Poverty alleviation of “smart countryside”: an empirical study on mechanism, innovation model and guarantee systems

L. Chen

Business School of the University of International Business and Economics, Beijing, China

E-mail: chenlian0208@126.com

Abstract: Since twenty-first century, the third revolution of science and technology as the core of the internet information technology makes society become more and more “smart”. Under the guidance of the strategy of “smart planet”, the concept and practice of “smart countryside” emerged. Using of energy and information & communication technology access to rural society to build a new “Smart countryside” in the 3I situations (Instrumented, Interconnected, Intelligent), which helps rural and poor areas out of poverty with a new form of poverty alleviation under the background of the internet. The paper analyses the mechanism of “smart countryside” poverty alleviation from the four perspectives: sustainable development of energy, social capital and knowledge, bridging the digital divide and promoting the information rights. Then, the paper investigates and summarizes seven kinds of innovation model of “smart countryside” poverty alleviation. The conclusion shows that the innovation model is conducive to the “multi-level” ecological interaction of poverty alleviation, which is “government-led, social participation, industry development and the poor benefit”. It also brings environment, economy, service, the humanities, and the people's livelihood performance for poverty alleviation. Finally, the paper puts forward policies supporting system for “smart countryside” poverty alleviation from the aspects of technology, space, capital and people.

1. The Proposal of the problem
Since twenty-first Century, in the development of the Internet era led by the third scientific and technological revolution, information differentiation has formed a clear technology partition system [1] in today's society, which causes the information gap to aggravate the opportunity poverty, the efficiency poverty and the evasion of the risk of poverty [2]. Therefore, it is necessary to pay high attention to the problem of information poverty in the Internet environment, because information poverty is not only an important cause of income poverty and human poverty, but also the result of
their poverty [3]. In China, the level of information poverty in national poverty counties is significantly lower than the national average level of [4]. Luo Chuanling puts forward the use of rural informatization to improve the information literacy of farmers in an all-round way and take the way of developing poverty alleviation [5]. As an important work of developing rural informatization, “village to village project” can effectively narrow the digital gap between urban and rural areas and eliminate the information poverty phenomenon in rural areas [6]. Empirical studies show that the level of information service in rural communities has positive significance for increasing farmers’ income and reducing the incidence of poverty [7]. Therefore, the application of Internet information technology to strengthen the rural informatization construction, accelerate the “Internet+” poverty alleviation projects is the inevitable choice of rural anti-poverty. Nowadays, the third technological revolution centered on Internet information technology has made society become more and more intelligent. Under the guidance of “smart planet” [8] strategy, the concept and practice of “smart countryside” emerge as the times require.

In recent years, the “smart tourism to help the poor” in Tibet Lu Langzhen Zha Xigang village, “intelligent e-commerce poverty alleviation’ in Henan Xi Ying village, “intelligent energy poverty alleviation” in Hunnan District of Shenyang, “wisdom culture support poverty” in Hebei Luanshuihe village, and “wisdom information support poverty” in Qinghai’s Dajia village are constantly emerging. From the grass-roots practice of “smart countryside”, a series of urgent problems need to be explored: what is the mechanism of “smart countryside” to help the poor? In practice, what are the innovative models for poverty alleviation? How to ensure its smooth operation in the rural area where the Internet information society is in the "fringe"?

2. The mechanism of poverty alleviation in the “smart countryside”

“Smart Countryside” is originated from the concept of “Smart Planet” proposed by Sam Palmisano, CEO of IBM, in 2008 [9]. The strategy of “Smart Planet” indicates that the full application of the new generation of information technologies in all walks of life is essentially the embedment and equipping of sensors in various articles for universal connections to form “Internet of Things” and then the Internet of Things is integrated with the Internet to conduct real-time management and control of personnel, machines, equipment and infrastructure in the network, so as to realize refined and dynamic human production and living and lead to a “smart” instrumented, interconnected and intelligent status of the planet [10]. Therefore, “Smart Countryside” is defined in this paper as “a digitalized, networked and intelligent brand-new rural form constructed through connection to sustainable energies and application of information and communication technologies”.

The paper expounds the mechanism of “smart countryside” from the following four aspects: sustainable development of energy, social capital and knowledge, bridging the digital divide and enhancing information rights.

2.1. Energy sustainable development

Around the world, nearly 130 million people still do not have access to electricity. These groups are usually located in remote areas, far away from the urban centers, and are placed outside the national grid. In many areas far away from power grid, renewable energy is gradually regarded as the most practical and economic choice. Green poverty alleviation is based on the protection of the ecological
environment in the poverty-stricken areas, the rational exploitation of natural resources, the promotion of green low-carbon economy and sustainable development in the poor areas, and further help the poor people in the fragile areas to get out of poverty and become rich [11]. For example, “Internet + tourism poverty alleviation”, increasing “cost-utility” photovoltaic technology applications for the poor areas (green energy) force for poverty reduction. “Internet + tourism” poverty alleviation is in the information age in the new poverty reduction by green, using the Internet to solve the information barriers between poverty areas and non-poverty areas and to improve the fairness of the application of information technology.

2.2. Increasing social capital and knowledge
Information and communication technology promotes human resource and social capital growth by promoting information flow, building endogenous knowledge and reducing human poverty [12]. The core contents of social capital and knowledge include social network resources, cooperative behaviors, and behavioral norms and information to promote reciprocal cooperation. The World Bank [13] believes that access to income and the ability to cope with poverty are the key factors to solve poverty, and social capital and knowledge can play a role in reducing poverty by increasing farmers’ income, providing them with various opportunities and enhancing their capacity [14]. Information and communication technology can be regarded as a “correct” social capital to promote community economic and social progress. The weaker the social capital is, the harder the growth of knowledge and human capital is in a community, so poverty will continue to exist.

2.3. Plugging the digital gap
The so-called digital divide refers to the gap between the people who are exposed to the latest information technology and those who are not exposed to the latest technology [15]. The digital divide means the widening gap between the “owners” and “non-owners” of information, communication and technology all over the world. In developing countries, the digital divide may occur in places where infrastructure (such as electricity supply) is lack or access to modern technology (Internet, computer or mobile phone). The World Bank (1998) pointed out that the new technology greatly facilitated the acquisition of knowledge and provided unprecedented educational opportunities for developing countries to bring greater business opportunities for the poor. [16] Moreover, information and communication technology can provide effective information for villagers’ economic welfare and social welfare [17].

2.4. Promotion of information rights
In the Internet information society, information right is a basic right of citizens. In the information age of the Internet, the lack of information rights of “information disadvantaged groups” has evolved into an important resistance to economic development and social progress. The inadequacy of the information resource acquisition ability of the disadvantaged groups inevitably leads to the lack of the opportunity to enjoy the information rights fully and equally, thus damaging the information rights. Amartya Sen viewed poverty from the perspective of deprivation of rights and deprivation of “feasibility” [18]. Poverty must be regarded as a deprivation of basic practical ability, not just a low income. Therefore, in the Internet information society, the anti-poverty management of rural and
poverty-stricken areas can be carried out from the perspective of the promotion of information rights and the “feasible ability” recharge of information access to the rural and poor areas [19].

3. Innovative poverty alleviation models of “Smart Countryside”

With the significant improvement of rural network infrastructure and the flourishing of the Internet economy, the construction of a “Smart Countryside” has been implemented all over the China. Through summarizing the novel experience from the construction of “Smart Countryside”, the poverty alleviation models are concluded into 7 forms in this paper and described in the following sections.

3.1. Smart tourism poverty alleviation model

Smart tourism refers to a systematic and intensified management providing tourists with high-quality and individualized services and social resources based on information and communication technologies [20]. As a new poverty alleviation model, the smart tourism poverty alleviation model boasts extensive participation of the poverty-stricken population, quick effect of poverty alleviation and low poverty-returning rate. Smart tourism is an intelligent service management mode centering on provision of tourism information. For example, the City of Linzhi, Tibet initiated the implementation of a “Smart Countryside” Tourism Information Engineering Construction Project and established a platform comprising rural information construction data to make it convenient for tourists to intelligently sense and conveniently utilize various kinds of tourism information, thus improving tourists’ independent experience awareness. In the meantime, as an advanced stage of tourism informatization development, smart tourism demands technical supports from information, network and artificial intelligence.

3.2. Smart E-commerce poverty alleviation model

The national poverty alleviation work meeting of 2014 included e-commerce into the Chinese poverty alleviation policy system for the first time. Given that e-commerce has the market expansion effect, market flattening effect and information feedback mechanism, the development of e-commerce in rural poverty-stricken regions benefits the effective connection between the poverty-stricken population and big market, so that the poverty-stricken population can acquire opportunities to participate in the market and the effect of poverty reduction and elimination can be realized [21].

The e-businessman is a core subject of Smart E-commerce. The so-called e-businessman refers to any enterprise or individual making deals through the Internet. In rural areas, some villagers are lacking basic e-commerce operation skills, which give birth to the e-commerce “intermediary”. For example, in the strategy of “Smart E-commerce” of Xinxiang County, Henan Province, “Rural Taobao Partners” helped villagers “vicariously buy and sell”, thus opening the purchase and sales channels between the villagers and the outside world. Besides the e-businessman, platform enterprises are also a key subject in Smart E-commerce. The connection of the local market and national big market can be better realized only by fully utilizing the resources and strengths of the platform enterprises.

3.3. Smart information poverty alleviation model

Within the scope of “Smart Countryside”, smart information poverty alleviation mainly refers to the application effect of “Smart Governmental Services” in the rural basic-level society on improvement
of the information rights of poverty-stricken population [22]. Smart Governmental Services refer to a public service paradigm providing the public with seamless connection based on reality network and through comprehensive application of information and communication technologies. This kind of “ubiquitous” governmental service management model “centering on the public” and “benefiting all” presents certain convenient, transparent, autonomous, real-time and intelligent features, so as to provide enormous conveniences for the general public to get to know and handle governmental affairs. For example, the “Rural Digitalized Social Management Platform” of Daijia Village, Qinghai Province and “Smart Governmental Services” platform of Jiangzhu Township, Sichuan Province vigorously promoted the information construction of rural basic-level governments.

3.4. Smart energy poverty alleviation model
Smart Energy is a new energy system utilizing Internet thinking and technologies to reconstruct the traditional energy industry and realizing a high degree of integration between energies and information [23]. Smart Energy relying on the Internet information technology finally forms a high energy market and realizes full, transparent and free configuration of energy flow through the erection of a distributed energy transaction market. In this way, Smart Energy benefits the breaking of isolation and monopoly of traditional energy markets and ensures that the energy efficiency can benefit ordinary people in remote regions. For example, Hunnan District of Shenyang created an “Internet + New Energy” smart countryside construction model called “Aiyi Sheepherder” Internet + Rural Household Photovoltaic Power Station Project. The application of photovoltaic roof power stations cannot only solve the problem of energy shortage of peasant households, but also enable peasant households to acquire stable power generation benefits and promote the development of low-carbon and environment-friendly green economy.

3.5. Smart network poverty alleviation model
The urban-rural “binary” economic and social structure formed for a long time results in the serious lack of balance of China’s information construction and the relatively severe situation of “great information gap” between urban and rural areas [24]. The establishment of Smart Network facilities is a key step to solve the problem of weak rural infrastructure, make the network system unimpeded and overcome the phenomenon of “Information Isolated Island”. By accessing the Internet, peasants are able to get to know the cutting-edge agricultural development and improve their agricultural science quality. Besides, the formation of the Internet thinking of the peasant groups can be promoted and the good effect of information poverty alleviation can be achieved. For example, the integration of “Communication Network, Broadcast Television Network and Internet” has been successively realized in Tankun Village of Guangxi Zhuang Autonomous Region, Huizu Village of Shanxi Province and Dazhai Village of Shanxi Province, thus improving the local historical puzzle of information poverty.

3.6. Smart culture poverty alleviation model
It is clearly pointed out in Outline of Construction and Planning of the Public Culture Service System in Poverty-stricken Regions during “13th Five-year” Period that an important part of Smart Culture poverty alleviation is to implement “public digitalized culture construction project in poverty-stricken
regions”. Library digital comprehensive service platforms for rural poverty-stricken regions shall be erected to realize one-stop acquisition of massive resources, provide diversified service modes and satisfy the users’ individualized demands through integration of digital resources, design of unified exhibition interfaces and utilization of new media approaches [25]. For example, China Association of Poverty Alleviation & Development organized the commencement of the “Accurate Poverty Alleviation Smart Countryside Multimedia Reading Room” Public Welfare Project in Luanshuixi Village, Dongxiaobaiqi Township, Hebei Province, which was an innovative practice of “Internet + Public Culture Service”. It provided people in the poverty-stricken regions with abundant and accurate culture information services, so as to promote the development of poverty-stricken regions.

3.7. **Smart rural area poverty alleviation model**

The Smart Rural Area Poverty Alleviation Model is an advanced model of “Smart Countryside” poverty alleviation, aiming at constructing agricultural informatization of rural areas and promoting the development of “Agriculture, Rural Areas and Peasants”. To be specific, this model fully utilizes information and communication technologies, improves peasants’ comprehensive quality and realizes their personal development, promotes the transformation of the agricultural development mode to reliance on modern technologies, realizes comprehensive and coordinated development of each public service undertaking of rural areas and finally forms a new pattern of integrated social development of urban and rural areas [26]. Such kind of “Smart Countryside” poverty alleviation model has been widely applied in relatively developed regions in China. For example, Xibaidian Village, Pinggu District, Beijing constructed “Smart Countryside” through a series of agricultural and rural informatization application engineering to realize the comprehensive integration of e-agriculture affairs, e-government affairs, e-commerce and information services with rural production, living and ecology. The construction path is mainly about the application of IOT technology to transform the “fuzzy” processing of agricultural production to “accurate control”, so as to realize scientific management and improve production efficiency. In addition, emphasis is placed on the embedment of Internet information technology into financial and tourist services.

4. **Establishing a policy supporting system for poverty alleviation of “Smart Countryside”**

4.1. **Technical level**

To build the information industry ecology as the main body, information infrastructure planning and information resources development and utilization as the two wings, with green, intelligent and ubiquitous “one body, two wings, three dimensional” technical policy support system. We should enhance and improve ubiquitous and advanced information infrastructure, expand 4G network coverage, and promote the next generation Internet evolution and upgrading. Deploy cloud computing data center and Internet of things facilities in advance, so as to achieve optimal matching and effective collaboration between application technology and broadband network. It should vigorously support the construction of green cloud computing data center in rural and poverty-stricken areas. We will fully implement broadband rural areas and increase network investment and network coverage for remote and poverty-stricken areas.
We should accelerate the sharing mechanism of government, society and Internet data resources, and establish a unified and open big data system. Based on government information resources and relying on government data sharing platform, we accelerate cross layer and cross department data resource interaction. We should establish laws and regulations related to data opening, property rights protection and privacy protection as soon as possible, and strengthen data security protection.

4.2. Space level
To build a deep and wide coverage information service system, so as to achieve unified planning, systematic deployment and collaborative promotion.

Firstly, it needs to build a three level service platform system. At the national level, a unified big data platform for poverty alleviation and development is built to provide information collection and analysis support for poverty alleviation departments at all levels. At the county level, we should build an e-commerce platform in poverty-stricken counties, and vigorously develop the rural e-commerce. At the township level, we should establish an online-offline and interactive service provider for the poor towns, and give full play to the key role of the township node network in helping the poor.

Secondly, it needs work deployment with in the full factors. We should set up a network poverty alleviation team with high quality and ability, train Internet business leaders, help poor households improve their information skills, and achieve rich incomes. A simple and easy to operate network terminal is designed to solve the problem of poor households accessing the Internet.

Lastly, it needs to build a comprehensive information service system. In order to serve the people’s livelihood as the value orientation, we should set up the information service system of network poverty alleviation. To speed up the implementation of Internet plus government services, livelihood information systems and services integration and utilization of resources, build a comprehensive poverty alleviation service system, make public services inclusive of poor people.

4.3. Capital level
Establish a market-oriented and diversified investment and financing mechanism. Taking financial capital as the leading factor, attracting social capital such as corporate capital and crowd raising funds and social donation, we will build a new path to investment and financing of smart countryside for poverty alleviation.

To make full use of the "leveraged" guidance of financial funds, make full use of the funds in the rural self-financing, the central and local budget, temporary or one-time financial aid, so that it will become the basic capital for the construction and implementation of the "smart country".

We should fully mobilize the enthusiasm of private capital investment in building smart countryside. From the international experience, telecom operators and high-tech enterprises are important investment entities in smart countryside construction. From the point of view of the practice of helping the poor in rural areas, Tennent Inc., Alibaba group, Qinghai giant Thailand Technology Company, China Telecom and other telecom operators and high-tech enterprises have actively invested in the construction of smart countryside, which shows that private capital has become one of the main financing sources of "smart country" construction.

4.4. Human level
To establish skills training mechanism, we should set up a skill training system for poor groups to take the initiative to help them out, so as to help the poor groups change from passive participation to voluntary participation.

First, from the stage of compulsory education to higher education, we should carry out all field pair assistance to poor students and accurately target poor groups. Secondly, we should infiltrate, enlighten, nourish and educate the poor people in culture and wisdom, so that they can widen their horizons and enhance their inner driving force. In the end, we should increase the education and publicity of the poor areas and invest in the funds of education, so that the children in the poverty-stricken areas are exposed to rich educational resources and are well educated to avoid the vicious circle of "intergenerational poverty".

References

[1] Xie J G, 2003, Information differentiation and information poverty alleviation in the process of social informatization, Inform. Sci., 11,1138-41.
[2] Wang W L, Mao Q Q and Yu J, 2008, Redefinition of poverty based on risk and opportunity perspective, China Popul., Resour. Envir., 12, 147-53.
[3] Zhou X H, 2016, From digital divide to digital poverty: basic concepts and research framework, Academia Bimestrie, 4, 154-57.
[4] Li G and Joe H C, 2017, Under the background of rural poverty alleviation evaluation index system research, J. Agrotech. Econ., 5, 2120-128.
[5] Li S L, 2009, Commentary on the research of rural informatization and development oriented poverty alleviation, Econ. Geogra., 10, 1759-60.
[6] Zhang W L, 2011, Information and communication technology makes rural life better--- from "digital city" to "digital countryside", China New Telecommun., 10, 26-9.
[7] Gao M T, He Y and Shi H L, 2008, Information service and farmers' Income: China's empirical evidence, J. World Econ., 6, 50-8.
[8] Zhang Z C and Lu G, 2015, The wisdom of the Earth concept, Studies in Dialectics Nat., 11, 117-22.
[9] Wang X T, 2018, China's smart city construction: partial “leading”, China economic herald, 2018-01-09, edition 07.
[10] Li H, 2014, The foundation of the Internet of things and its business mode research, Beijing: China Fortune press, 23.
[11] Zhang Q and Feng D M, 2016, Poverty alleviation practice and theoretical innovation in China: 1978–2016 years, Reform, 4, 27-42.
[12] Cathy U, Shantha L and Muhammadoum K, 2008, ICTs and poverty reduction: a social capital and knowledge perspective, J. Inform. Tech., 23, 203-13.
[13] World Bank, 1990 World Development Report, Beijing: China financial and Economic Publishing House, 35.
[14] Guo J Y, 2011, Poverty reduction analysis of poor farmers under the perspective of social capital, Comm. Res., 3, 193-7.
[15] Compaine B M, 2001, The digital divide-Facing a crisis or creating a myth? Cambridge: MIT press, XI.
[16] Dalman D, 1998, A world bank expert says -- knowledge can narrow the gap between rich and poor, *Leadership decision-making information*, 16.

[17] Anwer M, 2006, ICTS for Better Society, *Dhaka: International Conference on Computer and Information Technology*, 56-70.

[18] Zhou M H, 2009, Farmers' rights poverty and its governance -- an analysis based on amartya sen’s “feasible ability”, *Gansu theoretical J.*, 5, 78-81.

[19] Xiang L L and Niu L H, 2016, The cause of information poverty based on Amartya Sen rights method, *Inform. Sci.*, 34, 47-51.

[20] Li Y P, Hu Z, Huang C and Duer L, 2014, The concept of Intelligent Tourism in the perspective of tourism information service is discussed, *Tourism Tribun*, 29, 106-15.

[21] Lin G Y, 2016, The function mechanism and the mechanism of poverty alleviation in rural areas, *Chinese Academy of Social Sciences*, 118.

[22] Zhao D, 2013, From e-government to smart Government: paradigm shift, key issues and government coping strategies, *J. Intelligence*, 32, 204-07+197.

[23] Guo Y W and Cheng A N, 2015, “Internet +” smart energy: Future direction of energy development, *On Economic Problems*, 11, 61-4.

[24] Li X W, 2011, Problems and causes of rural informatization operation mechanism and performance in western minority areas, *Social Scie. Ningxia*, 3, 145-7.

[25] Jiang X X, 2017, Construction of digital integrated service platform for Library in poor county in the“Internet +”context, *Library Tribune*, 37, 18-22+76.

[26] Hu Y M, 2016, Research on rural informatization construction under the background of urban and rural co-ordination development, *Jiangxi Social Sci.*, 36, 208-213.