Research on the Informationization Construction Based on E-Commerce in Rural Areas

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Abstract

The increasing development of mobile electronic commerce has produced a great impression on the informatization construction in rural areas of our country. Electronic commerce might be developing rapidly only by means of both the hardware basis of internet and data center and the software basis of the complication of rural logistics network, therefore the both parts may restrict mutually. The article herein will analyze the mobile electronic commerce's importance on the information construction from the perspective of its current situation and then find a realistic way to improve the mobile electronic commerce in rural areas on the basis of research of its details and status quo.

Keywords*: Mobile Electronic Commerce Informatization in Rural Areas Internet Platform Logistics Network a Realistic Way*

1. Introduction

With the entering into a new stage of society informatization of our country, the level of urban informatization has improved increasingly fast. The gap of development of informatization between urban areas and rural ones has continued to widen, which may have significant impact on the realization of urban-rural integration. We can make a step jump to realize the informatization in rural areas by means of giving priority to develop mobile electronic commerce to promote the level of rural informatization.[1] On one hand, we can lay a basis for rural informatization by the infrastructure established for the development of mobile electronic commerce; on the other hand, mobile electronic commerce may change the ideology of rural mass and enlighten them to take full advantage of the Internet.[2] So realizing the development of mobile electronic commerce and exploring the innovative way to improve the e-commerce in rural areas have been priority among priorities to eliminate the informatization gap between urban and rural.

2. Current Situation of the Construction of Mobile Electronic Commerce in Rural Areas

2.1. Basic Situation

With the wider and wider coverage of the Internet and the deepening internet integration of urban and rural, the system of mobile electronic commerce in Chinese contemporary countryside has gradually taken shape, which has been connecting from dots to lines and lines to surfaces.[3] Recent years have witnessed the development of mobile electronic commerce in rural areas, and nowadays the coverage of the software of the internet has basically completed. With the increase of mobile network speed and the abundance of rural logistics network, the mobile electronic commerce has been booming in rural areas.[4]

2.2. Common Problems

The mobile electronic commerce in rural areas is still at an initial stage. Although it has witnessed years of rapid growth and development of internet platform, it is in its early development and remains vulnerability and imperfection. There exist failures in network connection in some areas due to the incomplete coverage of the internet. Moreover, the network speed is lower because of the less number and smaller coverage of mobile data base stations.[5] The infrastructure of O2O platform and logistics service remains vulnerable and causes more delivery problems.

3. The Technology of Mobil E-Commerce: Take the Mobile E-Commerce of Android System as Example

3.1. Function of Network Communication

The client program of Android platform is connected to the server-side by UDP, and use the XML to realize data communication.

XML, is short for Extensible Markup Language, and it is a method to express the data and has nothing to do with the platform, so these data created by XML can be read by any program on any platform. We can even edit and create the XML document by manual coding. XML is the same as HTML, both of them are built based on the technology of Labeling Technique. However, in XML, the labels are not defined in advance, and the users can and must define the labels by themselves. The XML is a flexible method with high efficient to describe and save data.[6] It can describe what is the data, which data it has and how to organize the data clearly. XML is a standard text format to represent the structured information, and it is widely used to data change in network, and it has the advantage of "Easy to generate data".

Data of XML is saved with the format of text, it provides a method for data sharing and has nothing to do with the software and hard ware. So the XML data document is widely used by more and more users and equipment, not only it is based on the browser of HTML standard. XML is the bridge between different system, and the XML can support almost all of the main language in the world, and the texts of different language can be used in a document at the same time, and use the software of the XML can process any combination of these language.[7] All of these make the XML become an open standard, and these data can independent from the machine platform, suppliers and programming languages. Many network protocols have been introduced into the XML, so as to provide a standard communicating method for two software. XML store the serialized information as text, by this, the data can be used in any needed environment, even we can get the contents of the XML without any special application.

In this article, between the client-side and the server, we use the communicating protocol of XML format. These different data the final encapsulated XML files are different. For easy processing, we divide each XML file into two part, the head and the data. The part of head includes some packet header information of the message packets, and in the part of data, it has encapsulated the data contents of the message within the message packets need to include., and they are arranged by the field format, all of the data are expressed in the form of string. Take the login request packet as example, the message packets is like below:

```
<Msg>
    <Head>
        <Bcd>1000</Bcd>
        <Send>C</Send>
        <Uid>0</Uid>
    </Head>
    <Data>
        <LoginId>IDUser11</LoginId>
        <LoginPwd>PWUser1</LoginPwd>
        <Signed>1</Signed >
    </Data>
</Msg>
```

These data, need to be transformed are included in the relevant data nodes, and the send-side realize the function of encapsulating, and the receive-side realize the function of resolving.

3.2. Handling and Operating of the Client-Side

The function of the client includes these: User login, Account Management, Product Information Inquiry, Buying and Selling operation and so on.

All of the client-side's user operation of mobile e-commerce platform are realized by sending request to the server. So the main function of the client-side is to handle each of users' operation in the interface, capture the user's request and the corresponding data type, then send the message packet to the server to process. After the server-side processing is completed, it need to return the success or fail processing message. Then the client-side update a new interface to tell the user the executive condition based on the message returned. The relevant function structure are shown in the Figure 1 below:
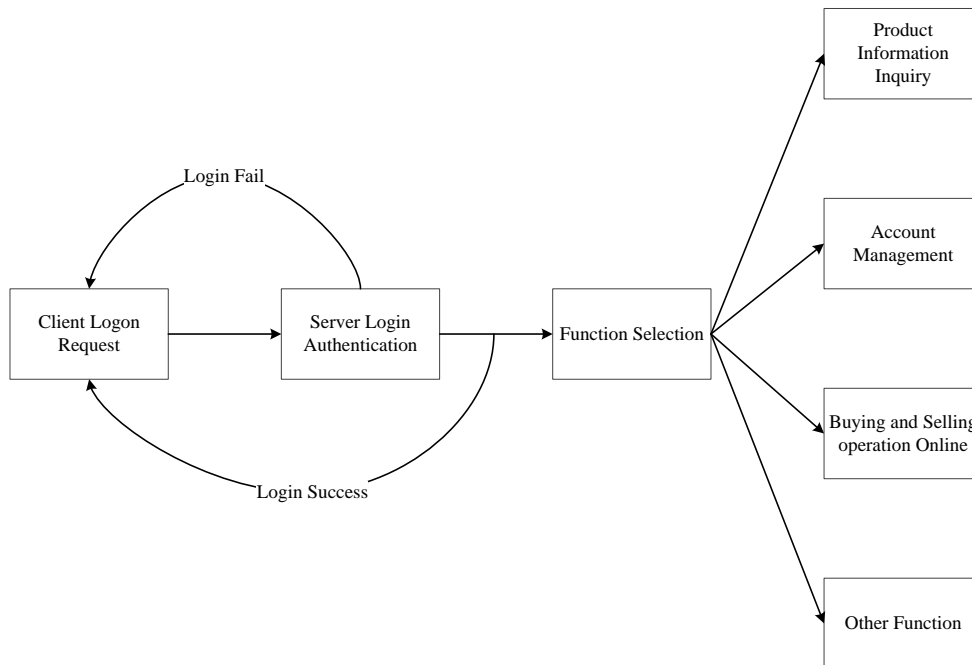
Figure 1. Client Operating Processing Block

4. To Analyze Content and Status Quo of Informatization Construction of Contemporary Countryside

4.1. The Content and Synopsis of Rural Informatization

Our country has been promoting the strategic development pattern of "Internet+" recently, which leads to the deepening use of the internet, stable increase of rural informatization and enrichment of construction of rural informatization. As a result, new rural areas with a multilevel, wide-ranging and all-round pattern of informationization have taken shape.

Table 1. The Content of Rural Informationization

rural informationization of technology	rural informatization of main factors
rural informatization of environment	rural informatization of health
rural informatization of population	rural informatization of education
rural informatization of government administration	

As it is showed in Table 1, the content of rural informatization of our country can be divided into seven parts:t essence of rural informatization represents the informatization of agrotechnique and can be described as following points:

The informatization of farming technology[2] means the traditional agriculture may rely on season and climate to a great extent to control the time of farming; Rural informatization of main factors may represent natural environment, cultural environment, land resources and so on; Rural informatization of environment may represent the location, natural state and environment quality; Rural informatization of health may represent countryside clinics, medical care homes and suitable equipments should be accessed to the local medical data network; Rural informatization of population may represent the establishment of the cloud platform of population register.; Rural informatization of education may represent the network of lesson preparation recourses of teaching and using the video resources to teach; Rural informatization of government

administration may represent the administration information transparency, opening the administrative information through the internet and listening to the opinions of people.

4.2. The Number of Information Tool Ownership and its Usage of Peasant Households

The usage of information tool of peasant households is a major index to estimate the level of construction of rural information. Peasant households, as[3] beneficiaries and receiving ends of the internet can connect to the internet platform by mobile devices such as mobile phones, tablet computers and personal computers. In the survey of the quantity of information tool ownership of peasant households, we collect the usage condition and penetration of fixed-line telephone, mobile phone and personal computer.

The article herein may use the principal component analysis to analyze the collected datum. The principal component analysis is a kind of statistical analysis technique which is to divide the multiple variables into a few overall targets and to explain the MANOVA (multivariate analysis of variance)--covariance structure through a few linear combinations (principal components) of original variable. In other words, the research may be dramatically simplified by means of keeping principal components of original variable as many as possible and eliminating some irrelevant components while solving the problems through the analysis of principal components.

Its mathematical model is : Suppose the targets $X_1, X_2, \cdots X_m$, whose number is 'm', and we may find those who can summarize the major information of these targets will be called overall targets and marked as $F_1, F_2, \cdots F_m$ It mathematically means finding a group of constants , $a_{i1}, a_{i2}, \cdots a_{im}$ (i=1. 2,…,m) to make up the linear combination of 'm':

$$\begin{cases} F_1 = a_{11}X_1 + a_{12}X_2 + \Lambda + a_{1m}X_m \\ F_2 = a_{21}X_1 + a_{22}X_2 + \Lambda + a_{2m}X_m \\ \vdots \\ F_m = a_{m1}X_1 + a_{m2}X_2 + \Lambda + a_{mm}X_m \end{cases} \tag{1}$$

who can summarize the major information of $X_1, X_2, \cdots X_m$ while each $F_i, (i=1,2,\cdots,m)$ is irrelevant.

According to the essence of rural informatization and combining not only the research targets and feedback of some experts but also the actual situation of the investigated areas, the article herein will set up 16 variables to analyze the principal components of the construction of rural informatization on the basis of representativeness, comparability, maneuverability and scientificity.

Table 2. Variable Table of PCA (Principal Component Analysis) of the Construction of Rural Informatization

Variable Name	Description of Variable
X1	fixed-line penetration
X2	mobile phone penetration
X3	personal computer penetration
X4	peasant household's attitude towards scientific and technological information and market dynamics
X5	peasant household's attitude towards the establishment of agricultural information

	network
X6	the resources of peasant household's production and lifestyle

We should normalize the datum of different types. The normalization of datum generally means chemokine and non-dimension. Since there is no possibility that the datum of the research of rural informatization may be negative value, the non-dimension method can be taken to normalize the datum. The article herein will normalize the 6 targets and eliminate the effects of those in level and dimension.

From the analysis of the component matrix, we can draw the conclusions: Firstly, the information that the principal components contain accounts for 17.9%, which includes two variables of the quantity of peasants who own a computer and the proportion that agriculture-related enterprises trading online occupies. Secondly, the principal components contain two variables which are the proportions of fixed-line penetration and employee of agricultural information services in countryside. Thirdly, the principal components contain two variables which are mobile phone penetration and personal computer penetration. Fourthly, the principal components contain two variables which are the average number of information that each rural basic-level information service station send and the quantity of agriculture-related websites of counties. Fifthly, the principal components contain two variables which are the proportion of peasants who know the market dynamics of agricultural science and technology and the online trading of agricultural products proportion of total value of agricultural output.

According to the principal component analysis model and factor loading, we may get following expressions of linear combinations of the 5 principal components and the initial 6 variables:

$$\begin{cases} Y_1 = 0.609X_1 + 0.539X_2 + 0.631X_3 - 0.226X_4 + 0.497X_5 + 0.521X_6 \\ Y_2 = 0.065X_1 + 0.457X_2 + 0.104X_3 + 0.582X_4 + 0.392X_5 + 0.37X_6 \\ Y_3 = 0.143X_1 + 0.072X_2 + 0.354X_3 + 0.477X_4 + 0.080X_5 - 0.065X_6 \\ Y_4 = 0.39X_1 + 0.004X_2 + 0.051X_3 - 0.145X_4 + 0.044X_5 + 0.425X_6 \\ Y_5 = -0.450X_1 + 0.317X_2 + 0.312X_3 - 0.323X_4 - 0.440X_4 + 0.321X_6 \end{cases}$$

(2)

Notes: The Xi in the expression is not the original variable but the variable after normalization.

The survey of the use condition and popularity of fixed-line telephone is conducted among more than three hundred families and the number of people related is up to 939. There are 629 people who use fixed-line telephone and enjoy the convenience of it. However, there are 310 people who haven't the habit of using fixed-line telephone and think no needs of using it.

For the use condition and popularity of mobile phone among these 939 people, there are 668 people who own at least one mobile phone only for themselves and think mobile phone may dramatically raise efficiency while there are 96 people who claim they have plans to purchase a mobile phone recently and are strongly influenced by people who have mobile phone around them. Moreover, there are 175 people who haven't a mobile phone and don't plan to purchase one because they don't regard mobile phone as necessity of life. For the use condition and popularity of personal computer, there are merely 117 individuals who own a personal computer and are capable of operating it among these investigated ones and there are 274 individuals who have the plan to buy one recently while majority of them without a personal computer haven't even thought about purchasing one, because they think whether they own a computer or not won't have influence on their daily life as peasants. So according to the research datum above, the types of tools of rural informatization in Chinese countryside are too fewer, which are fixed-line telephone, mobile phone and personal computer, however with fewer qualities.

In the datum processing above, there are different effects on the elimination of

dimensions during the normalization of original datum, so we need to normalize the original datum and the expression used is represented below:

$$X'_{ij} = \frac{X_{ij} - \bar{X_j}}{S_j}, (j=1,2,\Lambda,m)$$

(3)

We may normalize the original datum first and then calculate the principal components through the normalized datum. In order to simplify the calculations, X_{ij} may take the datum after normalization and also **X** may be the datum matrix after normalization.

4.3. How Much Peasant Households Know about Informatization and the Needs of it

How much peasant households know about informatization, degree of recognition and level of acceptance of informatization may be the prior factors that will limit the development of rural informatization. [4]On one hand, in the survey of whether it's necessary for peasant households to know scientific and technological information and market dynamics when programming agricultural production, there are 79.3% of peasant households who claim they are willing to know the latest technology and information about agricultural production through the internet platform and mobile network. There are 7.9% of peasant households who say they have no idea of whether they need to know the information of these two parts, because they are used to the traditional patterns of agricultural production and offline business and may stick to their guns to the offline agricultural production channels.

Moreover, there are 12.80% of peasant households who think it's not necessary to know about these and regard the increase of agricultural output as the key factor to get rid of poverty and become better off. On the other hand, in the survey of whether it's necessary to establish agriculture-related information network, there are 70.10% of peasant households who think it is of great necessity and regard information resources as the key factor in agricultural income. There are 11.30% of peasant households who think it's no need to establish one, because the targets of agricultural management are fixed, the management pattern of agricultural products is point-to-point, and it's no need to establish a diverse information network to conduct the agricultural production. And there are 18.6% of peasant households holding a neutral attitude.

Calculating the percentage of the datum above actually is to calculate the eigen value and eigenvector of covariance matrix "Cov(X)" of X. Through the characteristic equation of R:

$$|R - \lambda I| = 0$$

(4)

To calculate the number 'm' of nonnegative eigen values first, and then list these eigen values in order of numerical magnitude:

$$\lambda_1 \geq \lambda_2 \geq \Lambda \geq \lambda_m$$

(5)

then from:

$$\begin{cases} (R - \lambda I)a_i = 0 \\ a'_i a_i = 1, i=1,2,\Lambda,m \end{cases}$$

(6)

To calculate the unit eigenvector 'ai' corresponding to each eigen value, on the basis of calculations above, then to list the expression of principal components:

$$F_i = a'_i X = a_{i1}X_1 + a_{i2}X_2 + \Lambda + a_{im}X_m, (i=1,2,\Lambda,m)$$

(7)

We can further calculate the values of principal components from this.

4.4. The Resources of Production and Lifestyles of Peasant Households
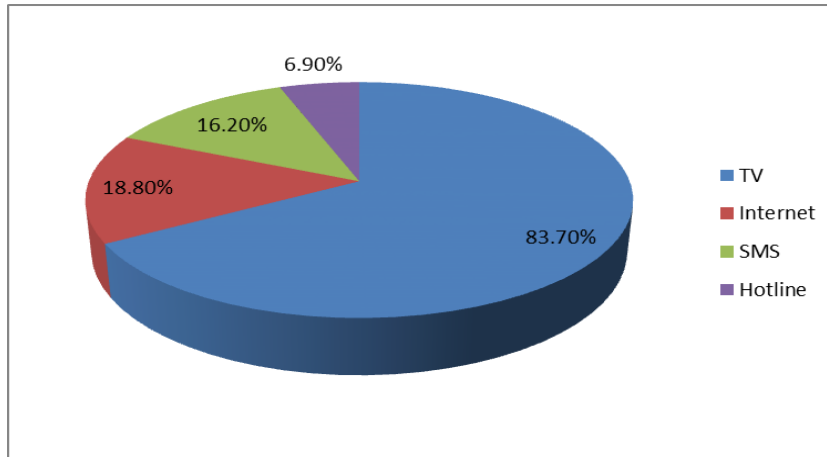

Figure 2. Resource of Production and Lifestyles of Peasant Households

In the survey of resources of production and lifestyles of peasant households, the main channels that they get information from are television, network, SMS (short message service), phone hotline. There are 83.7% of peasant households who get their information of production and lifestyles when they watch TV programmes for entertainment and recreation, so this kind of percentage of peasant households may be the highest. The percentages of peasant households who use network and SMS are almost same value of about 17% and most of them own a computer or a mobile phone. The percentage of peasant households who get information from phone hotline is the lowest because there are fewer individuals who may get more specialized information by calling a hotline.[8]

4.5. The Mathematical Statistical Model used in the Research

In surveys of these aspects, the mathematical statistical model is used to collect and deal with the datum and there is a formula of index of the assessment of efficiency: whose foundation is DEA (data evenlopment analysis). It is a linear programming technique whose fundamental is to take each evaluated sample as a decision-making unit, and where each DMU (decision-making unit) owns the same 'input' and 'output' variables. We may calculate the index of overall efficiency of each DMU by the comprehensive analysis of the input-output ratio of each DMU and then classify and rank them on the basis of calculations above. Finally, we may judge the availability of DMU of DEA.

Suppose there are 'U' samples of DEA and there are 'V' kinds of input variable 'X' and 'W' kinds of output variables 'Y' of each DMU.

$$X_m = (X_{1m}, X_{2m}, LX_{vm})^T, Y_m = (Y_{1m}, Y_{2m}, LX_{wm})^T$$
(8)

Represents

The input and output vectors and $X_{jm} \geq 0 (j = 1,2Lv)$, $Y_{km} \geq 0 (k = 1,2Lw)$, Fj represents the 'j' kind of weight of input index and Hk represents the 'k' kind of weight of output index. All the weights are decided by the general evaluation composed of each DMU. So the index of the assessment of efficiency of the 'm' DMUm can be expressed as:

$$\theta_m = \frac{\sum_{k=1}^{m} H_k Y_{km}}{\sum_{j=1}^{v} F_j X_{jm}}, m = 1,2,3,L,u$$

(9)

θ_m is the efficiency value of DMUm, which is the ratio of the sum of each DMU's weighted input-output index and whose value range is between zero and one.

And another statistical model of datum is the $\mathbf{C^2R}$ and whose precondition is that constant returns to scale. Suppose there are 'u' DMU in system to be evaluated and there are 'V' input index and 'W' output index among the DMUs, so the $\mathbf{C^2R}$ with the non-archimedes infinitesimal 'e' can be expressed as:

$$\begin{cases} \min\left[\theta - \varepsilon(eS + eTs)\right] \\ s.t \sum_{j=1}^{u} X_j \lambda_j - S = Y_0 \\ \sum_{j=1}^{u} Y_j \lambda_j - S = Y_0 \\ \lambda_j \geq 0, j = 1,L,u \\ \quad S \geq 0 \end{cases}$$

(10)

θ represents the efficiency value of evaluated DMU and the larger the 'e' valuing means the DMU boasts more efficient and reasonable than the others. On the contrary, the smaller the θ valuing means the DMU owns less efficiency and the more serious waste of recourse.

5. Research on the Combination of Mobile E-Commerce and Informationization Construction in Rural Areas

5.1. Trading Mode of Mobile e-commerce in Rural Areas

The trading object of e-commerce in rural areas are various agricultural products and its processed products, and they belong to the tangible goods. Because of its widely requirement, the trading can be carried out between the enterprise and enterprise, enterprise and person, person and person, government and person, and also can be person and person, thus there may exist variety of trading modes. Presently, the main e-commerce of agricultural products includes electronic market trading, futures trading, B2B and so on.

5.2. Farmers online shopping mode

To enable the residents shopping online easily, we can build a new business service platform system, which is the combination of the "the network of the real supermarket chain" and "the virtual network of ecommerce". Provides the farmers with variety materials of production and living, and the technical information. Enable the farmers buy the satisfied goods with a low price. Because of the service object mainly in rural areas, so it can stimulate the rural consumption. This new business service platform can shorten the supply chain of goods, expand cross-sectoral and inter-regional service application, fully tap the rural market potential and can widespread the practical business information, technical information, life information and production information that can service the rural areas.

5.3. Logistics Distribution Mode of E-commerce in Rural Areas

Presently, the main logistics operation mode in the rural areas of our country both includes the supply of agricultural production and agricultural marketing system under the planned economy controlled by the state and the logistics system of business unit in rural household. In our country, when constructing the rural logistics system supporting the development of the rural business, we can start from these points below:

(1) build the regional logistics center;

(2) build the regional logistics network;

(3) design the hierarchical of area distribution center.

5.4. Payment Mode of E-commerce in Rural Areas

The specific measures for building rural e-commerce payment platform is like below:

Firstly, Based on the construction of web portals, build an integrated information platform to serve the rural areas.[9] Make full use of Internet's advantages of wide radiating surface of information, the characteristic of strong real-time to broadcast the rural financial information to the rural customers in time. And build an authoritative professional website to serve the agriculture, farmer and rural areas.

Secondly, based on the construction of customer service center of agriculture, farmer and rural areas, build a multi-channel platform to serve the agriculture, farmer and rural areas. Strengthen the cooperation with relevant departments of the rural bank's business linkage, build a customer service center, facing the agriculture, farmer and rural areas, and build a comprehensive customer service system to support the rural financial services.[10]

Thirdly, based on the construction of e-commerce payment system, construct an agricultural commodity electronic payment platform to serve the agriculture, farmer and rural areas, and play an active role in the construction of agricultural commodity circulation system.

6. Conclusion

The level of rural informatization of our country still witnesses a relatively low level. The penetration of the internet lags behind and moreover the development of mobile electronic commerce in countryside has been meeting difficulties, which all shows us the no optimistic present condition. Although the software and hardware facilities have initially formed, there are still more problems such as the small coverage of the internet, fewer quantities of data bases and the simple logistics network. However, the development of rural mobile electronic commerce is closely related to the construction of informatization. It may accelerate the rural market transition, widen the distribution channels and ranges of agricultural trade, coordinate the development of rural and urban, speed up the transfer of rural surplus labor. Therefore, the development of mobile electronic commerce in countryside may require realistic approaches and strategies, which can be described as following: firstly, to treat the effect of government and online store association correctly; secondly, to increase governmental support; thirdly, to strengthen the training of e-commerce talents; fourthly, to enhance the brand consciousness and implement commercialized operation. The early development of mobile electronic commerce in countryside can be enhanced by all kinds of strategies to dramatically boost the construction of rural informatization.

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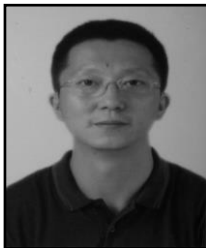
Ma Jinhai, He was born in 1971 in the province of Chongqing, the master of the Sichuan University, and the Associate Professor of Department of business administration of Chongqing business vocational college ,his main research direction is e-commerce.