Feasibility of Electronic Commerce at Cooperative in Gilan Province to Select an Appropriate E-Commerce Model by Using Fuzzy Analysis Network Process

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ABSTRACT

Electronic commerce as one of the most important innovation aspects in the process of doing business is used by many organizations and companies in the world. Cooperatives as the main part of the country's economy have fundamental role in improving and promoting economy. Therefore, innovation methods and tools, new processes and perform business tasks such as e-commerce will play an important role in the success of cooperatives. In this study in the first stage the infrastructures will be considered and those as a requisite will be explained for development of e-commerce in cooperatives establishment and implementation involves having an appropriate infrastructure and technical readiness, to support cultural, social and legal institutions. The aim of this study is to identify bottlenecks in development of e-commerce with cooperatives in Gilan province and finally priorities of this infrastructure, successful implementation of e-commerce needs to choose an appropriate strategy. Therefore, in the second stage based on a variety of previous researches and literature study related to topics and fuzzy analysis network process is attempting to select the most appropriate of e-commerce model in cooperatives. In this study statistical population includes two groups.

Keywords

Electronic Commerce, E-Commerce Models, Infrastructures for Establishment of E-Commerce, Fuzzy Analysis Network Process.

1. INTRODUCTION

Growth and development of information technology is transforming the economics of communities. Companies in international level and worldwide countries are looking for ways to increase profits and market share compared with their past, searching for more efficient ways to conduct e-commerce activities is resulted for another revolution in business. This revolution is called e-commerce. E-commerce and in a broader interpretation; e-business will change people's lifestyle, but these efforts have not been effective so far, on the one hand, because the consistency and integrity is not necessary and on the other hand lacks of the proper speed. In the organizational aspects, discussed e-commerce has now located at the top priorities of the organization [1].

Today the application of electronic solutions for cooperative economic enterprises as well as an important necessity in unavoidable and if cooperatives don`t have the necessary attention to this matter will be faced with decreasing profitability and eliminated from competition of e-commerce strategic initiatives in the Gilan province with coopera-

tives, one of the most important step in planning for the establishment of cooperative deployment of e-commerce. Thus, in this study, using the results of previous studies and experts, professors, library studies of effective development of e-commerce infrastructure in the Gilan province with cooperatives should identified and prioritized and finally the most appropriate model is presented for e-commerce in the Gilan province with cooperatives.

2. LITERATURE REVIEW

According to Ward and Pepard set of the e-commerce strategy begins with the determining of the vision, mission and total goals of the organization. Today, most organizations are seeking competitive organizations attempt to provide value-addition activities such as the internet, assessment, and timely process for making pay-related transactions.

Lampikin and Des (2004) Also, the combined companies which are present in two environments try to get all their business operations. Very limited researches about how arrival of e-business strategy has been performed in the existing strategy of organizations. However, Doerty and Mc Eli (2003) suggest that any action including investing in e-commerce is conducted with regard to organizations strategy.

The research was conducted by Kanspekton's group in Departments of English show that creating e-business strategy was in high levels in many of them. It can be said, almost all organizations, surveyed, 48% organizations, chosen no centered model in which one special strategy was created and developed for all organizations. In contrast, 4% of these organizations acts as no centered and each unit according their needs have been selected different strategy of e-business. 48% remaining also have used the conducted by Hoze (2001), it was characterized that in the high level, organizations are lack of any clear and transparency direction for the strategy of e-commerce.

According to questionnaires, the main reason of this problem was the lack of sufficient and experienced of human force in the e-commerce for changing the structure of organizations as well as lack of and its effects. In fact, many managers are decision and no as a critical decision for organizations. Another reason is that strategies that doesn`t have a place in the total strategies of organization, finally was not received as an appropriate budget and are doomed to fail. However, the aims of organization was identified based on chances and threats that obtained from the analysis of environment, and in terms of it was defined the aims for the strategy of e-business. Nevertheless, it is necessary to the strategy of e-business not only to support the strategy of the organization, but also is affected or affects on it [2].

Different global studies related to readiness of e-commerce have been. It can be mentioned as the following subjects:

APEC studies for which the readiness of electronic are measured 6 subjects:

- Infrastructure and technology base (speed, price, availability, market, competition, industry standards, and foreign investment).
- Access to network services (bandwidth industry diversification, export controls, and export regulation cards).
- Internet use (government, business and home standards).
- Advertise and facilitate (leading industry standards).
- Skills and human resources (ICT and workforce).
- Preparing for the digital economy (taxes and traffics, self-industry, government regulations and customer confidence).

CSPP studies

CSPP the readiness guide for living in the global measurement network does in 5 categories:

- Infrastructure.
- Availability.
- Economy.
- Determinations (policy, confidential, security, and present everywhere)

Studies at HARWARD University (CID)

Networked readiness index, (NRI) HARWARD CID is based on two indicators:

- The use of network.
- Determining factors: information infrastructure, hardware, software, and support.

The policy of information and communication technology, the environment of business and economy, training network, opportunities of information and communication technology, social investment, electronic government, e-commerce and general infrastructure [3].

Javalgi and Ramci (2001) in their research titled of strategic e-commerce issues, have studied the factors affecting the growth of e-commerce and in their research expressed, e-commerce has been one of the internet e-commerce application and its growth depends on infrastructures such as information and communication technology, social and cultural, business and legal and governmental. Lack of infrastructure can be considered a major obstacle in implementing e-commerce. The above infrastructures are necessary to support the growth of e-commerce and to take of strategic interests.

In Iran, Azizi with a case study in the IRANKHODRO Company has attempted to identify barriers and using e-commerce solutions. In this study, obstacles has presented to the development of e-commerce, lack of readiness and capability necessary partners, behavioral and cultural barriers, technical problems, lack of appropriate competitive

environment.

Naseri and et.al., (2008) have expressed in the study titled the introduction of e-business model in Iran's cooperatives, before entering the modeling of e-commerce and e-business need to be integrated the internal environment of cooperative until to provide using conditions of business models in cooperatives.

3. CONCEPTUAL MODEL OF RESEARCH

Conceptual model is schematic model to show the relationships between variables that are extracted from theoretical research framework. Conceptual model is the relationship between the theoretical and conceptual work and collection and analysis of the information. In figure 1, variables are shown in a conceptual diagram.

4. HYPOTHESES OF RESEARCH

H_1: Infrastructure of technical readiness is the most important effective factor in the establishment of e-commerce in cooperatives of Gilan province.

H_2: Ready accesses to the network speed and quality indicators are the most important indicators of infrastructure technical readiness in the establishment of e-commerce in cooperatives of Gilan province.

H_3: Availability index of services providers of special supporting institutions is the most important infrastructure index of supporting institutions in the establishment of e-commerce in cooperatives of Gilan pronounce.

H_4: The indicator of English language skills is the most important indicator of cultural and social infrastructure in the establishment of e-commerce in cooperatives Gilan province.

H_5: Index of certification service providers are the most important legal and rights infrastructure index in the establishment of e-commerce in cooperatives of Gilan province.

H_6: business to customer model is the most appropriate model of e-commerce.

H_7: Providing model in selecting the most appropriate model of e-commerce has value in the cooperatives of Gilan province is the Fuzzy Analysis Network Process.

5. RESEARCH METHOD

Type of the research based on the purpose is practical, because the results obtained of this study can be used to facilities planning for the deployment of e-commerce in the cooperatives of Gilan province. In addition to cooperatives of private, public, companies and … Can also benefit from the research results. In terms of method is descriptive-survey, because most attention is focused on understanding and study of changes.

5.1. Methods of Data Gathering

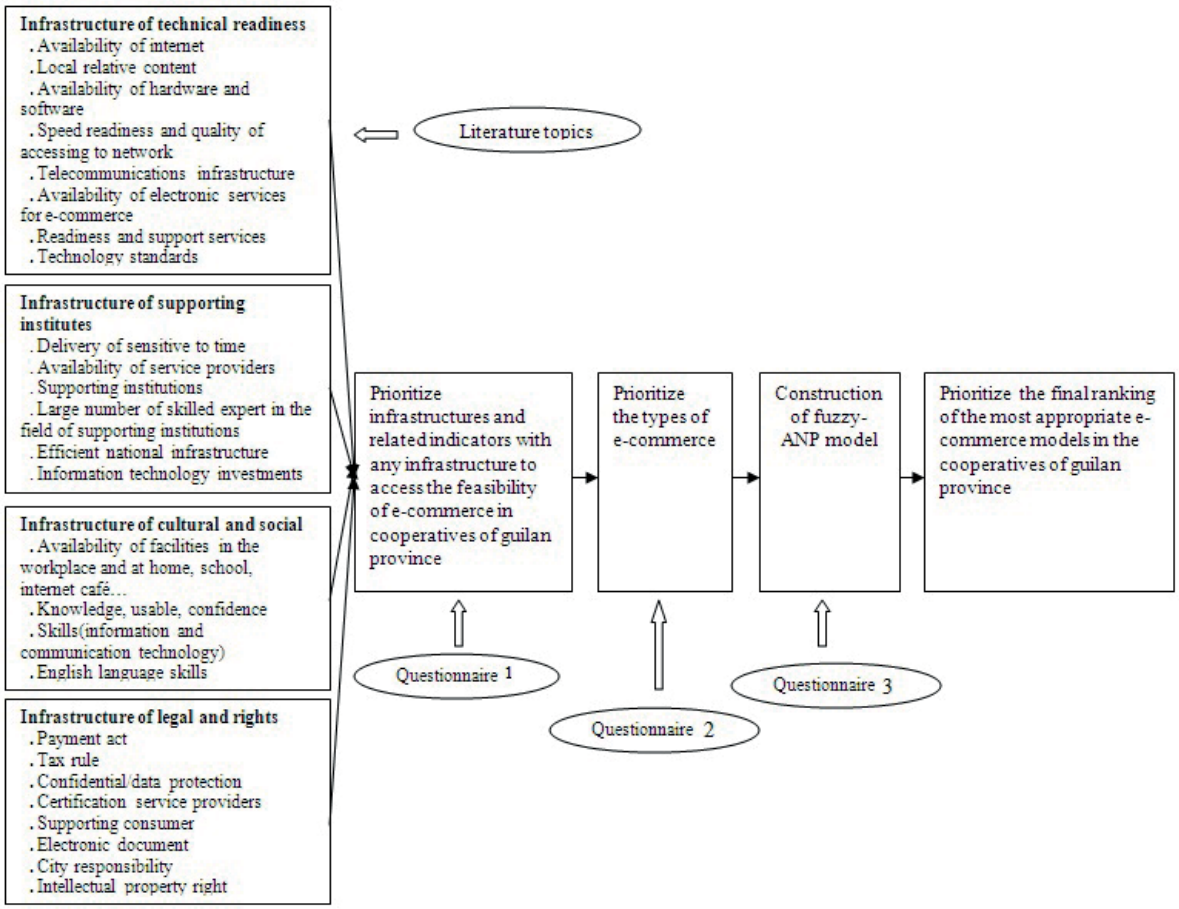

Figure 1: Conceptual Model of Research

In this study, methods data collection is in two forms, a library and field, i.e. in the first visit the library and internet searches were conducted to identify the most important effective factors and indicators for deployment of e-commerce and different models of e-commerce. Then, in order to prioritize and select the appropriate model of e-commerce was used for e-commerce field method.

5.2. Information Gathering Tools

When the researcher seeks to know exactly what and how to measure their variables, the questionnaire is used an efficient tool for gathering information [4]. During this study have been used three types of the following data collection.

Table 1: Methods of Data Collection

Scale	Goal	Tools	No
Range from 1(very low) to 5(very high) of LIKERTS scale	Priority of infrastructure and indications related to each infrastructure in the establishment of e-commerce in Gilan province with cooperatives	Questionnaire 1 (26 questions)	1
Range from 1(very low) to 5(very high) of LIKERTS scale	Identifying the most appropriate models of e-commerce with respect to the conditions and exits infrastructures in the cooperatives of Gilan province	Questionnaire 2 (7 questions)	2
Triangular fuzzy numbers	Collection data for creating a model of network analysis process	Questionnaire 3	3

5.3. Validity of the Measurement Tools

Validity test is the ability of the desired tool in measuring trait that the test is made to measure it, and includes formal validity, predictive validity and content validity [10].

Since individual questions of the questionnaire is based on literature research and adaptation of relevant studies conducted in other countries. This questionnaire has enough validity.

In addition, in order to be more ensure about the validity of questionnaire. 5 points are charted by Delphi method for obtaining them.

5.4. Reliability of the Measurement Tools

Reliability of measurement tools has been mentioned to its careful and when a test is reliable, if we give it several times in a short period of time to some group of people, the obtained results are close together. To determine the reliability of questionnaire is used Cronbach`s Alpha whatever this coefficient is closer to 1, indicating good reliability of the instrument [1].

5.5. Statistical Community

Statistical community is all real or imaginary members we are interested in generating our findings to them [6]. The statistical community of Gilan province cooperatives is including cooperative company which is obtained as a separate activities as a category in table 4 (statistical sample studied is listed on the table as percentage).

Table 2: CRONBACH's Alpha coefficient of the first questionnaire

CRONBACH's Alpha	N of Items
.859	26

Table 3: CRONBACH's Alpha coefficient of the second questionnaire

CRONBACH's Alpha	N of Items
.742	7

Table 4: Classification cooperatives used in research

Activity Area	Percentage
Consumer cooperatives company	%26.1
Production cooperatives company	%17.8
women cooperatives company	%20.8
services cooperatives company	%22
credit cooperatives company	% 5.95
Cooperatives frontiersman	%7.14

5.6. Sampling Method

Sampling method in this study is stratified-random (relative stratification) sampling method. In this method, units of population study which are grouped are more homogeneous in terms of trait variables, to be less variation within their groups and then some example of each class is chosen [7]. To determine the sample size, it is used the following formula:

$$n=\left(\frac{Z^{\alpha/2}\times\sigma}{\varepsilon}\right)^2 \qquad (1)$$

In this regard, z is the standard normal probability, α is scale deviation and ε is carefully case study (in this study, confidence level is 95%). On the basis of formula for sample size between cooperatives of Gilan province is selected 171 cooperatives.

6. RESEARCH EXECUTION MODEL

In this study, the following chart describes the implemented steps.

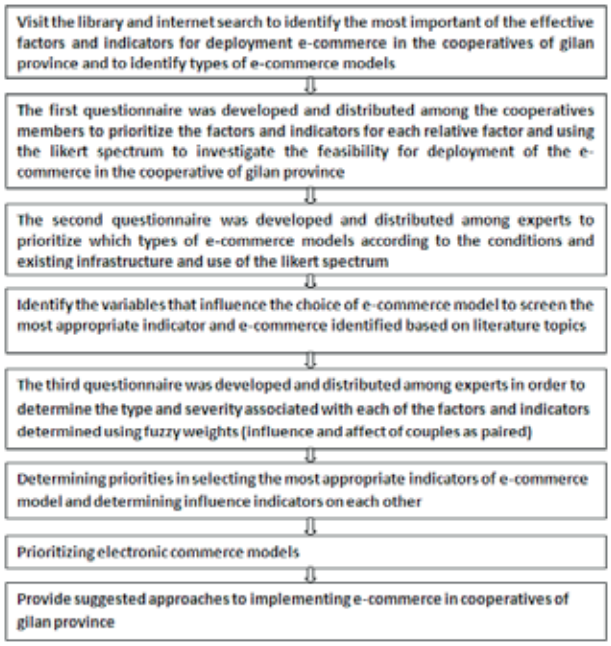

Figure 2: Research executive model

7. DATA ANALYSIS

in order to prioritize any infrastructures and indicators related to each infrastructure and prioritizing e-business models have been used descriptive statistics and the basis of analysis of average rank is used the Friedman test. Freidman test is a non-parametric test. Then, in order to select the most appropriate model of e-commerce in cooperatives of Gilan province have been used the process of Fuzzy network analysis. It should be noted that in this study in order to screen for components of the model is used the ratio test community.

8. HYPOTHESES TESTING

8.1. First Hypotheses testing

$$\begin{cases} HO:\ \mu_i \leq \mu_x \\ H1:\ \mu_i > \mu_x \end{cases}$$

H0: Infrastructure of technical readiness is as the most important effective factor in the establishment of e-commerce in cooperatives of Gilan province.

H1: Infrastructure of technical readiness is not as the most important effective factor in the establishment of e-commerce in cooperatives of Gilan province.

To investigate the first hypothesis was used Friedman test and then by averaging the mean rank of the variable number question, the final average is calculated. Table 5 shows results of this test.

According to the result in table 5, significantly value is Asymp.sig=.000, because Sig is less than 5%, H0, i.e. claims to be more important than other infrastructure, technical readiness infrastructure to be accepted. As shown in Table 5, social and cultural infrastructure, with an average rating 16.6 ranked first infrastructure supporting institutions with an average 14.17 in the ranked second infrastructure technical readiness with an average rating of 13.16 in the third rank and legal and rights infrastructure with an average rating 12.04 in the fourth rank.

8.2. Second Hypotheses Testing

$$\begin{cases} HO:\ \mu_i \leq \mu_x \\ H1:\ \mu_i > \mu_x \end{cases}$$

H0: Ready accesses to the network speed and quality indicators are the most important indicators of infrastructure technical readiness in the establishment of e-commerce in cooperatives of Gilan province.

H1: Ready access to the network speed and quality indicator is not the most important indicator of technical readiness infrastructure in the establishment of e-commerce in cooperatives of Gilan province.

Table 5: The test results of the hypothesis (1)

Priority	Explanation of factors	The number of questions	The number of respondents (N)	Statistics2χ (Chi-square?)	Freedom degree(df)	Asymp. sig	Mean rank	Test result
1	Infrastructure of cultural and social	8	168	1.383E3	25	.000	16.06	Hypothesis rejects
2	Infrastructure of supporting institutes	8	168				14.17	
3	Infrastructure of technical readiness	6	168				13.18	
4	Infrastructure of legal and rights	8	168				12.04	

Table 6: The test results of the hypothesis (2)

Priority	Explanation of factors	The number of questions	The number of respondents (N)	Statistics2χ (Chi-square?)	Freedom degree (df)	Asymp. sig	Std Deviation	Mean rank	Test result
1	Availability of internet	4	168	455.393	7	.000	0.818	6.96	Hypothesis rejects
2	Local relative content	1	168				0.987	6.38	
3	Availability of hardware and software	3	168				0.917	4.90	
4	Speed readiness and quality of accessing to network	2	168				0.935	3.80	
5	Telecommunications infrastructure	7	168				1.080	3.64	
6	Availability of electronic services for e-commerce	5	168				0.920	3.54	
7	Readiness and support services	6	168				0.915	3.42	
8	Technology standards	8	168				0.897	3.36	

To investigate hypothesis (2) is used Friedman test Table 6 shows results of this test.

According to results in Table 6, value significantly is Asymp.sig=0.000, because sig is less than 5%, as a result, H0, i.e. the claim to be more important speed readiness indicators and access to the network quality was not accepted than the other indices. As shown in Table 6, availability of internet infrastructure is in the first rank, relevant local content index is in the second rank, availability hardware and software infrastructure are in the third rank. Readiness index of speech and access to the quality network in the fourth rank, readiness indicators of e-services required for e-commerce in the sixth rank, readiness indicator to support services in the seventh rank and finally, technology standards indicator in the eighth rank.

8.3. Third Hypotheses Testing

$$\begin{cases} HO: \mu_i \leq \mu_x \\ H1: \mu_i > \mu_x \end{cases}$$

H0: Availability index of services providers of special supporting institutions the most important infrastructure index of supporting institutions in the establishment of e-commerce in cooperatives of Gilan pronounce.

H1: Availability index of service providers of special supporting institutions the most important infrastructure index of supporting institutions in the establishment of e-commerce in cooperatives of Gilan province.

To investigate the third hypothesis was used the Freidman test, Table 7 the results test of third hypothesis.

According to the results in table 7, significantly value is symp.sig=0.000, because sig is less than 5%. As a result, H0, i.e. the claim to be more important than availability index of service providers of special supporting institution was not accepted than the other indicators of supporting institutions services. As shown in the table 1, delivery index of sensitive to time is in the first rank, availability indicator of service providers of supporting institutions in the second rank, the indicator of a number of the skilled experts is in the field of supporting institutions in the third rank, the index of efficient national infrastructure in the fourth rank, the indicator of the international efficient supply chain in the fifth rank and index investment capability in the sixth rank.

8.4. Fourth Hypotheses Testing

$$\begin{cases} HO: \mu_i \leq \mu_x \\ H1: \mu_i > \mu_x \end{cases}$$

H0: The indicator of English language skills is the most important indicator of cultural and social infrastructure in the establishment of e-commerce in cooperatives Gilan province.

H1: The indicator of English language skills is not the most important indicator of cultural and social infrastructure in the establishment of e-commerce in cooperatives Gilan province.

To investigate hypothesis 4 was used the Friedman test, Table 8 shows the results of this test.

According to the results in Table 8, significantly value is Asymp.sig=.000, because sig is less than 5%, as a result,

Table 7: The test results of the hypothesis (3)

Priority	Explanation of factors	The number of questions	The number of respondents (N)	Statistics2χ (Chi-square?)	Freedom degree (df)	Asymp. sig	Std Deviation	Mean rank	Test result
1	Delivery of sensitive to time	9	168	342.043	5	.000	0.681	5.50	Hypothesis rejects
2	Availability of service providers	11	168				0.924	3.76	
3	Supporting institutions	14	168				0.842	3.56	
4	Large number of skilled expert in the field of supporting institutions	13	168				1.003	3.04	
5	Efficient national infrastructure	10	168				0.845	2.80	
6	Information technology investments and integration capacity systems	12	168				0.814	2.35	

H0, i.e. the claim to be more important index of English language skills was not accepted than the other indicators of cultural and social infrastructure. As shown in Table 8, availability index of facilities in the workplace, at home, internet café and etc. is in the first rank, index of knowledge, confident and usable (satisfaction), in the second rank, index of skills ,information and communication technology in the third rank and index of English language skills in the fourth rank.

8.5. Fifth Hypotheses Testing

$$\begin{cases} HO: \mu_i \leq \mu_x \\ H1: \mu_i > \mu_x \end{cases}$$

H0: Index of certification service providers are the most important legal and rights infrastructure index in the establishment of e-commerce in cooperatives of Gilan province.

H1: Index of certification service providers are the most important legal and rights infrastructure index in the establishment of e-commerce in cooperatives of Gilan province.

To investigate hypothesis 9 was used the Friedman test results of this test.

According to the results in Table 9, significantly value is Asymp.sig=0.000, because sig is less than 5%. As a result, H0, i.e. the claim to be more important index certification service providers were not accepted than the indicators in Table 9, index of payment act is in second rank, the index of confidential/date protection in the third rank, index of certification service providers in the fourth rank, the indicator of consumer protection in the fifth rank, index of

Table 8: The test results of the hypothesis (4)

Priority	Explanation of factors	The number of questions	The number of respondents (N)	Statistics2χ (Chi-square?)	Freedom degree (df)	Asymp. sig	Std Deviation	Mean rank	Test result
1	Availability of facilities in the workplace and at home, school, internet café…	15	168	224.038	3	.000	0.862	3.12	Hypothesis rejects
2	Knowledge, usable, confidence	16	168				0.776	2.96	
3	Skills(information and communication technology)	18	168				0.934	2.52	
4	English language skills	17	168				0.702	1.39	

Table 9: The test results of the hypothesis (5)

Priority	Explanation of factors	The number of questions	The number of respondents (N)	Statistics2χ (Chi-square?)	Freedom degree (df)	Asymp. sig	Std Deviation	Mean rank	Test result
1	Payment act	24	168	152.272	7	0.000	0.855	5.75	Hypothesis rejects
2	Tax rule	25	168				0.780	5.36	
3	Confidential/data protection	26	168				0.841	5.22	
4	Certification service providers	20	168				0.963	4.29	
5	Supporting consumer	23	168				0.995	3.96	
6	Electronic document	19	168				0.836	3.92	
7	City responsibility	22	168				0.978	3.83	
8	Intellectual property right	21	168				0.924	3.67	

citizen responsibility in the seventh rank, and index of the intellectual property right in the eight rank.

8.6. Sixth Hypotheses Testing

$$\begin{cases} HO: \mu_i \leq \mu_x \\ H1: \mu_i > \mu_x \end{cases}$$

H0: business to customer model is the most appropriate model of e-commerce.

H1: business to customer model is not the most appropriate model of e-commerce.

To investigate hypothesis 6 was used the Freidman test, Table 10 shows the results of this test.

According to the results in Table 10, significantly value is Asymp.sig=.000, because sig is less than 5%, as a result H0, i.e. the claim to be most appropriate B2C business model was not accepted that the other e-business models.B2B business model is in the first rank.B2C business model is in the second rank, C2B business model is in the fourth rank, B2B2C business model is in the fifth rank, and B2A model is in the sixth rank.

8.7. Seventh Hypothesis Study

Providing model in selecting the most appropriate model of e-commerce have the most appropriate model of e-commerce have value in the cooperatives of Gilan province with the Fuzzy analysis network process.

In this section, it is used two approaches to select the most

Table 10: The test results of the hypothesis (6)

Priority	Explanation of factors	The number of questions	The number of respondents (N)	Statistics2χ (Chi-square?)	Freedom degree (df)	Asymp. sig	Std Deviation	Mean rank	Test result
1	Business to Business	7	5	25.744	6	0.000	0.547	6.30	Hypothesis rejects
2	Business to Customer	1	5				0.547	6.00	
3	Business to Employee	4	5				0.447	5.70	
4	Customer to Business	3	5				1.00	2.90	
5	Collaborative Commerce	6	5				0.894	2.90	
6	Business to Business to Customer	5	5				0.836	2.50	
7	Business to Administration	2	5				0.447	1.70	

appropriate model of e-commerce and finally to study the validity of the model is used of error tests. Each model with the less error would be appropriate.

Figure 3 shows the most appropriate structure of e-commerce model in cooperative of Gilan province. As can be seen, the structure has four levels. A purpose, the selection of the appropriate e-commerce model in cooperatives Gilan province is shown in the first level. The efficient infrastructures are in the second and third and the last level of e-business level, respectively.

The indicators of any infrastructure have interdependence which is shown in the form of a feedback arch.

So that W1 shows the effect of target vector for example selecting the most appropriate e-commerce model according to infrastructure, w2 specifies the effect matrix of infrastructure on each indicator, W3 indicates the matrix of the interdependencies indicators, and W4 also specifies the effect indicator on the options. It should be noted that zero-entries in the super-matrix shows that element corresponding to the super-matrix is not effective on these elements, because doesn`t have an interactive relationship with each other.

$$W=\begin{bmatrix} \cdot & \cdot & \cdot & \cdot \\ W_1 & \cdot & \cdot & \cdot \\ \cdot & W_2 & W_3 & \cdot \\ \cdot & \cdot & W_4 & I \end{bmatrix}$$

In the normal analysis network process, paired comparison is performed using a relative scale. Although the discrete scale advantages is its simplicity and easy of use, but it couldn`t enter the perceptions or judgments of uncertainty of individuals in the calculations. However, it is observed that people evaluate the relative importance of individual requests of our customers are not always subjective and inaccurate. Linguistic terms that people use to express their feelings and judgments are vague and ambiguous. As first Lotfizadeh in 1965 stated, Fuzzy sets theory is a critical theory for dealing with ambiguity I a system [8]. In this model are used triangular Fuzzy numbers.

• First Approach

There are various methods for integrating the phase of the judgments of experts, but SAATY 1980, recommends the geometric mean method for obtaining better results. That is will be calculated through this formula.

$$\tilde{A}_i^g = \left(\prod_{k=1}^{N} \tilde{a}_{ij}^k\right)^{1/N} \qquad ,\forall_K = 1,2,(2)N$$

Where, is Fuzzy judgments and priority of decision-making group and N is the number of decision-making [9].

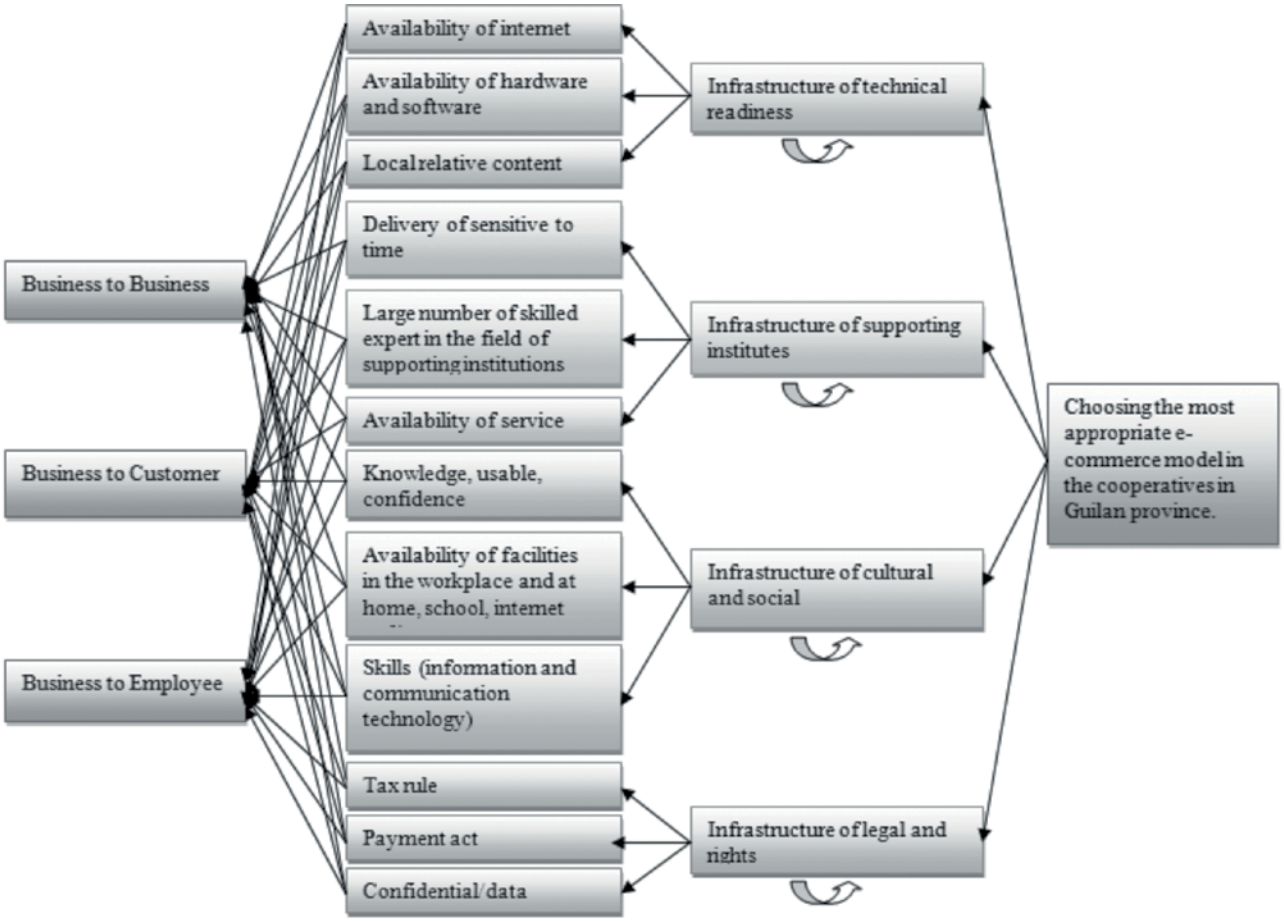

Figure 3: The decision structure for choosing the most appropriate e-commerce model in the cooperatives in GILAN province.

Table 11: linguistics scales for assessing the degree of relative importance.

Linguistics Scales for Assessing The Degree	Fuzzy Numbers	Inverse of Fuzzy Number
Just equal	(1,1,1)	(1,1,1)
Equally important	(1/2,1,3/2)	(2/3,1,2)
Weakly more important	(1,3/2,2)	(1/2,2/3,1)
Strongly more important	(3/2,2,5/2)	(2/5,1/2,2/3)
Very strongly more important	(2,5/2,3)	(1/3,2/5,1/2)
Absolutely more important	(5/2,3,7/2)	(2/7,1/3,2/5)

There are several methods for estimating the weights, because the numbers are as fuzzy, it is necessary. For convert to Fuzzy numbers to absolve to numbers, it is used the center of gravity for its simplicity and thus doesn`t require the analysis to judge the person. Formula of the center of gravity for Defuzzy is as follows [5];

$$CAij = \frac{[(UEij-LEij)+(MEij-LEij)]}{3} + LEij \ , \ \forall i,j \quad (3)$$

Weights were calculated using the software method. The final priority index according to the normal and limit matrix is as follows Table 12.

The final priorities obtained show that B2B model have highest preferences and B2C and B2E models are the next priorities. The results are shown in figure 4.

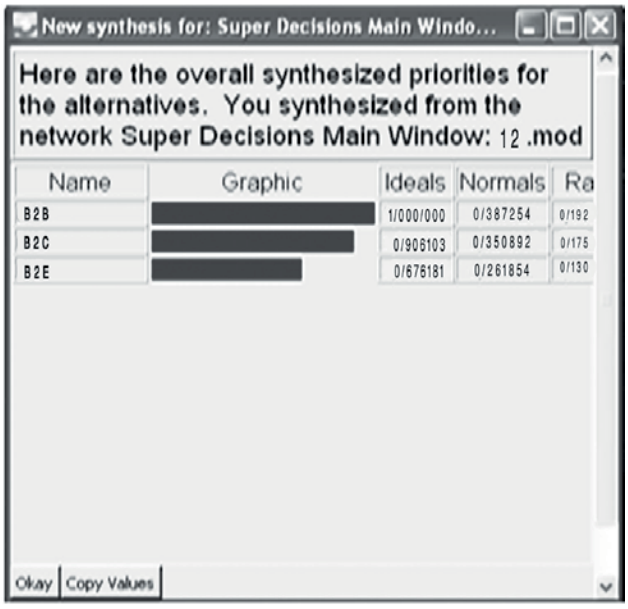

Figure 4: final priorities options of ANP

It should be noted, the incapability of paired comparisons in all cases is less than 0.1.

• Second Approach

Chung developed an analysis method AHP in 1996, and presented 4 methods to work with AHP Fuzzy. He used the triangular Fuzzy numbers as a measure of paired comparisons and method of analysis (EA). The numbers used in this way are the triangular Fuzzy numbers. Concepts and definitions Fuzzy hierarchical analysis process and described based on analysis of the development method and this method is used for ANP Fuzzy. Consider two triangular numbers M1 = (l_1, m_1, u_1) and, M_2= (l_2, m_2, u_2) are drawn in figure 5.

Table 12: Normal and extent matrix related to indicators and options

Indicators	Normal Matrix	Limit Matrix
Availability of internet	0.33333	0.045120
Availability of hardware and software	0.36364	0.049222
Local relative content	0.30303	0.041018
Tax rule	0.40535	0.066260
Payment act	0.36315	0.059363
Confidential/data protection	0.23149	0.037840
Knowledge, usable, confidence	0.36219	0.038280
Availability of facilities in the workplace and at home, school, internet café	0.24235	0.025614
Skills(information and communication technology)	0.39546	0.041796
Delivery of sensitive to time	0.37136	0.035461
Large number of skilled expert in the field of supporting institutions	0.23256	0.022207
Availability of service providers	0.39608	0.037821
Business to Business	0.387254	0.19
Business to Customer	0.350892	0.18
Business to Employee	0.261854	0.13

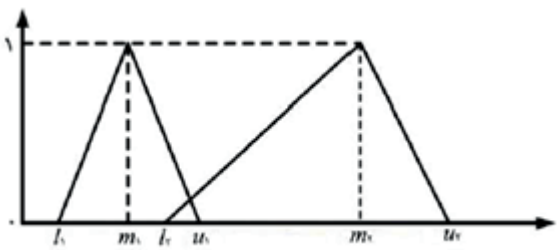

Figure 5: triangular numbers M1 and M2

The mathematical function is defined as the relations (4),

(5) and (6).

$$M_1 + M_2 = (l_1 + l_2, m_1 + m_2, u_1 + u_2) \quad (4)$$

$$M_1 \times M_2 = (l_1 \times l_2, m_1 \times m_2, u_1 \times u_2) \quad (5)$$

$$M_1^{-1} = \left(\frac{1}{u_1}, \frac{1}{m_1}, \frac{1}{l_1}\right)$$
$$M_2^{-1} = \left(\frac{1}{u_2}, \frac{1}{m_2}, \frac{1}{l_2}\right) \quad (6)$$

It should be noted that the multiplication of two triangular fuzzy numbers or a reverse of triangular Fuzzy numbers, the other one is not a triangular Fuzzy number. This relations are expressed only approximate the actual product of two triangular Fuzzy numbers and a reverse of triangular Fuzzy numbers.

In the analysis of development method, for each roe of paired comparison matrix, the value is a triangular number, is calculated as equation (7).

$$Sk = \sum_{j=1}^{n} M_{kl} * \left[\sum_{i=1}^{m}\sum_{j=1}^{n} M_{ij}\right]^{-1} \quad (7)$$

In which k indicates row number and i and j represent options and indices respectively. In the analysis of development method, after calculating , their large degree to each other must obtain. In general, if M_1 and M_2, which is shown $V(M_1 \geq M_2)$, is defined as equation (8).

$$\begin{cases} V(M1 \geq M2) = 1 & if\ m1 \geq m2 \\ V(M1 \geq M2) = hgt(M1 \cap M2) & otherwise \end{cases} \quad (8)$$

We have also:

$$hgt(M1 \cap M2) = \frac{u1 - l1}{(u1 - l2) + (m2 - m1)}$$

A large amount of triangular Fuzzy numbers to triangular Fuzzy number is obtained from equation (9).

$$V(M1 \geq M2, \ldots, Mk) = V(M1 \geq M2), \ldots, V(M1 \geq Mk) \quad (9)$$

To measure the weights of the indicators in the paired comparisons matrix, we act as equation (10).

$$w'(x_i) = Min\{V(S_i \geq S_K\}, k = 1,2,\ldots,n \ \ k \neq i \quad (10)$$

Therefore, weight vector of indicators will be as equation (11).

$$W'(x_i) = [W'(c_1), W'(c_2), \ldots, W'(c_n)]^T \quad (11)$$

This is the same non-normalized vector of coefficients, of the process of Fuzzy hierarchical analysis [10].

To help the equation (12), abnormal results obtained from equation (11) are normalized.

$$W_i = \frac{w'_1}{\sum w'_i} \quad (12)$$

In which W is not a Fuzzy number [11].

Due to high volume of calculations, only one factor is presented in the calculations.

Table 13: paired comparisons matrix of technical readiness index regardless of dependence between them

Infrastructure of Technical Readiness	A1	A2	A3
Availability of internet (A1)	(1,1,1)	(1,3/2,2)	(1,3/2,2)
Availability of hardware and software (A2)	(1/2,2/3,1)	(1,1,1)	(1/2,1,3/2)
Local relative content (A3)	(1/2,2/3,1)	(2/3,1,2)	(1,1,1)

In this stage, using the method of analysis developed Chung, the coefficient of each paired comparisons matrix is calculated from equation (7).

$$\left[\sum_{i=1}^{m}\sum_{j=1}^{n} M_{ij}\right]^{-1} = (7.16, 9.32, 12.5)^{-1} = (0.08, 0.107, 0.14)$$

S1=(3,4,5)(0.08,0.107,0.14)=(0.240,0.429,0.698)*

S2=(2,2.66,3.5)(0.08,0.107,0.14)= (0.160,0.285,0.489)*

S3= (2.16, 2.66, 4)(0.08, 0.107, .014) = (0.173, 0.285, 0.559)*

Now, we must calculate the large degree of each element on other elements. Calculation is done using the equation (8). Table 14 shows the relevant calculations.

Table 14: The large degree of each element on another element

V(s1≥s2) =	1
V(s1≥s3)=	1
V(s2≥s1)=	0.634
V(s2≥s3)=	1
V(s3≥s1)=	0.689
V(s3≥s2)=	1

After determining the large degree of each element on the other elements, turn is to calculate the magnitude Si on the other Si. Relative calculation is done using equation (9).

W1= Min V (s1≥s2, s3) =Min(1,1)=1

W2= Min V (s2≥s1, s3) =Min (0.634,1)=0.634

W3= Min V (s3≥s1, s2) =Min(0.689,1)=0.689

Therefore, weights vector of indicators (non-normalized) using equation (11) will be as following:

$$W'(xi) = [1, 0.634, 0.689]^T$$

Now based ob equation (12), normalized weights of indices A_1, A_2, A_3 are achieved.

W= (0.431, 0.273, 0.297)

Yet, the dependence between the indicators is applied.

Table 15: The internal dependency matrix of indicators according to availability of internet (A1)

A1	A2	A3	W
A2	(1,1,1)	(1,3/2,2)	0.685
A3	(1/2,2/3,1)	(1,1,1)	0.315

Table 16: The internal dependency matrix of indicators according to availability of software and hardware (A2)

A1	A2	A3	W
A2	(1,1,1)	(1,1,1)	0. 5
A3	(1/2,1,3/2)	(2/3,1,2)	0. 5

Table 17: The internal dependency matrix of indicators according to the relevant local content (A3)

A1	A2	A3	W
A2	(1,1,1)	(1,1,1)	0. 685
A3	(1/2,2/3,1)	(1,3/2,2)	0. 315

W=		A1	A2	A3
	A1	0	0.685	0.5
	A2	0.685	0	0.5
	A3	0.315	0.315	0

Similarly, the other calculations are done and finally the extent matrix is shown in the following table.

Table 18: the limit matrix related to indicators and options.

Indicators	Limit Matrix
Availability of internet	0.12
Availability of hardware and software	0.12
Local relative content	0.08
Tax rule	0.17
Payment act	0.15
Confidential/data protection	0.10
Knowledge, usable, confidence	0.09
Availability of facilities in the workplace and at home, school, internet café	0.07
Skills (information and communication technology)	0.08
Delivery of sensitive to time	0.01
Large number of skilled expert in the field of supporting institutions	0.01
Availability of service providers	0.01
Business to Business	0.43
Business to Customer	0.37
Business to Employee	0.21

The first similar approach obtained shows that B2B model has the highest preference and B2C and B2E models are the next priorities.

In this stage, we calculated error test of MAD, MSE, and BIAS for two current approaches. Thus, we examined the validity of the model, where n is number of experts, y is the weights of limit matrices. The results of the calculation errors are shown in Table 19.

$$MAD = \frac{\sum_{n}^{i=1}|yi-ye|}{n} \quad (13)$$

$$MSE = \frac{\sum_{n}^{i=1}(yi-ye)^2}{n} \quad (14)$$

$$Bias = \frac{\sum_{n}^{i=1}(yi-ye)}{n} \quad (15)$$

As shown in the Table 19, in all three cases, the second approach, the error rate is less than the first approach.

9. CONCLUSION

In this study, the feasibility for establishment of e-commerce were examined with the view of cooperatives and from perspective of technical readiness infrastructures, supporting institutions, cultural-social and legal infrastructure with indicators related to each other. In terms of infrastructures, the most important indicator related to technical readiness infrastructure, access to internet, the most important indicator of supporting institutions infrastructure, delivery of time sensitive, the most important indicator of social and cultural infrastructure, availability of facilities at the workplace, home, internet café, the most important indicator of legal and rights infrastructure, the most important e-commerce model; organization to organization trade, and finally using the process of network analysis and using Fuzzy weights were selected the most appropriate model of e-commerce in cooperatives of Gilan province and business to business trade.

With considering the scope of research, the following research areas are recommended for future readers and enthusiasms. The suggestion of this study is presented by direct findings of the research and the literature studies.

- Selecting the best strategy of the establishment of e-commerce with the other approaches of multi-criteria of the decision making and meta-innovation such as neural network system.
- To provide a model according to the limitations of

Table 19: Error test of the first and

	MAD first approach	MAD second approach	MSE first approach	MSE second approach	BIAS first approach	BIAS second approach
C1	0.256	0.256	0.328	0.328	0.256	0.256
C2	0.296	0.296	0.438	0.438	0.296	0.296
C3	0.234	0.234	0.274	0.274	0.234	0.234
C4	0.214	0.214	0.229	0.229	0.214	0.214
A1	0.286	0.216	0.409	0.233	0.286	0.216
A2	0.268	0.198	0.359	0.196	0.268	0.198
A3	0.306	0.266	0.468	0.354	0.306	0.266
B1	0.274	0.174	0.375	0.151	0.274	0.174
B2	0.278	0.188	0.386	0.177	0.278	0.188
B3	0.276	0.216	0.381	0.233	0.276	0.216
D1	0.280	0.230	0.392	0.265	0.280	0.230
D2	0.308	0.268	0.474	0.359	0.308	0.268
D3	0.306	0.266	0.468	0.354	0.306	0.266
E1	0.362	0.392	0.655	0.768	0.362	0.392
E2	0.292	0.302	0.426	0.456	0.292	0.302
E3	0.246	0.276	0.303	0.381	0.246	0.276
B2B	0.192	0.048	0.184	0.012	0.192	-0.048
B2C	0.162	0.028	0.131	0.004	0.162	-0.028
B2E	0.146	0.066	0.107	0.022	0.146	0.066

budget and the other executive limitations following the optimization and selecting the best strategy of the establishment of e-commerce using by planning the ideal.

• Expanded model in the level of indicators and understanding the operation infrastructures of each indicators.

• Model designed to prioritize the effective factors in the establishment of e-commerce based on experts systems.

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