

A perceptual study on the constraints in adoption of e-commerce practices among the farmers of composite Coimbatore.

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Abstract— Despite the fact, that agriculture is the largest livelihood provider in our country, the small farmers gains are not enough compared to the efforts put in and agriculture cost inputs which can affect the agricultural productivity and food security of the nation. The development of e-commerce in agriculture is of course strictly linked with the adoption of the Internet by, mainly, the farmers. Reports show that farmers are slightly behind the general population in adoption. The intention of this study is to develop a measuring scale to capture the perception of the farmers on e-commerce practices and to reduce the identified variables into a limited number of factors. It was found using Cronbach alpha that the scale developed was reliable. The identified variables were effectively reduced to two major factors, viz.; Benefits and Constraint in e-agriculture. The deployment of ANOVA for the study brings out that there is a significant difference in the perception concerning adoption of E Commerce based on education background of farmers, farming experience on selected variables. The one way analysis of variance reiterates that there is a significant difference in the perception concerning constraints in adoption of e-commerce based on education background of farmers based on the variables 'Infrastructure' and 'Cost of implementation' . It was also found that there is a significant difference in the perception concerning constraints in adoption of e-commerce based on education background of farmers based on only variable 'Benefits'.

I. INTRODUCTION

A. Agriculture is our livelihood

Agriculture, with its allied sectors, is unquestionably the largest livelihood provider in India, more so in the vast rural areas. The agriculture sector in India is currently passing through a difficult phase. Agriculture is the largest livelihood provider in rural India. In spite of this, the small farmers gains are not enough compared to the efforts put in and agriculture cost inputs; this can affect the agricultural productivity and food security of the nation. India has 127 different agro climatic zones, immense biodiversity and natural resources. In the agriculture sector, constant application of latest ideas and better technologies is essential to enhance economic well being of the farmer. The bane of Indian agriculture is not lack of technology, R&D efforts; it is inadequacy and inefficiencies in the dissemination of relevant information to the farming

sector¹. The Vision 2020 document of the Department of Agriculture and Co-operation envisages that "the tools of ICT will provide networking of Agriculture Sector not only in the country but also globally. The Center and State Government Departments will have reservoir of databases. And it will also "bring farmers, researchers, scientists and administrators together by establishing "Agriculture Online" through exchange of ideas and information².

B. Need and Importance of the study

As the Internet continues to become more popular among people who deal with agricultural businesses of any type, e-commerce finds further applications in agriculture. A few of the benefits of e-commerce in agriculture include market and price transparency, reduction or elimination of transaction costs and the like. Online access to product and price information allows comparison of products and increases price transparency. Price differentials resulting from geographic location can diminish because of increased competition. This may benefit farmers with regard to input prices but may reduce the prices received for their products. This may be particularly true where many existing products are not differentiated, are required on a regular basis, and where there is a heavy reliance on input supplier expertise in choice of product. With the application of e-commerce, many transactions through the supply chain are either eliminated or simplified. In this way, transaction costs are drastically reduced or even eliminated. Numerous applications have been developed by different interest groups. Applications in the marketplace can be categorized from a farmer's viewpoint, including services, outputs, and factors of production and inputs. Services, inputs, and production factors are generally purchased via the Internet at a fixed price, whereas outputs are generally traded through an auction. This is perhaps because many of the outputs are perishable and therefore the market price is more sensitive to supply and demand. The development of e-commerce in agriculture is of course strictly linked with the adoption of the Internet by, mainly, the farmers. Reports show that farmers are slightly behind the general population in adoption. Since our economy is largely agriculture based, the role of ICT is vital for its accelerated

¹ Enos, L. 2000, Report: B2B still driving e-commerce, E-Commerce-Times, December.

² Kenny D., and J.F. Marshall, 2000, Contextual marketing, Harvard Business Review, November-December.

and an efficient growth. This situation calls for a perceptual study on the e-commerce practice among the farmers.

C. Statement of the problem

A major setback of Agriculture industry is its failure to plan production according to market requirements. In fact it is this difference between other industries and agriculture which puts it in a disadvantageous position. Market oriented production surely will improve the lots of the farmers in India. Elina Eskola who conducted a study on Agricultural Marketing and supply chain Management in Tanzania is of the opinion that the farmers should be educated to produce according the market requirements. Therefore he suggests, that "Training in business skills could facilitate that farmers in coning more market oriented and changing production patterns to follow the market requirements in order to materialize larger profits from agricultural production and further education in innovative farming and marketing skills are indeed in high demand among the farmers." So in this juncture, it is felt by the researcher to know the perception of the farming community on e-commerce. Among the districts in the State of Tamil Nadu, Coimbatore – Erode – Tirupur called the "Kongu Triangle" has always witnessed the progressive farmers with entrepreneurial spirits. In this way, the researcher's curiosity increased to know more about the perception of the farmers on e-commerce practices. The researcher has chosen the composite Coimbatore comprising of Coimbatore and Tirupur for the study.

II. RELATED WORK

LITERATURE REVIEW

John Davis and Adel.I El-Ansary³ in their article argued that despite the noticeable gains in agricultural productivity in the last decade, people are still dying from starvation and malnutrition. While part of the problem is inadequate food supplies at the national level, nutrition problems relate to physical and economic access to food. The key to improving access to food for the rural and urban poor consumers in developing countries lies in reforming the food distribution or marketing system. The objective of this paper is to define food marketing system parameters, delineate the imperatives of marketing system reform, and recommend actionable managerial strategies for their reform.

Fred Davis and Richard Bagozzi⁴ has depicted that Technology Acceptance Model (TAM) is one of the most

influential extensions in the literature. The TAM was developed by Fred Davis and Richard Bagozzi (Davis 1989, Bagozzi & Warshaw 1992). TAM has strong behavioural elements, assume that when someone forms an intention to act, that they will be free to act without limitation. In the real world there will be many constraints, such as limited freedom to act (Bagozzi & Warshaw 1992). Bagozzi, Davis and Warshaw say that because new technologies such as personal computers are complex and an element of uncertainty exists in the minds of decision makers with respect to the successful adoption of them, people form attitudes and intentions toward trying to learn to use the new technology prior to initiating efforts directed at using. Attitudes towards usage and intentions to use may be ill-formed or lacking in conviction or else may occur only after preliminary strivings to learn to use the technology evolve. Thus, actual usage may not be a direct or immediate consequence of such attitudes and intentions. (Bagozzi & Warshaw 1992).

The Technology Acceptance Model (TAM) is an information systems theory that models how users come to accept and use a technology. The model suggests that when users are presented with a new technology, a number of factors influence their decision about how and when they will use it, notably:

Perceived usefulness (PU) - This was defined by Fred Davis as "the degree to which a person believes that using a particular system would enhance his or her job performance".

Perceived ease-of-use (PEOU) - Davis defined this as "the degree to which a person believes that using a particular system would be free from effort" (Davis 1989).

Bartholomew Aleke, Udechukwu Ojiako, David W. Wainwright, (2011)⁵ critically examine how social augmented parameters impact on the effective adoption of information and communication technology (ICT) by small-scale agribusinesses operating in Southeast Nigeria. The relevance of incorporating social imperatives in scholarship focused on technology adoption is due to its role in sustaining the process of adoption and diffusion. Data were gathered from a focus group made up of 27 agribusiness proprietors affiliated with a state cooperative based in the south-eastern Nigerian state of Ebonyi. The outcome of this study highlights important issues for ICT adoption. One particular area that must be taken into consideration is the adoption channel. Perceptions of ICT adoption will differ significantly among adopters. For this reason, the need for developing an appropriate adoption channel that ensures successful diffusion of the innovation should be recognised.

III. OBJECTIVES & RESEARCH METHODOLOGY

³ John Davis, Some food marketing policy implications of European enlargement, European Journal of Marketing, Vol. 21, Issue 7, 1987, pp.18-27.

⁴ Davis, Fred; Bagozzi, R. P.; Warshaw, P. R. (1992), "Development and test of a theory of technological learning and usage.", Human Relations 45(7): 660–686.

⁵ Bartholomew Aleke, Udechukwu Ojiako, David W. Wainwright, "ICT adoption in developing countries perspectives from small-scale agribusiness" Journal of Enterprise Information Management, 2011. Vol24, Iss:1, pp. 66-84.

A. Objectives

- To determine the reliability of the scale developed to capture the perception of farmers regarding the benefits and constraints in usage of Internet information.
- To summarize the data into a limited number of components.
- To determine the perception concerning constraints in adoption of e- commerce with respect to education and farming experience

B. Research Methodology

Research Design

Survey method has been followed in the research process; samples, data collection and analysis are done with the help of survey method as applicable for the study.

Pilot study and Pre- testing

A preliminary investigation is undertaken by contacting 50 farmers in the study area. Convenient random sampling method is applied. The purpose of the pilot study is to test the quality of the items in the questionnaire and to confirm the feasibility of the study.

Sampling Design

The sample chosen for the study covers the farmers of different segments of Coimbatore and Tirupur districts. A double stage sampling was applied. In the first stage, 64 villages from composite Coimbatore were selected using simple random sampling method. A total of 640 farmers were selected on convenient sampling method from whom the responses were collected using a structured questionnaire.

Out of the sample size of 640, only 518 of the questionnaire forms are returned in a completed form and found usable. One hundred and twenty two questionnaire forms were incomplete and found unusable. The response rate was 80.9 %.

Period of the study

Primary data for the purpose of this research study were collected for a period of one year from 2009-2010. The secondary data relating to agriculture development through e-commerce were collected for a period of 10 years from 2000 to 2011.

Area of the study

The area chosen for the present study is Coimbatore and Tirupur District (Composite Coimbatore) in the state of Tamil Nadu. Now, Tirupur has been officially announced as a separate District. Hence, the two districts Coimbatore and Tirupur together is called Composite Coimbatore by the Department of Statistics.

Data Collection

The study is based on both primary data and secondary data. The secondary data were collected from the

books and research articles published in leading journals. Also literature from magazines, publications of Tamil Nadu Agricultural University, Department of Agriculture and publication of records on the AGMARKNET website by DEMIC Cell of TNAU were also used for the background knowledge for this research.

The data was collected from farmers of Coimbatore and Tirupur Districts. The data were collected for the present study by means of a well-framed questionnaire. The first part of the questionnaire is framed to obtain the general information and profile of the farmers and the second part consisted of questions surveying the perception of e-commerce benefits for farmers.

Statistical Tools Used

The data collected from both the sources are scrutinized, edited and tabulated. The data was entered in Microsoft – Excel Spread sheet and transported to SPSS package for further analysis. Sample means, standard deviation and N were calculated and presented for all the variables of the study. Cronbach alpha was calculated to check the reliability of the scale developed to capture the perception of the farmers. To reduce the variables to a limited number of components, exploratory factor analysis was used.

IV. LIMITATIONS IN THE STUDY

- 1) A. This study encompassed the respondents from Composite Coimbatore District only.
- 2) Time constraint have imposed major limitations to the study and forced to restrict the respondents within a stipulated time.
- 3) The information provided by the respondents was purely based on their perception only. The quality and reliability of the data collected were the actual expression of respondents.
- 4) The present study concentrated only on the application of e-commerce in agricultural marketing.

V. ANALYSIS

Objective 1: To determine the reliability of the scale developed to capture the perception of farmers regarding the benefits and constraints in usage of Internet information

The researcher has calculated Cronbach alpha to study this objective and to determine the reliability of the scale developed to capture the perception of farmers regarding the benefits and constraints in usage of Internet information.

Table No.1: Showing the results of Reliability Statistics	
Cronbach's Alpha	N of Items

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Cronbach's Alpha	N of Items
.824	16

The reliability statistic, that is, Cronbach Alpha score of 0.824 ensures the model fitness.

Table No. 2: Showing the results of KMO and Bartlett's

Kaiser-Meyer-Olkin Measure of Sampling		.917*
Bartlett's Test of Sphericity	Approx. Chi-	4227.458
	df	120
	Sig.	.000

The Kaiser – Meyer – Olkin Measure is 0.917 which confirms that the sample is adequate and can proceed for factor analysis. Further Bartlett’s test of sphericity is also significant since p value is less than the error level of 0.05 and further confirms to proceed for factor analysis.

Table No. 3 : Rotated Component Matrix^a

	Component		
	1	2	3
Logistics	.827	.333	.348
Advertising	.826	.371	.395
Coordination	.818	.316	.333
Improve_Collb_Supplier	.817	.357	.369
Customer_support	.808	.337	.358
Improve_collb_farmer	.794	.319	.358
Benefits	.324	.871	.242
Cost_implementation	.288	.870	.208
Obstacles	.331	.859	.241
Infrastructure	.197	.856	.244

Lack_trust_epayments	.390	.834	.199
Buying_selling	.188	.188	.851
Provide_information	.370	.234	.848
Improve_recruitment	.429	.273	.835
Labour_training	.391	.236	.814
Decision_making	.397	.276	.801

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

The results of Factor Loading using Rotated Component Matrix depicted in table number 3 reinforce the reliability of the scale used to capture the perception of farmers. The total variance of the 3 components is above 80 % and all the variables are adequately represented. Loading has occurred as given below.

Factor 1 : Advertising, Logistics, Collaboration with suppliers, farmers and customer support

Factor 2 : Benefits, Cost implementation, obstacles, Infrastructure, Lack of trust

Factor 3 : Buying- Selling, Provide Information, Improve recruitment, Labour training and Decision making.

Factor 1 and 3 were clubbed together and named as “Benefits of e-agriculture” and Factor 2 was named as “Constraints in e-agriculture” based on the scree plot.

Objective 3 : To determine the perception concerning constraints in adoption of E- commerce in respect of education and farming experience, the researcher has performed One Way Analysis of Variance. Based on the objective it is hypothesized as follows:

H₀: There is no significant difference in the perception concerning adoption of E Commerce based on education background of farmers.

H₁: There is a significant difference in the perception concerning adoption of E Commerce based on education background of farmers.

Table No. 4: Showing the Oneway ANOVA results across Education and Perception

Variables		df	Mean Square	F	Sig.
Buying and selling	Between Groups	4	7.172	6.344	.000
	Within Groups	513	1.131		
	Total	517			
Provide	Between Groups	4	10.508	9.217	.000

information	Within Groups	513	1.140		
	Total	517			
Decision making	Between Groups	4	8.549	7.685	.000
	Within Groups	513	1.112		
	Total	517			
Improve recruitment	Between Groups	4	3.569	2.897	.022
	Within Groups	513	1.232		
	Total	517			
Labour training	Between Groups	4	7.662	5.893	.000
	Within Groups	513	1.300		
	Total	517			
Customer support	Between Groups	4	9.550	8.929	.000
	Within Groups	513	1.069		
	Total	517			
Improve collaboration with supplier	Between Groups	4	4.935	4.548	.001
	Within Groups	513	1.085		
	Total	517			
Improve collaboration with farmer	Between Groups	4	9.253	8.660	.000
	Within Groups	513	1.068		
	Total	517			
Coordination	Between Groups	4	7.390	6.603	.000
	Within Groups	513	1.119		
	Total	517			
Advertising	Between Groups	4	9.950	9.976	.000
	Within Groups	513	.997		
	Total	517			
Logistics	Between Groups	4	6.673	6.207	.000

	Within Groups	513	1.075		
	Total	517			

The results from the Table no. 4 reveals that all the variables listed have significant F values at 0.05 level and hence the null hypothesis, H_0 is rejected and the alternate hypothesis, that is, there is a significant difference in the perception concerning adoption of e-commerce based on education background of farmers.

Based on the set objective, it is hypothesized as follows:

H_0 : There is no significant difference in the perception concerning adoption of E Commerce based on farming experience of farmers.

H_1 : There is a significant difference in the perception concerning adoption of E Commerce based on farming experience of farmers.

Table No. 5 : Showing the One-way ANOVA results across Experience and Perception

Variables		df	Mean Square	F	Sig.
Buying and selling	Between Groups	4	3.524	3.041	.017
	Within Groups	513	1.159		
	Total	517			
Provide information	Between Groups	4	4.810	4.061	.003
	Within Groups	513	1.184		
	Total	517			
Decision making	Between Groups	4	.893	.762	.550
	Within Groups	513	1.172		
	Total	517			
Improve recruitment	Between Groups	4	1.384	1.108	.352
	Within Groups	513	1.249		
	Total	517			

Labour training	Between Groups	4	1.670	1.240	.293
	Within Groups	513	1.347		
	Total	517			
Customer support	Between Groups	4	1.795	1.589	.176
	Within Groups	513	1.130		
	Total	517			
Improve collaboration with supplier	Between Groups	4	1.749	1.576	.179
	Within Groups	513	1.110		
	Total	517			
Improve collaboration with farmer	Between Groups	4	4.145	3.740	.005
	Within Groups	513	1.108		
	Total	517			
Coordination	Between Groups	4	2.926	2.536	.039
	Within Groups	513	1.154		
	Total	517			
Advertising	Between Groups	4	.924	.865	.485
	Within Groups	513	1.068		
	Total	517			
Logistics	Between Groups	4	2.754	2.491	.042
	Within Groups	513	1.106		
	Total	517			

It is evident from the table that, the variables ‘Buying and selling’, ‘Provide information’, ‘Improve collaboration with farmer’, ‘Coordination’, and ‘Logistics’ are significant at 0.05 level and therefore H₁ is accepted and for the rest of the variables H₀ is failed to be rejected.

Based on the objective the researcher has hypothesized as follows:

H₀: There is no significant difference in the perception concerning constraints in adoption of E Commerce based on farming experience of farmers.

H₁: There is a significant difference in the perception concerning constraints in adoption of E Commerce based on education background of farmers.

Table No. 6: Showing the Oneway ANOVA results across Experience and Constraints

Variables		df	F	Sig.
Infrastructure	Between Groups	4	2.648	.033
	Within Groups	513		
	Total	517		
Cost of implementation	Between Groups	4	2.698	.030
	Within Groups	513		
	Total	517		
Obstacles	Between Groups	4	.688	.600
	Within Groups	513		
	Total	517		
Benefits	Between Groups	4	.574	.682
	Within Groups	513		
	Total	517		
Lack of trust	Between Groups	4	1.480	.207
	Within Groups	513		
	Total	517		

From this table no. 6, it is found that the variables ‘Infrastructure’ and ‘Cost of implementation’ are significant and therefore H₁ is accepted for the same. For the other variables H₀ is failed to be rejected.

Based on the objective the researcher has hypothesized as follows:

H₀: There is no significant difference in the perception concerning constraints in adoption of E Commerce based on education background of farmers.

H₁: There is a significant difference in the perception concerning constraints in adoption of E Commerce based on education background of farmers.

Table No.7: Showing the One-way ANOVA results across Education and Constraints

Variables		df	F	Sig.
Infrastructure	Between Groups	4	1.122	.345
	Within Groups	513		
	Total	517		
Cost implementation	Between Groups	4	1.841	.120
	Within Groups	513		
	Total	517		
Obstacles	Between Groups	4	.458	.766
	Within Groups	513		
	Total	517		
Benefits	Between Groups	4	2.594	.036
	Within Groups	513		
	Total	517		
Lack of trust	Between Groups	4	1.022	.395
	Within Groups	513		
	Total	517		

The above table clearly reveals that the only variable 'Benefits' alone is significant and hence the alternate hypothesis, there is a significant difference in the perception concerning constraints in adoption of e-commerce based on education background of farmers is accepted. The remaining variables have secured insignificant results and hence for those variables H0 is accepted.

VI. RESULTS

The summary of the major findings is presented in this section.

- The Cronbach Alpha score of 0.824 ensures the measurement scale developed to capture the perception of farmers on the benefits and constraints is reliable.
- The deployment of ANOVA for the study brings out that there is a significant difference in the perception concerning adoption of E Commerce based on education background of farmers.
- Based on ANOVA it is found that there is a significant difference in the perception

concerning adoption of e-commerce based on farming experience of farmers as far as the variables 'Buying and selling', 'Provide information', 'Improve collaboration with farmer', 'Coordination', and 'Logistics' are concerned.

- The ANOVA performed for the study reiterates that there is a significant difference in the perception concerning constraints in adoption of e-commerce based on education background of farmers based on the variables 'Infrastructure' and 'Cost of implementation'.
- Through ANOVA it is evident that there is a significant difference in the perception concerning constraints in adoption of e-commerce based on education background of farmers based on only variable 'Benefits'.

VI. FUTURE DIRECTIONS OF THE STUDY

A number of suggestions in respect of the limitations identified in this study are cited here with the fond hope that future researchers would address these issues more concretely. They are as follows:

- The scale used in this study to capture the perception of farmers concerning the e-commerce adoption strategies, though tested for reliability, future research is required to validate the scale if it is to be used in different sectors and other segments.
- The studies in future, incorporating the following aspects and questions would be of immense value to the stakeholders.
- Decision Support Systems (DSS), Management Information Systems (MIS), Internet, Precision Farming, Process Control and Production Models.

1. What are the factors limiting the use of ICT by farmers?
2. What are the factors limiting the use of ICT by Extension working with farmers?
4. What are the consequences for farmers not using ICT: Today and in the near Future
5. What are the consequences for Extension not using ICT: Today and in the near Future:

VII. CONCLUSION

The results obtained through these analyses have thrown intriguing insights in several fronts. This is the first of its kind in India, in terms of using Internet Adoption, which still is a complex issue for application in farming practices in India, to say the least. Hence this study is unique and proposes practical implications for agricultural sector which is in dire need of technology up gradation and application at all levels to

face the global crisis in terms of production and distribution of this scarce resource. The results through this study will help to understand that farmers' perceptions and activities can be initiated to improve the usage of internet to this end and tide over several loose ends in modern farming practices. Union Ministers for Agriculture and Information Technology, and Chairman, Planning Commission, Government of India, have to be appraised of the results obtained through such studies, so that a National Policy for Agricultural Information Technology is adopted and implemented at the earliest. Otherwise such studies will have very little impact on the Agricultural ICT issues in India and other developing countries.

Author's Profile



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