current discussions between developing and developed countries. However, socio-economic views and land economy's aspects of the poor go beyond the objectives of this paper. We make a point of the causes and impacts of poor conditions by interpreting geographical analysis of locations of the poor who have not benefits of local and governmental supports of land information and Internet services. Surely, it takes enormous efforts and times to identify the level of poor conditions and classify the poor when government intends to eradicate absolute poverty in slum and rural areas, and makes efforts on reducing relative poverty among working classes.

2. Cadastral hexad surveying for the poor

Many researches and empirical experiments of international organizations have long tackled poverty-related issues and established counter-measurements for anti-poverty policies, strategies, and practices. They perceive the relationships between real estate management and human welfare concerned with understandings of the reasons and results of vicious cycle of poverty. However, two different research concerns and little concentration on dynamic poverty mapping(Henninger, 1998; Sehlin and Bodin, 1996) might have rooms to be desired for analytical interpretation and debate of spatial distribution of poverty pattern, and individual symptoms of poor status quo

since many geo-referenced survey data are designed to be used to understand living standards(Grosh and Munoz, 1996) and the effects of government policy-making as a national level of census and population survey or others. Most current poverty maps often make use of census data and sampling clusters techniques because it allows quick glances at rough ranges of socio-economical inequality and demographical issues of human welfare. However, this approach would lead to ineffective analyses of the urban and rural poor that often concentrate in a relatively small number of villages. There might be little efforts for clear indication of spatial causes and reasons of poverty as to why and when they move in and out of poor conditions.

Although De Janvry and Sadoulet(1996) investigate causal relationships of poverty and inequality through spells of growth and

recession over time, this economical analysis at macro level might have rooms to examine a feasible model for human well-being's status quo at a specific community and household given in periods(or time). In addition, a poverty profile(Lok Dessallien, 1996) for poverty-related information might not be sufficient for expounding a wide variety of poor causalities of the poor household. The poor tend to live with poor people in a specific and concentrated area even in urban districts and frequently look for affordable shelters over time. This spatial concentration could often give rise to land degradation and hard infra-structural setting for public communications and Internet due to the high cost of networks. Here, we propose the Hexad model(Liou, 2001) to make it possible to explain poverty circumstance dealing with actor(who) and then apply to individual timeline of poverty when and why he

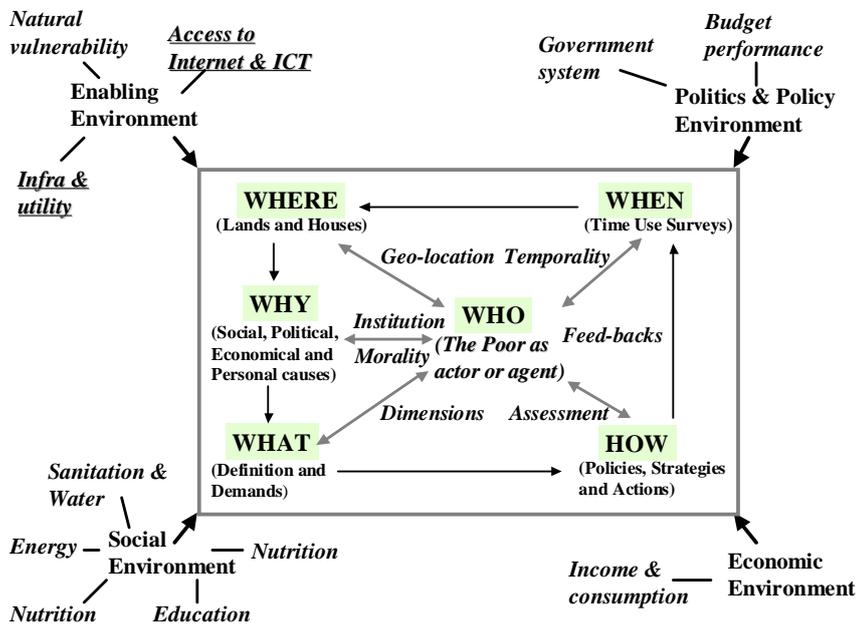


FIGURE 2. Hexad model for poverty interpretation

(or she) enters and how they can move out of poverty (Figure 2). The idea of Hexad model based on actor-based (or agent) framework is to interpret reasons and results of behaviors and actions of actors in GIS environment and institutions (Nolan et al., 2000). These six parameters are used to support the framework for information system architecture (Sowa and Zachman, 1992; Benzanosov, 2000) and are shed on the light at the domain of spatio-temporal data modeling (Liou, 1999).

Cadastral Hexad surveying for spatial conditions of poverty starts to address the geo-locations of poor households as to where the poor live, why and when they move in poor situations and what kinds of poverty they are faced with and how local and national authorities can establish anti-poverty programs and measurements. Evidently, these six parameters often connect with external environments such as socio-economic, political and enabling factors. This Hexad model is only used to depict geo-location of the poor group and to trace their movements, but is limited to describe poor circumstances and conditions without interviews and field surveys. This model should be linked to more details of household surveys and data collection methods such as the LSMS (Grosh and Munoz, 1996) and DHS (Westoff, 2000), and others if there are demands for full descriptions of status quo of poverty and practical ways of escape. A similar idea of this concept is recently focused on the PASIR (OECD, 1994; Duraiappah et al., 2000) framework pertaining to poverty-environmental degradation in relation to spatio-temporal dynamics of the changes. Cadastral Hexad surveying provides household surveys with more details of built environment, natural

biophysics, education, health, and nutrition maximizing its potential when connecting with the concept of multipurpose land information system. It requires significant amount of data collections and timing between data sources and access to household unit level (Davis and Siano, 2001), but can illustrate dynamic simulation of human behaviors in spatio-temporal domains when time use surveys are involved with individual men and women who make their decisions on how to divide or spend their time between remunerated and unremunerated work (UNSD, 1998) in the context of actual environments of economy.

BRIDGING THE DIGITAL DIVIDE WITH LAND INFORMATION

During the Internet revolution era, it forces us to not only change governmental organizations, non-public enterprise's business systems and individual life, but also accelerate the Internet economy. In the course of the Internet transaction between business and business, there are incredible information(or Internet) poverties among companies and people. In other words, the use of Internet and its application is a major key role in giving birth to huge income gaps that are rarely interpreted by traditional economic theories. Because people using the Internet are increasingly computer maniac, venture groups and young generations. It is very shocking that they make immense fortunes within a short period considering conventional characteristics of businesses and trades.

The digital divide between technology haves and have-nots is increasingly widening and leads to political debates and the social divide.

In particular, those who excel in the Internet tend to acquire stock options and can monopolize social capitals and information markets that already shows serious income unbalances between IT workers and all others. An inequality access to the Internet between the rich and the poor can be considered to be a poverty indicator resulting in the potentials of technological poverty trap. Many country's governments, however, try to boost digital economy and e-commerce in support of the infrastructure of information highway. There are common senses that those who do not keep up with the Internet evolutions and digital economy might be regarded as social renegades.

Naturally, side-effects of digital economy may be sensitive matters of governments and often make us depressed when considering breakthrough success of the Internet business to IT workers. Someone believes that differences in e-commerce's income arise primarily from individual choices, preferences, abilities, educational status, real estate's investments, and productivities, etc. Other people consider that e-commerce's income differences reflect the unequal distribution of economic, social and technical opportunities in our present society, and that the opportunity to succeed is elusive for those who do not belong to digital(or Internet) expert groups. Meanwhile, it might not be easy to measure the impact of the Internet since it has been already penetrated into all spheres of industries, educations, and businesses, etc and the use of Internet might causes serious additional income gap and the social divide between information haves and have-nots. Thus, it requires investigations of negative aspects of the Internet whether the

digital divide(NTIA, 1999, 2000; OECD, 2001) can directly give rise to poverty seriousness. Naturally, the Internet is a part of tools for ICT that several models scrutinize the impacts of information technology such as Mosaic Model(Wolcott et al., 1996), Meta-level framework(Lanfranco, 1997), Information Environment Model(Spink and Cole, 2001), and Internet Engagement Model (Norris, 2001). In addition, there are also more details of the Internet's impact on poverty in developing countries(NRC, 1998; Dyke, 1999).

However, few works have been done in terms of the relationship between the Internet and land information towards digital equity or welfare as to how the Internet have a powerful impact on pathways of shadows of poverty at the international and national, local and individual level(Figure 3). This is a real question mark to further investigate dark islands of cyberspace that the poor is not able to access to basic human needs. We need to push further and ask about access to what, for what, why, where, for whom, how, and when. Perhaps, these six questions might be serious matter associated with information poverties that are not benefited from local and commune land information networks. Figure 3 depicts the conceptual framework for interdisciplinary approach to anti-poverty's solution based on full supports of the Internet model that leads to presumable counter-measurements of four elliptical mappings.

At the household and individual level, it might be significant to support the poor who are willing to consider land and house as the future assets to move out of poor environments. The web-based land information might be one of attractive strategies for poor actors to use the

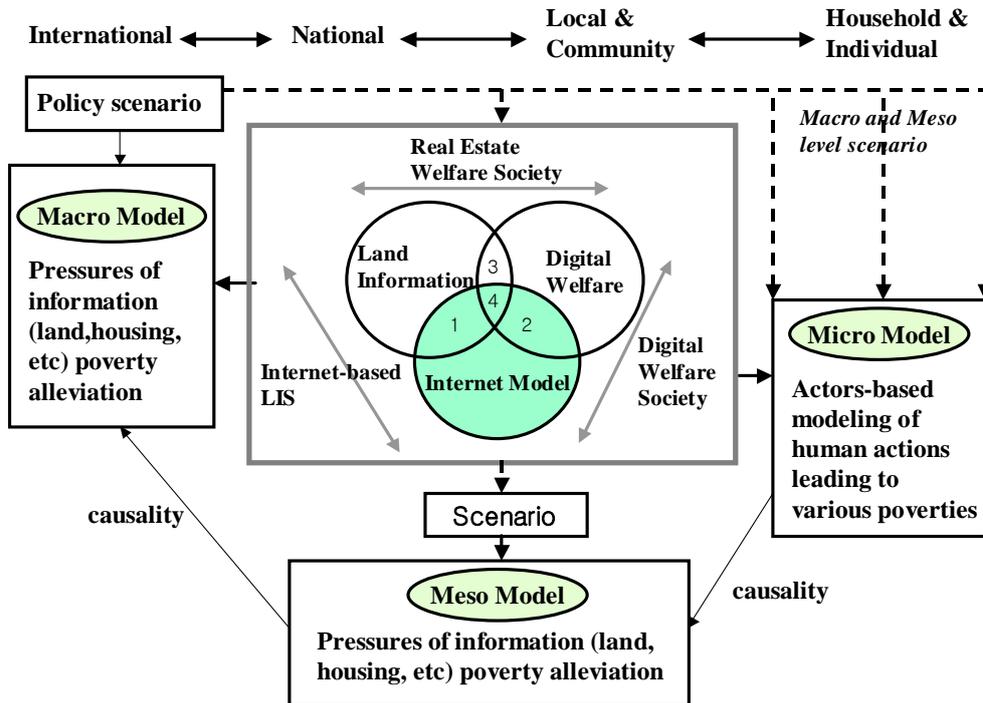


FIGURE 3. Interdisciplinary solutions for poverty alleviation

Internet and let them think of other commercial application programs. Considering the advent of the web-based land information system, we can presume potentials of cyberspace enabling low-income classes to access to civic information on real estate's ownerships and values, land uses, housing rents, local economic situations and job news, and concerned issues of land related activities with free and low charges of service through the Internet.

At the local & community level, low-income class may directly benefit from ICTs, but interactions with the Internet relating to valuable information are often indirect and needs to be bridged by the social network, and public tele-centers or libraries. The Internet can connect low-income class to information on

loans or poverty alleviation schemes. In terms of benefits between land information and the Internet, where agricultural or urban lands are the main resources of their communities, information and knowledge about legal ownership of land, commercial values of land use, and urban land development plan through the Internet are principal resources enabling local or commune organizations to assist individual poverty alleviations. In response to the digital divide and concerned poverties, asset-based mappings(Kretzmann and McKnight, 1996) or community asset mappings(Allen et al., 1999) approach to community development might be a crucial pathway to maximize their strengths and capacities of the individuals and neighborhoods. These mappings provide some judgments as to what kinds of assets are

available to help improve not only individual quality of life, and local employments and educations, but also collaborative networks of land and housing supply through the Internet. However, they require enormous developments of survey instruments and methods for collecting and gathering asset's information.

At the international or global level, the DOT Force(2001) has developed a dynamic model that could be used as a basis for supporting multifaceted natures of the digital divide with respect to human capability, infrastructure, enterprise, content, and policy. Thus, our framework might have drawbacks to deal with national or international goals of digital bridges. However, the DOT Force operational framework has used three questions of strategy to bridge the digital divide(What, Who and Where) at the global level. In this Figure 3, each mapping closely pertains to a pilot project and feasible practice tested by concerned organizations and authorities at the international and national, local and individual level. It not only envisages a concrete model to eradicate cycle of poverty and accelerate economic development, and improve social consolidation, but also boosts the use of the Internet in accordance with policy, strategy and action at the different level of scenario. Solutions for information poverty, and absolute and relative poverty differ from countries to communities because many efforts and troubles are entangled in the process of socio-economical, cultural, political and technical development, and continuously interact with each other giving rise to unpredictable circumstances from the digital and social divide to digital opportunity.

On the contrary, it is required to examine the constraints and feasibilities of each model or

program at the three different levels towards increases of the Internet's access and application for low-income classes, and assuagement of information poverty as well as increases of digital welfares. Here, much deeper examinations on anti-poverty programs and actions in socio-economical and environmental aspects at macro and meso level go beyond the objectives of this paper. Meanwhile, poverty researchers using an individualistic model try to identify causes of individual poverty(Henninger, 1998) that poor actors are highly mobile and migrate or to remain in poor area because of specific wage and their income power for rents. In terms of geographical model, poverty is due to the geographical causality pertaining to local & community factors such as climate, soil type, infrastructure, environmental risk and natural disasters, and access to social services, etc. This is why actor-based GIS modelings at the individual and household level are very essential in clarifying trace of actor's(or agent) location, and spatial distribution of computer and land ownership, and mapping of the Internet access with an appropriate surveying method and internet-based technologies.

PROOF-OF-CONCEPT IMPLEMENTATIONS

In this section, we illustrate conceptual idea of Hexad model as the proof-of-concept. Principally, it is discussed as confirmation of the feasibility of six parameter's application in land information system. A full-scale expansion of six parameters to an integrated spatial poverty information system could be a large-scale project if it could include the wide

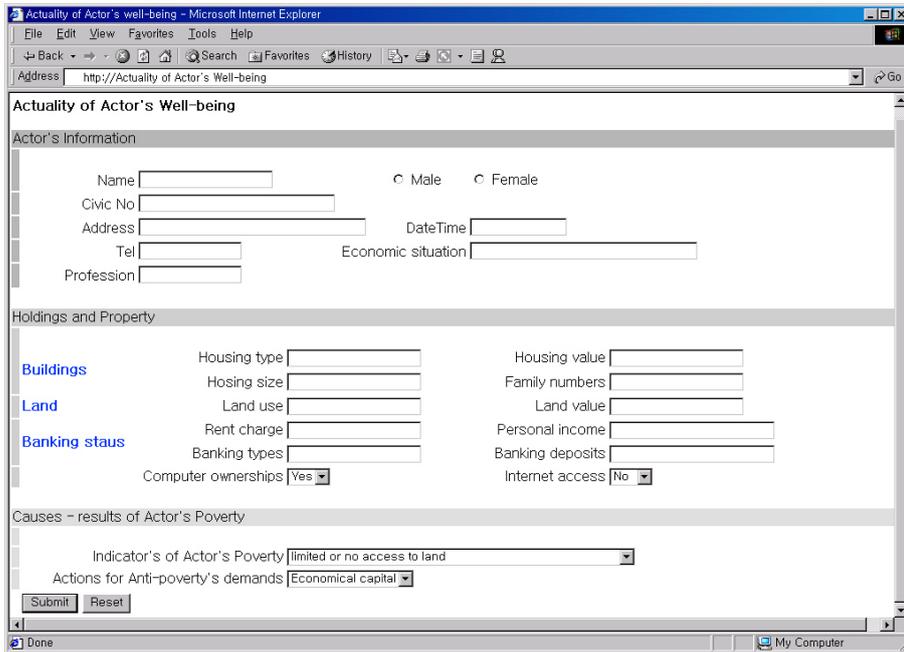


FIGURE 4. User interface of Hexad model

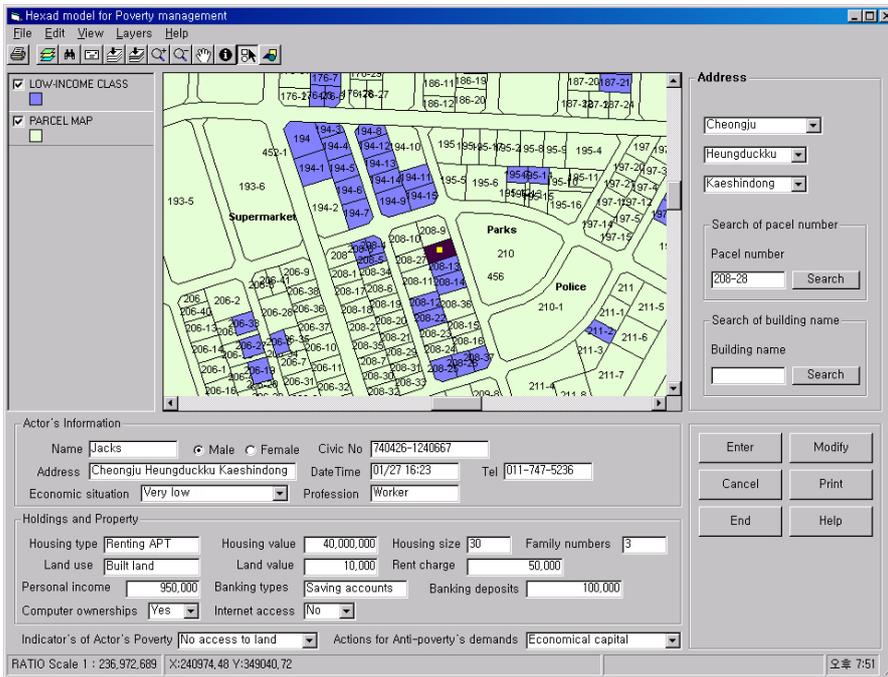


FIGURE 5. Parcel-based mapping for poverty management

variety of welfare's services and the ranges of different software environment between land information system and poverty information system. Here, we describe geo-locations of poor actors and their poor circumstances to assist partly poverty monitoring and control through conceptual model of Hexad. Considering traditional census and household surveys with interviews to examine poor actor's status quo, it requires huge expenses and time-consuming tasks to continuously maintain their individual information and data. To prove effectiveness and efficiency of conceptual model of Hexad in poverty management, the Internet-based menu system (Figure 4) is proposed to support poor actors who often need to secretly express their living conditions and qualities no matter where they are. One of clear things is that poor actors are unwilling to confess their current difficulties and scarcities due to the matters of social exclusion or separation.

This is why our menu system is made for client-oriented forms that enables poor actors to submit their opinions through the Internet, and then this information is only controlled by a local and commune administrator. On the basis of narrow targeting at the household level, it is very information-intensive, and the necessary information is costly compared with other GIS survey techniques. Thus, our Hexad model might be considered to be a feasible idea to reduce costs and times when this Web-based input system is further developed towards an integrated poverty information system.

Based on conceptual idea of Hexad model, an appropriate way for poverty identification based upon cadastral map is explored (Figure 5) which enables local or commune administrators

to inspect complicated information on spatial distribution of poverty and certain circumstances of poor actors. This cadastral map information can benefit further understandings of more accurate examination on poor actor's assets in connection with their holdings and properties. Naturally, it depends upon actor's description whether they are poor or not. This is why actor's holdings and properties are essential for indirectly measuring poor circumstances. To confirm actor's information, this Hexad model should be connected with other civic and local taxation system, social safety networks and land-related map databases. At the same time, various ways of household surveys are required for an integrated manner of poverty information system.

Dark color of households shows low-income classes in a cadastral map. Administrators should input actor's information through map's window when poor actors submit their poor conditions. Through the strengths of parcel-based mapping, administrators can visualize poor household's location and can approximately measure their living qualities. On the contrary, poor actors can become aware of what is useful for increasing individual holdings and properties, and whether local and commune assets can be used to maximize their strengths for feasible schemes of poverty alleviation through the Internet. Although this visualization is surely not enough to determine poverty seriousness, it provides easy ways and freedoms for geographical targeting of anti-poverty programs and actions at the individual and household level.

CONCLUSIONS

There are many efforts for poverty reduction

coming from socio-economic, environmental, and financial, and technological aspects within umbrella of poverty management. The economical gains would lead to serious land ownerships by elites and greater impoverishment (Meinzen-Dick, 2001) when land administration and registration system within sustainable land information system could not guarantee economic problem of the poor, women, and other marginalized groups who are inaccessible to land and high burdens of urban utilities. From the prospective of land management, there might be lacks of serious attention to the causes of poverty, and analysis of structural factors such as differential access to the means of production and to political influence (Quan, 2001). Many researches have focused on the question of access to land (De Janvry and Sadoulet, 2000) and consider land access as a major welfare role of the poverty reduction. However, they rarely discuss the risks of economic exclusion presented by a lack of ICT and the Internet enabling the poor to look after better place of shelter and good information on job opportunity.

However, there might be rooms to be desired in dealing with three perspectives without different environments of poor actors who continuously move here to there so as to find appropriate their living quality and escape information poverty. Urban and rural poverty management is more larger than land information management when considering not only living standard survey for poverty in developing countries, but also growing issues of the digital divide and economical potentials of digital economy in advanced nations. Few would argue that lack of access to information and communication technologies is an indicator

of poverty. In addition, fewer studies have examined the effects of network-oriented communication on decision-making between the digital divide and poverty around a central axis of land information.

As skill requirements have risen, so have wages paid to IT workers. The wage gap between IT workers and other workers continues to widen. This relative poverty is, today, significant signs of social divide and intimidating the birth of digital economy stemming from labor market imbalance. The analysis of the Internet usage and impacts on the poor and the rich resulting in serious relative poverty should be further reconsidered within the framework of policy scenario of macro, meso and micro level in our present international societies. **KAGIS**

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