

Review Paper

Identifying and prioritizing c-commerce infrastructures in the mining industry and trade of Mazandaran Province

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Abstract

This investigation was carried out to determine and prioritize the main infrastructures of collaborative commerce in industry and mine organization of Mazandaran province. Cooperative commerce is a new issue in domestic studies and was begun by identifying the main infrastructure of cooperative commerce construct. Then main indices of evaluating organization fitness for each infrastructure were determined using Delphi method. The components of cooperative commerce and the indices were offered in the context of a hierarchical analysis model. In the next step, a questionnaire was prepared for gap analysis. Content reliability method was used for assessing questionnaire reliability. Chronbach's alpha coefficient was calculated as 0.756 in a preliminary study consisting of 15 questionnaires. The validity of the investigation was, therefore, assessed as suitable. Statistical society in the first step where Delphi method was used and through hierarchical analysis was composed of expert panel. In the gap analysis between current and desired circumstances, the employees of industry and mine organization of Mazandaran made the statistical society. Among these, 240 persons were selected as statistical sample. Data analysis was carried out using SPSS software's. The findings were as below:

The main infrastructures of collaborative commerce were: technical factors, external environment, organizational fitness and information sharing culture. Technical aspect, external environment, information sharing culture and innovation had the highest to lowest priority respectively. The main assessment indices for each infrastructure are: innovative human resource, tendency to change, optimized application of personal competence, presenting and applying new methods, high competitive pressure, technological growth in task field, top management back up, hard ware facilities, software facilities, reliance, information distribution, comprehensive communication, infrastructure of communication network, the history of information technology system, and information technology maturation.

The results of gap analysis indicated difference between current and desired condition of organization fitness for accepting collaborative commerce. For information sharing culture and organizational fitness, the organization is in a good condition for collaborative commerce lay out. In other cases, there was a gap which was significant for environmental, innovational and technical aspects.

Keywords: collaborative commerce, electronic commerce, Knowledge management

1. Introduction

Considering global competition in new era, organizations have to perform their activities beyond geographical boundaries, make their business interactions in collaborative manner and launch cooperative plans and activities.

These kinds of activities are not only carried out in inter-organization level but also in inter-continental level. Indeed, while the organizations do their work independently they have to accomplish some activities in collaboration with other organizations. This kind of collaborative activities, mainly carried out through internet virtual area, is called c-commerce* (chen 2000).

Collaborative stems from electronic commerce concepts. Electronic commerce is powerful movement having created many fundamental changes in human life. It is a conspicuous sign of revolution of communication and information technology in economics. Due to its great advantages and profits for human life, electronic commerce is growing very quickly. It is an

indispensable fact that electronic commerce has eliminated many limitations of traditional commerce and made substantial changes in both appearance and content of business activities, the changes that constitute the basis of any idea and activity in the field of economy (naghshineh 1386).

C-commerce fortifies the relationship between suppliers and customers. Many companies have tried to exploit IT-based systems to create commercial societies and markets (li 2011). With fast progress of business environment and globalization process, commercial firms should meet the new condition. To meet global competition properly, each organization has to share information with other firms and organizations. C-commerce is an appropriate strategy for organization success in today competitive environment (roud rigers 2002)

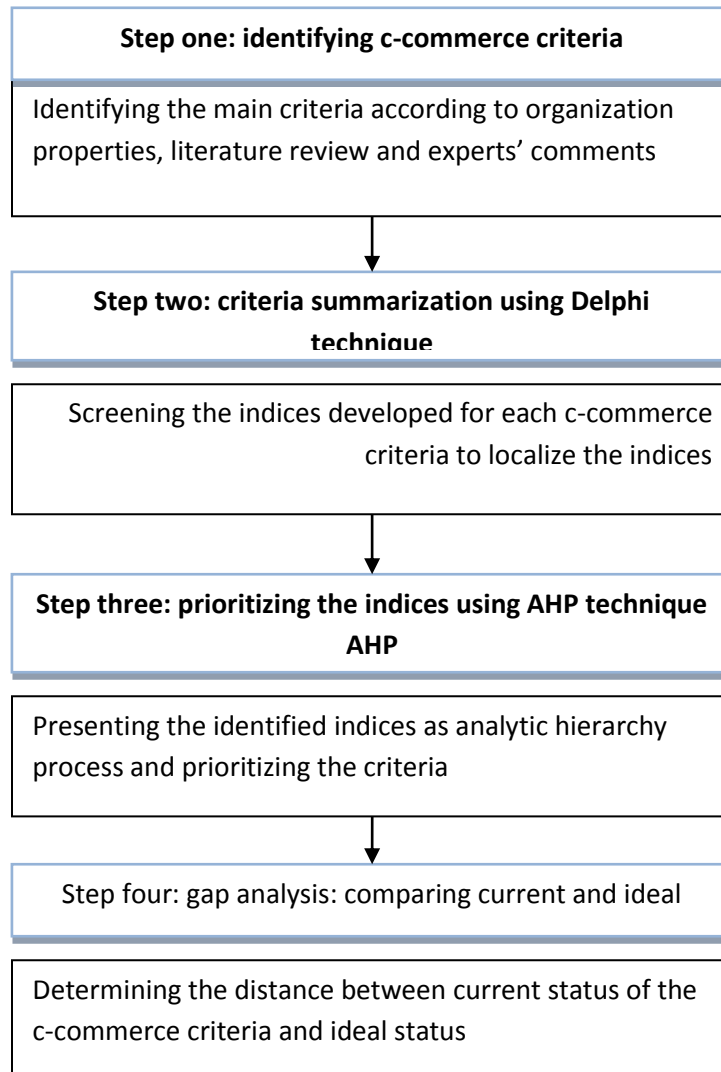
Another concept sometimes used along with c-commerce is CPRF meaning collaborative planning, replacing and forecasting. In response to change of costumers' habit, old products should be replaced by new ones meaning that organization is encountered with a long list of new products which should be manufactured.

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2. Styles

Methodology of the investigation



Data gathering tool and method

Two library and field methods were used for data gathering in this study. Library method was used for literature review and field method was used for gathering data to reject or accept investigational hypotheses.

Questionnaire was used for data gathering. Questionnaire is a widely used tool for data gathering in survey investigations and includes a collection of purposeful questions assessing a person's attitude, vision and idea by different scales (hafez nia 1388).

Questionnaire 1 was Delphi questionnaire used for final screening and grouping of main criteria indices.

Questionnaire 2 is an expert questionnaire for Prioritizing main criteria and indices of c-commerce using analytic hierarchy

process (AHP) technique. This questionnaire was prepared based on Saati 9 point scale.

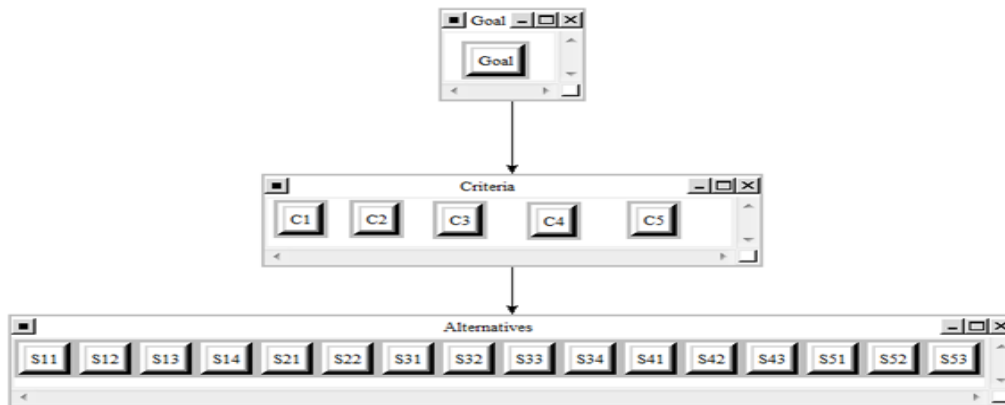
Questionnaire 3 was prepared for gap analysis based on likert 5 point scale.

3. Statistical methods

To describe and investigate general properties of the respondents, methods of descriptive statistics such as frequency distribution table, frequency percentage, accumulative frequency percentage and mean were used. T-test and single-factor analysis of variance were used to test the investigation hypotheses. Data analysis was performed using Super decision and SPSS software.

Prioritizing elements of the model using AHP technique Analytic hierarchy process (AHP) technique was used in this study the weights of criteria and indices of the model.

Hierarchical pattern of the model in Super decision software



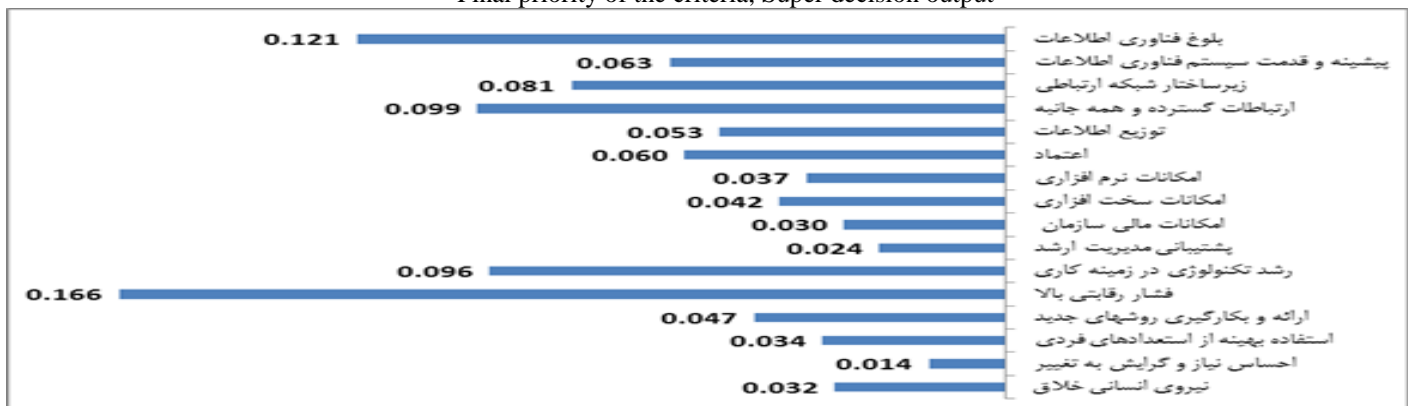
Prioritizing the main criteria according to the goal
To perform analytic hierarchy process, the main criteria were compared in pairwise. The comments of ten experts were used

and special vector was calculated by geometrical mean and normalization of the resulted values.

Prioritizing the main infrastructures of c-commerce

| Special vector | technical dimension | Information sharing | Organization readiness | External environment | innovation | |
|----------------|---------------------|---------------------|------------------------|----------------------|------------|------------------------|
| 0.127 | 0.287 | 0.355 | 3.325 | 0.391 | 1.000 | innovation |
| 0.262 | 3.147 | 1.738 | 0.355 | 1.000 | 2.552 | External environment |
| 0.133 | 0.395 | 0.500 | 1.000 | 2.817 | 0.301 | Organization readiness |
| 0.212 | 0.535 | 1.000 | 1.999 | 0.575 | 2.817 | Information sharing |
| 0.265 | 1.000 | 1.871 | 2.531 | 0.318 | 3.483 | technical dimension |

Final priority of the criteria, Super decision output



Final weight of any index of the model is calculated using AHP technique. Based on this, high competitive pressure with normalized weight of 0.166 is conspicuously the main factor in adopting e-commerce approach. IT maturity weighting 0.121 is also an important factor rated the second place.

4. Figures

Statistical population and sampling

In the first step, Delphi technique was used. There is disagreement on the composition and volume of Delphi panel, but it is generally recommended to use a composition of persons of different skills and it is generally accepted that heterogeneous groups are better than homogenous ones (pavel 2003). A combination of persons with different skills was used in the present study. Hogart (1978) believes that six to twelve members is ideal for Delphi technique and according to keliton (1997) five to ten persons is sufficient when a combination of persons with different skills is used (samvil 2008). A combination of 10 experts was used in the present study. Then, AHP technique was applied. According to Saati (2002) a group of 10 persons is sufficient in studies conducted based on pairwise comparison. Moreover, Riza and Vazilis (1988) suggested the number of experts should be five to fifteen, emphasizing that the number of interviewed experts should not be too high. As a result, 10 experts were used in the second phase of the investigation. To enhance accuracy of the results, the questionnaires were distributed among experts who were chosen through internet search for scientific publications or introduced by other experts. A table describing each dimension and criterion was prepared and attached to the questionnaires. Since the criteria were too long, the questionnaires were completed by interviewing. Personnel of industry, mining and trading organization of Mazandaran were used as statistical population in the gap analysis step. There are different formulas for determining

sample size. Cochran formula is widely used for determining sample size, which is as below:

$$n = 217.491 \sim 218$$

According to calculations, 228 persons were selected as the sample. For further confidence, 250 questionnaires were randomly distributed among sample population and 240 applicable questionnaires were received.

To describe general properties of the respondents, indices of descriptive statistics were used. Frequency of the respondents was assessed based on gender, age, education level and work experience, and related graphs were drawn.

- Gender: 176 persons equal to more than 70% of the respondents were male. 64 persons equal to 26.7% were female.

- Age: four respondents were younger than 20 years. 44 persons were between 20 to 30 years old. The highest frequency was related to 30-40 years class being composed of 116 persons which constitutes more than 48% of the total respondents. 50 individuals were between 40-50 years and 26 persons were older than 50.

- Education level: only 8 individuals had diploma or lower educational grade constituting 3.3 % of the sample volume. The highest frequency relates to graduate degree including 134 persons which constitutes 55% of the sample volume. Individuals having post graduate or higher degree are 32 persons which constitutes less than 15% of the sample volume

- Work experience: 30 persons (12.5%) had work experience lower than three years. 54 persons or 12.5 % had work experience between 3-5 years. 74 persons or 30 % had work experience between 5 to 10 years. 78 persons had work experience more than 10 years. Four persons did not answer to this question.

Results of one sample t-test

| Confidence distance 95% | | Significance value | mean | value | hypotheses |
|-------------------------|-------------|--------------------|-------|--------|------------------------|
| Upper limit | Lower limit | | | | |
| 0.768 | 0.586 | 0.000 | 3.677 | 14.616 | innovation |
| 0.324 | 0.093 | 0.000 | 3.208 | 3.559 | External environment |
| 0.903 | 0.747 | 0.000 | 3.825 | 20.927 | Organization readiness |
| 1.144 | 0.984 | 0.000 | 4.064 | 26.109 | Sharing culture |
| 0.241 | 0.025 | 0.016 | 3.133 | 2.430 | Technical dimension |

Mean value in all the cases was higher than 3 which is the middle of Likert scale. But conclusion based on mean is not a reliable statistical approach. So population mean test was used. Significance value in all case but technical dimension was 0 which is lower than critical value (0.05). in the case of technical dimension this value was 0.016 which is again lower than zero. Null hypothesis is therefore rejected in all the cases. Moreover, upper and lower limits of confidence interval were in all cases higher than zero (positive) and investigation hypotheses were therefore accepted. So it can be expressed with 95 % confidence that:

- 1- Innovation dimension has influence on performing c-commerce in industry, mining and trading organization of Mazandaran.
- 2- Environment has influence on performing c-commerce in industry, mining and trading organization of Mazandaran.
- 3- Organizational readiness has influence on performing c-commerce in industry, mining and trading organization of Mazandaran.

- 4- Sharing culture has influence on performing c-commerce in industry, mining and trading organization of Mazandaran.
- 5- Technical dimension has influence on performing c-commerce in industry, mining and trading organization of Mazandaran.

Hypothesis test using pairwise t-test

Pairwise (dependent)t-test was used to investigate the gap between current and ideal status in each dimension of performing commerce in industry, mining and trading organization of Mazandaran. Using this test, gap between expectation and cognition about each dimension of the investigation was evaluated. In this test, H0 claims that there is no difference between experts' expectations and cognitions on investigated dimensions. Alternative hypothesis (H1) claims that the difference between experts' expectations and cognitions is significant.

Results of pairwise t-test

| Significance of the difference | Significance value | Existing status | Ideal status | hypothesis |
|--------------------------------|--------------------|-----------------|--------------|--------------------------|
| ✓ | 0.000 | 3.677 | 4.140 | Innovation |
| ✓ | 0.000 | 3.208 | 3.538 | Environment |
| × | 0.125 | 3.825 | 4.052 | Organizational readiness |
| × | 0.138 | 4.064 | 4.133 | Sharing culture |
| ✓ | 0.000 | 3.133 | 4.225 | Technical dimension |

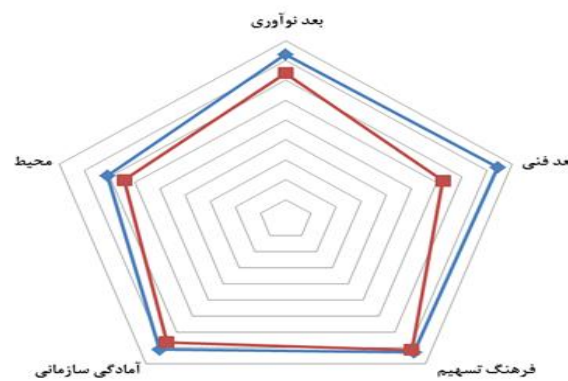
According to pairwise t-test results presented in 16-4 and observed significance value ($p < 0.05$) it can be claimed that:

- There is significant difference between ideal and existing status of the factors affecting c-commerce lay out concerning innovation dimension. It means that according to experts' vision, there is significant distance between organizational readiness for performing c commerce and ideal status concerning innovation dimension.
- There is significant difference between ideal and existing status of external environment for performing ccommerce.in other word, the experts believe that external condition is not in such a way that forces the organization to perform c-commerce.
- There is no significant difference between ideal and existing status of organizational readiness for performing c-commerce,

meaning that readiness of the organization is not significantly distant from ideal status for performing c-commerce.

- There is no significant difference between ideal and existing status of sharing culture for performing c-commerce.
- There is significant difference between ideal and existing status of technical dimension for performing c- commerce. According to observed mean value, technical properties and infrastructures necessary for performing commerce are not in a good situation.
- The difference between current and ideal status of organizational readiness for adopting c-commerce is presented as a radar graph. As can be seen from the graph, sharing culture and organizational readiness dimensions are close to ideal status for performing collaborative commerce. In the rest of the cases, a significant gap is observed in environment, innovation and technical dimensions.

Radar graph of difference between current and ideal status of c-commerce infrastructures.



Discussion and conclusion

Results of the present study can be divided in to two general groups: the first group includes findings about general properties of the respondents and the second is composed of information achieved by raw data gathered about hypotheses.

The main infrastructures of exploiting c-commerce are: technical factors, innovation, external environment, organizational readiness and information sharing culture. Among these, technical dimension possessing normalized weight as 0.265 possesses the highest priority. External environment with normalized weight as 0.262 occupies the second priority. Information sharing having normalized weight as 0.212 is placed in the third place. Organizational readiness having normalized weight as 0.215 occupies the fourth place and innovation possessing normalized weight of 0.127 has the lowest priority. Delphi technique was used for screening and determining final indices. Based on this, the main indices

for assessing each infrastructure include: creative human force, need and tendency to change, optimized application of individual competence, offering and applying new methods, high competitive pressure, technological growth in the task field, top management support, organization financial resources, hardware facilities, software facilities, reliance, information distribution, wide and multi-aspect communication, infrastructure of communication network, background of IT technology, IT maturity. Indices weights were calculated using AHP technique. Based on this, high competitive pressure with normalized weight as 0.166 is conspicuously the main determinant for applying c-commerce approach. IT maturity having normalized weight of 0.121 is also an important factor which is placed in the second position. Wide communication and technological growth are also important factor having considerable importance compared to other factors. Tendency to change and top management support are factors of low importance.

Before gap analysis, data normality test was performed. Data normality was confirmed by both Kolmogorov- Simonov and Shapiro-wilk tests in which no reason for rejection null

hypothesis was obtained. Based on one sample t-test, all the hypotheses are confirmed.

Results of gap analysis indicated the difference between current and ideal status concerning organizational readiness for exploiting c-commerce. Information sharing culture and organizational readiness are close to ideal status. In the case of innovational, environmental and technical dimensions, the gap is significant.

Acknowledgements

Our results are presented as applied suggestions to both academic persons and the organization in which the study was carried out.

Applied suggestions to industry, mining and trading organization of Mazandaran

1- Our results showed that technical dimension is effective in applying c-commerce in industry, mining and trading organization of Mazandaran.

Moreover, technical dimension has the highest priority for c-commerce lay out. The organization should, therefore, pay much attention to communication network infrastructure, background and maturity of IT systems.

Background of IT system is not a quickly accessible item. More over the gap between current and ideal status of technical dimension is significant. According to the results, technical properties and infrastructures necessary for c-commerce lay out are not in a good situation. As a conclusion, the organization should improve the technical dimension.

2- Criteria of organizational readiness for exploiting c-commerce include: top management support, organization financial resources, and software and hardware facilities. These indices are in a good situation and there is no significant difference between current and ideal status of organization readiness to apply c-commerce. in other words, according to exports' attitude, there is no significant difference between organizational readiness and that should be. It is an advantage for the

organization, but readiness dimension is placed in the fourth place of prioritization.

3- External environment is another dimension affecting c-commerce lay out in industry, mining and trading organization of Mazandaran. Concerning importance, external environment weight is similar to that of technical dimension. External environment refers to high competitive pressure and technological growth. According to the experts, external environment necessitates exploitation of c-commerce. The organization should design an appropriate strategy for c-commerce application in which all of these components are described and used as marketing guidelines: analysis of situation, identifying target market, marketing purposes, marketing strategy, marketing tactics, market forecasting, execution and control.

Suggestions to other investigators

1- A valid and reliable measure for evaluating c-commerce infrastructures was proposed in this article. Other investigators can use this measure to evaluate relation between organizational performance and c-commerce in this organization or other ones.

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2- In this study, the gap between current and ideal status of c-commerce infrastructures was investigated in a single firm with an applied vision. Other investigators can assess these relations in a given industry such as petrochemical with a basic vision to evaluate the proposed model in industry level and develop it as a tool for future studies.

3- We tried in this investigation to identify and analyze all indices and dimensions of c-commerce. However, regarding very few field studies conducted on the subject especially in Iran, other investigators can improve the proposed model by increasing their investigation range and by identification and modification in the factors and items.

4- As shown by Brogan and Armstrong, c-commerce success is not solely achieved by providing necessary infrastructures, rather knowledge plays important role to achieve this goal. It is recommended to other investigators to conduct an investigation about the relation between c-commerce and knowledge management.

These and the Reference headings are in bold but have no numbers. Text below continues as normal.

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