



B2B E-Commerce Adoption Framework in Agriculture: Evidences from the Case Study Ofnam

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Abstract

E-commerce is well known global success phenomenon and it is also gaining popularity in Indian Agriculture sector in the form of B2B e-commerce. The initiatives come as a savior to the highly fragmented and inefficient supply chain of the Indian agriculture sector. The B2B E-commerce provides more sale options to farmers, increase direct access to markets, reduce intermediation costs and promote common procedures, scientific storage and quality grading within a better supply chain. The National Agriculture Market (NAM) platform is a major initiative of the Indian government in this sector. To realize the benefits of B2B E-commerce, the high adoption is a pre-requisite. The Author has highlighted the adoption framework for the B2B e-commerce in Indian Agriculture sector. The explicit factors/variables and the implicit constructs (Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions, Behavioural Intention, Trust, and Cost) of the adoption framework relevant to the Indian agriculture sector are specified via empirical study. The positive relationship between the variable factors to the adoption and intention to adopt is highlighted using univariate statistical analysis of data gathered via the opinion survey. The survey of NAM users provides us with their opinion of influence, relationships, and suggestion for improvement in adoption. The Author expects framework shall help us understand the online behavior of adopters and help bring more and more participants to such useful platform leading to liquidity and eventual success of B2B e-commerce effort in the agriculture sector.

Keywords: Adoption Framework, Agriculture, B2B E-commerce, B2B E-commerce Adoption, National Agriculture Market, NAM, India.

Introduction

The agriculture sector is economically and socially vital to India. It contributes 19% of the GDP, feeds a billion people and employs 66% of the workforce. The GDP of agriculture & allied sectors in India was recorded at USD244.74 billion in FY16 and it is the primary source of livelihood for about 58 percent of India's population (IBEF, 2017). According to the latest India census data, the country has more than 270 million persons employed in the agriculture sector - about 50% of its workforce.

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As a B2B commerce, agricultural commodities are sold through oral auctions for hundreds of years (Banerji and Meenakshi, 2004). In an effort to improve efficiency, oral auctions are now being shifted to a B2B E-commerce format (a major success phenomenon globally) in India.

The purpose of this initiative is to disseminate farming knowledge, provide timely price information, eliminate intermediaries, and transform the agricultural supply chains that support the livelihood of billions of people around the world (Banker et al., 2013).

On one hand, the B2B e-commerce marketplaces are more transparent and competitive than physical markets, conditions that should attract more consumers and thus increase demand for produce in India (Verma & Chaudhuri, 2008). But on the other hand, it has also increased the bargaining power of farmers via opening access to a wider range of buyers. Consequently, farmers obtain a better price when they sell the produce on the digital platform rather than at the farm-field through the few regional agents (Banker et al., 2011).

The B2B e-commerce, is a relatively new activity for the agricultural industry in India. It is affecting organizational strategy, processes, customer relationship, information technology, and business culture of this sector. In addition, it is also changing the marketing, distribution and the economics.

While reason and the benefits are evident, B2B e-commerce adoption in the Indian agriculture sector still faces technology and collaboration barriers. Now, there is an urgent need to understand the adoption of B2B e-commerce in the Indian agriculture sector so that meaningful and actionable recommendations can be drawn from government, participants, business owners and policymakers. In this research, the adoption is described as a business engagement in an online exchange relationship with producers/sellers on the internet.

The Researcher has taken note of a study suggesting, that an idea (e.g. B2B e-commerce in Agriculture) may be novel and has the features of solving the issue at hand, but testing it in a given geography and value chain for the adoption can save a lot of financial and other resources (Ganguly et al., 2017).

Thus, the Researcher believes that the better understanding of determining factors of adoption highlighted via adoption framework shall help companies and policymakers, make suitable strategy and improve management. Doing it early in the life-cycle shall result in success and requisite benefits reaching participants. In addition, it helps the service providers take actions/decisions necessary for increased liquidity (use, volume) required for the very survival of agriculture sector B2B e-marketplace e.g. NAM.

The National Agriculture Market (NAM) is a pan-India digital trading platform started by the Ministry of Agriculture & Farmers' Welfare, Government of India. The NAM Portal is the largest such service in India and provides a single window for all state-regulated Agricultural Produce Marketing Committee (APMC) market-related information and e-commerce services. As of February 2017, 850 thousand participants (including 88 thousandtraders, 44 thousand commission agents) have registered on this e-marketplace portal. So far, 3113 thousand tonnes of agriculture produce worth INR 61300 million has been transacted on this e-marketplace platform (MAFW, 2017).

The Researcher uses the NAM to highlight the determinant factors involved in the adoption of B2B e-commerce in Indian Agriculture sector and use the NAM participant's survey data (analysis) to validate the adoption framework.

Objective of the Research

The primary purpose of this research study is to highlight the adoption framework for the B2B e-commerce in Indian Agriculture sector.

The factors relevant to the Indian agriculture sector are specified via empirical study. The determinant factors are validated using survey data analysis from the case study of Indian Government sponsored B2B Agriculture e-commerce platform “National Agriculture Market” (NAM).

Significance

The B2B e-commerce, in agricultural commodities, is a relatively new activity in India (Verma and Chaudhuri, 2008). Due to lack of data, there is insignificant research on the agriculture B2B e-commerce in India. The Researcher has analyzed the relatively new phenomenon in India.

The proposed adoption framework shall fill the gap for a theoretical framework required for B2B Agriculture e-commerce adoption. The Researcher takes the challenge to understand one of the important phenomena with respect to Agriculture marketing. In addition, it is among very few case studies of the Indian government-sponsored National Agriculture Market (NAM). The findings may help improve the adoption of NAM and diffuse its intended benefits. These benefits include farmers get more options for selling produce, farmers get competitive returns/price, traders get access to the larger national market for secondary trading and companies/buyers/exporters get reduced intermediation cost via direct participation in the local trade.

The agribusiness e-commerce also has much in common with other industry e-commerce e.g. use of the same information technologies, traders pursue their individual interests, and, there is an inverse relationship between supply and demand curves (Clasen and Mueller, 2006). Thus the Researcher believes that the findings of this research shall be also of interest for other industries.

Research Methodology

To figure out research design and research value, the author performed the systematic literature review (Afzal et al., 2009) of approximately sixty research journal articles and conference papers. The guidelines are as per explained in two leading articles on the topic (Biolchini 2005; Kitchenham, 2007). Out of this, the possible factors affecting B2B e-commerce adoption and theoretical framework are identified.

The validation of determinant factors in the framework is done via the survey of NAM participants using a Likert scale based questionnaire response. The multiple questions cover respondent opinions on the factors identified during our secondary research. The Likert scale has options of 1 to 5, where 1 means “Negligible” and 5 means “To an extreme extent” on B2B e-commerce adoption.

The trial questionnaire is pre-tested on 5 respondents (include 1 researcher, 1 professor, 1 industry professionals, 2 users) for suitability, language or editorial correction. In the APMC market of Meerut district (UP State, India), the simple random sampling without replacement (SRSWOR) is used to select the survey response participants. The sampling unit is an actual participant (farmer, trader, buyer, agents) trading on NAM or APMC regulated agriculture market of Meerut. As of now, there are 6000 farmers and 735 traders listed on the NAM system in Meerut APMC. Out of this list, 50 participants were at random picked from this list and approached for questionnaire (in the Hindi language) response. Being an actual participant in a market, respondent is expected to have an opinion.

The Data is collected in the month of November 2017 for a period of 4 days. The survey questionnaire results are entered in SPSS version 20 for descriptive statistics. The univariate analysis is used to get better insights into the conceptualized research variables.

Literature Review

B2B E-commerce and Indian Agriculture Sector

The agriculture supply chain in India is highly fragmented and inefficient. A study of fruit & vegetable supply chain in four metros (Delhi, Mumbai, Bangalore, and Kolkata) revealed that, on an average, there are 5 to 6 intermediaries in the supply chain (Global Agri System Consulting, 2010). Due to the high number of intermediaries, the total markup in the chain is approximately 60-75%, thus the primary producers receive only 20-25% of the end consumer price. The involvement of multiple intermediaries also resulted in huge wastage of 15-25% of the value (Patnaik, 2011; Kaur, 2014).

On top of this, the information inefficiency is high, which relates to product availability at source/market and demand patterns. The most popular reason given is that, the agriculture trade markets in India are dispersed across the country with little coordination, full of trader cartels and works in offline nature.

Given the above scenario, the B2B e-commerce marketplace is seen as the savior. These B2B e-commerce marketplaces (e.g. NAM) comes with relatively low-cost digital-trading and enhance transaction cost efficiency. The improvement is seen in the performance of purchasing rights which are at the right price, delivered at the right time, of the right quality and the right quantity from the right source (Smart and Harrison, 2003; Shirzad and Bell, 2013).

The Indian government's national policy on ICT in agricultural extension also supports a market-oriented policy framework to promote commercialization and diversification using ICT. But, it has to gel with the practical realities on the ground, e.g. complex interactions between the players, the role of tacit knowledge, the high impact of social actors, bad power and internet conditions (in rural India) and low IT literacy level in the agriculture sector (Kaur, 2014).

The earlier studies, focused mainly on defining the concept of electronic marketing and to describe potential applications to agriculture markets, including a gain in pricing efficiency (Henderson, 1984). A study of MarketMaker (a USA government-sponsored electronic trade platform for agriculture) estimated that participants had received an average of 2.6 new marketing contacts and gained an average of 1.5 new customers. In addition, registered farmers increased their annual sales by an average of \$121 (Zapata et al., 2011).

One key insight from the case study of MarketMaker, relevant from India's point of view, is that the e-trading leaders should encourage other participants to become more active to achieve the desired benefits. The reason is that the benefits associated with e-trading marketplace tend to become higher as users become more familiar with the functioning of the website (Zapata et al., 2013). Off-course, for success liquidity is a pre-requisite necessitating the increasing number of farmers registering and using the e-marketplace website. Given this, the peer persuasion and media advertisement are desirable features of e-marketplace.

An analysis of e-marketplace, agriculture.com with a number of hits per day as success criterion, revealed that low transaction costs, national and local language content, number of product categories, trading in agricultural machinery, and age of the e-marketplace are all positively significantly correlated with success (Clasen and Mueller, 2006).

The Indian literature, quotes the main reason for the success of the agriculture B2B e-commerce marketplace have been the involvement of local farmers and maintenance of the rural IT network by the corporate entity (Chahal, 2012). In addition, the participants are willing to pay more for a higher level of trust provided by a neutral, third-party host provider (Vassalos, 2014). Given this, roping in a third party for implementation, support and technical operations by NAM, is a right step.

In the Indian context, a successful e-platform in India shall provide instructions to farmers about how to get the best possible benefits out of B2B e-commerce. Such B2B e-commerce platform, along with e-trading shall also provide information related to marketing, best practices, weather forecast and rural development programme (Waghmare and Rahane, 2011).

Along with success factors come the barriers to success. The three significant barriers are: Change in Industry structure, product complexity and high touch nature of transactions in agriculture (Leroux et al., 2001). The adoption barriers can lower by a combination of strategies based on; structure of the industry (3rd party marketplaces, strategic alliances, niche players, virtual supply channels), market and product expertise (market knowledge, product expertise, risk profile) and organizational development (learning and training, human touch and knowledge acquisition) (Leroux et al., 2001).

B2B E-commerce Success Stories in India

Initially, on agricultural related websites in India, e-commerce implementation was scarce. This led to early findings that the Indian agriculture has not fully used the potential of ICT and it is restricted only to information side and not to the agricultural product side (Dsouza, 2014).

The earlier success stories are found in the private sector for corporate use, e.g. ITC e-choupal deployed IT technology to make use of the physical transmission capabilities of current intermediaries (aggregation, logistics, counter-party risk and bridge financing) while disintermediating them from the chain of information flow and market signals (ITC, 2017). It is operational in 35000 villages of 10 states using 6100 kiosks and involves 4 million farmers growing 6 crops. The e-Choupal system benefits include a higher profit margin on farmer's crops and access to information that improves the productivity (Verma and Chaudhuri, 2008).

Another noteworthy mention is that of eKutir Global, an online and mobile-based platform to connect small farmers with other value chain stakeholders such as soil-testing labs, suppliers of seeds and fertilizers, banks, exporters, food-processing units, and branded retailers. Most of these and other initiatives, are concentrated in a small area of the country and probably lose steam over time.

Major initiative that overcomes all barriers are commodity exchanges, e.g. National Commodity & Derivatives Exchange Ltd (NCDEX) or National Multi Commodity exchange (NMCE). The commodity exchange deals in up-stream secondary trading where only the trader deals in commodities derivatives (Datta & Sarkar, 2015) with no involvement of farmers.

The limited success of e-commerce has heralded a new era in the Indian agro-sector. Now this work needs to be carried forward and replicated in the other untapped sub-areas (Chahal et al., 2012). Though smaller and narrow focus initiatives (Akashganga, Drishtee, TTK etc.) in the agriculture sector are in existence for decades in India, the pan India-comprehensive-large sized B2B E-commerce platform was the need of the hour. This need for a B2B e-marketplace at the downstream of agriculture supply chain is met by the NAM. The NAM has become the de-facto alternate on-line digital trading platform for agricultural commodities in India.

National Agriculture Market (NAM)

The fragmentation of markets, multiple handling of agro-produce, multiple market charges all end up escalating the prices for the consumers without commensurate benefit to the farmer. To address these challenges and to meet the need of the hour (as mentioned in earlier sections), the Government of India approved a scheme for deployment of a unified B2B e-commerce platform "National Agriculture Market" (NAM, Figure 1). It is being implemented in 585 large and regulated wholesale agriculture markets (at state and national level) by March 2018 out of 2,477 APMC market-yards 4,843 APMC-regulated sub-market yards.

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NAM is the flagship scheme of utmost importance since more than 50% of India's population is employed in the Agriculture sector. The scheme is operationalized by Small Farmers' Agribusiness Consortium (SFAC), with a budget allocation of INR 2000 million; out of which a maximum of INR 7.5 million is earmarked for each of the markets.

NAM is a "virtual" B2B marketplace with a physical market (aka "Mandi") at the back end. The transaction process activities (e.g. registration of farmers/ traders/buyers/agents, lot details at the entry, weighment, quality check, auctions/trade transactions, payments) are online in digital form, while actual material logistics is via the physical market. In any market, the select agricultural commodities are traded completely online on e-NAM.

NAM is implemented based on the success of the Unified Market Platform (UMP) in Karnataka, where farmers saw an average realization increase of 38 percent in 2015-16 over 2013-14 (NITI Aayog, 2017). A study covering impact assessment of e-tendering of agricultural commodities in Karnataka conducted by the National Institute of Agricultural Marketing, Government of India, reveals that about 83% of stakeholders felt that the operations have become more transparent and time-efficient. So Far, NAM progress is slow but it will fill the infrastructure gaps that arose over six decades but would need the education of farmers and training (Subramanian, 2017).

As per Press Information Bureau, so far, 417 markets from 13 states have been integrated with e-National Agriculture Market (Government of India, 07-April-2017). To facilitate quality grading of agricultural commodities for e-trading, common tradable parameters have been developed for 25 commodities incl. wheat, maize, pulses, oilseeds, potatoes, onions, and spices, etc. (DACFW, 2016). Globally, several commodities have converged to a single internet trading platform (Wheatley and Buhr, 2005) and NAM formation is the similar example.

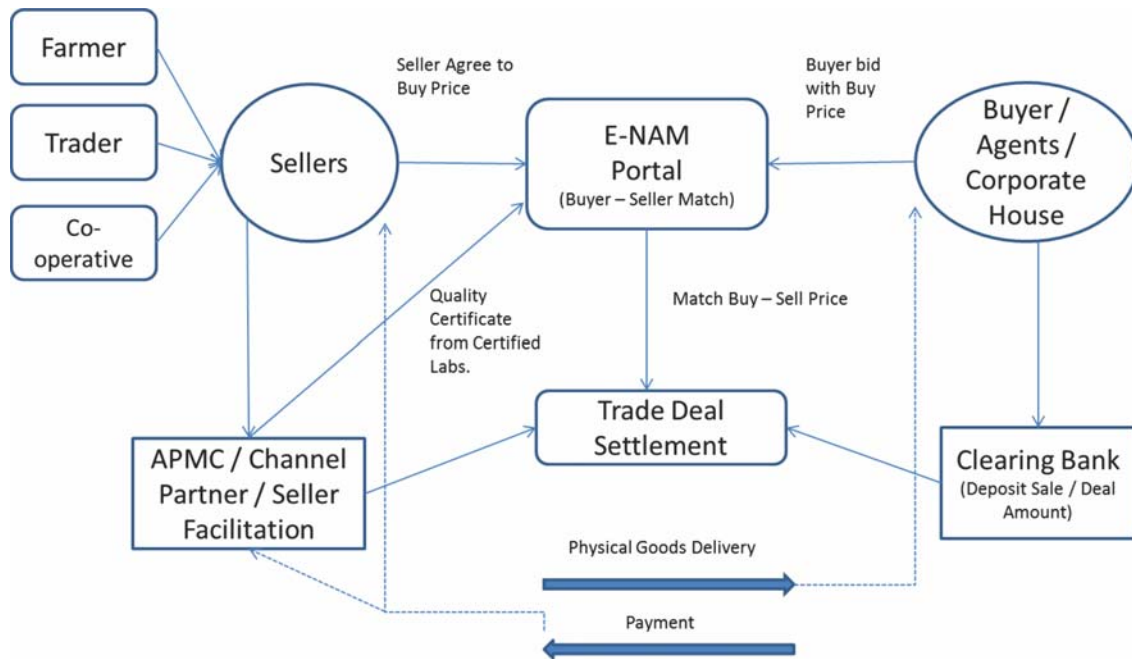


Figure 1: e-NAM Outline (Government of India, 2017)

The NAM initiative is aimed to take India's agricultural marketing system to a higher level. This initiative will prove to be a game changer for India's farmers and agriculture sector if it is implemented in true spirit (Chand, 2016). As of now, NAM is pushed by the government as a mandatory activity.

Indian farmers and other farmers have leveraged technology to achieve higher and sustainable agricultural growth and hopefully, they will make use of NAM initiative. For all this, the high adoption of NAM is a pre-requisite.

Adoption Framework Selection

To get the better understanding of adoption, the Author reviewed the empirical research on e-commerce/technology adoption theories and frameworks. In a search of online research database "PRO-QUEST" on April 25, 2017, prominently among the search results is the Unified Theory of Acceptance and Use of Technology (UTAUT) with 1000 hits. The UTAUT (Venkatesh et al., 2003) integrates the technology acceptance domain into one theory with 'behavioural intention' and 'actual usage behavior' as main dependent variables.

The UTAUT model is already validated in a cross-cultural study to conclude its robustness to be applied across countries (Oshlyansky et al., 2007). Since its inception in 2011, the UTAUT has emerged as a better choice based on the variance explanation analysis undertaken by several researchers. The UTAUT is able to account for 70 % of the variance (adjusted R2) in usage intention (Venkatesh et al., 2003) that is better than other competing models which explained between 17% and 53% of the variance in user intentions to use the IT system, e.g. TAM2 (53%), TRA (36%), TPB (36 – 47%) and IDT (40%).

The UTAUT is also applicable to both individual and organization subjects. UTAUT is mentioned in a number of research; A study of perceptions of 243 individuals in northern Finland toward mobile services and technology (Koivumäki et al., 2008), A study of social influence of workplace referent groups (superiors, colleagues) on intention to adopt technology in 152 German companies (Eckhardt et al., 2009), the adoption of social media by 409 United States non-profit organizations (Curtis et al., 2010). The theory is also used to explain mobile technologies (Park et al. 2007), mobile learning (Wang et al. 2009), mobile shopping services (Yang 2010), mobile banking (Yu, 2012), mobile stock trading (Tai and Ku, 2013) and location-based services (Zhou 2012). The extended UTAUT is also used in several studies, e.g. the physicians' adoption of robotic-assisted surgery (BenMessaoud, Kharrazi, and MacDorman, 2011), mobile learning in Taiwan (Wang, Wu, and Wang, 2009) and m-banking adoption in India (Deb and David, 2014).

B2B E-commerce Adoption Framework

Based on the literature review and the UTAUT adoption theory mentioned above, we selected the criterion that is appropriate for context under consideration that is "B2B E-commerce in Indian Agriculture Sector". The six factors appeared to be significant direct or indirect determinants of B2B e-commerce adoption in Indian Agriculture Sector. These determining factors are hereby shown in a proposed Framework (Figure 2), which two additional factors in a modified UTAUT framework.

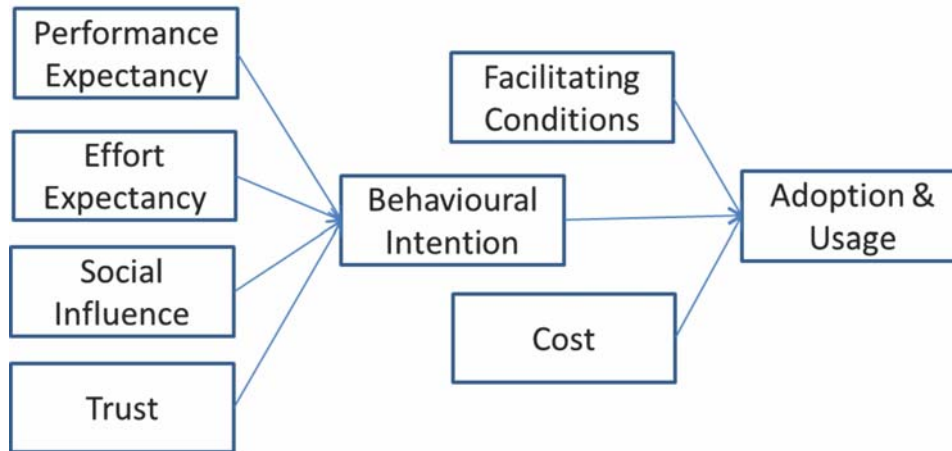


Figure 2: Graphical View of Research Model

The main constructs as per the UTAUT (Venkatesh, 2003) in the framework are:

Performance Expectancy (PE) is defined as the degree to which an individual participant believes that using the B2B e-commerce system will help him or her to attain gains in job performance.

Effort Expectancy (EE) is defined as the degree of ease associated with the use of the B2B e-commerce system.

Social Influence (SI) is defined as the degree to which an Individual participant perceives that how important others believe he or she should use the new B2B e-commerce system.

Facilitating Conditions (FC) is defined as the degree to which an individual participant believes that an organizational and technical infrastructure exists to support the use of the B2B e-commerce system.

Behavioral Intention (BI) is the degree to which an individual has made a conscious plan to perform or not perform a future behavior.

The two new constructs added to the framework are:

Trust embodies the trusted confidence in the trustee's actions. It is also an expectation that the trustee's promise can be relied on and that the trustee will act in the spirit of goodwill. Trust is an important factor in relationships with partial information about counter-party (Hawes et al. 1989), especially in virtual communities (Ridings et al., 2002). The analysis of trust in a virtual community is relevant since it may be the main precursor of consumer participation and a crucial aspect for developing sustainable communities in the long-term (Casalo et al., 2011). The researcher expect that high trust has positive effect on adoption.

Cost (transaction cost) is another major factor. A researcher found that if the government lowers the internet service costs or provides free e-commerce facilities, it can encourage businesses to adopt e-commerce (Solaymani et al., 2012). Another researcher suggests that the higher fees charged to market participants, reduce demand for e-marketplace services, and may reduce utility and chances for success (Clasen and Mueller, 2006). Thus, the researcher expect that high cost has negative effect on adoption.

Analysis

To check, the practical applicability and robustness of the adoption framework an opinion survey is conducted among NAM participants (farmer, trader, official) in the Meerut APMC market.

Out of 50 survey responses, 40 responses were found to be complete and used for data analysis. The internal consistency reliability of each construct is tested via Cronbach's alpha which is 0.65. A score of 0.60 or above is an acceptable value of for empirical research (Hair et al., 2006; George and Mallery, 2011).

The descriptive statistics presented in Table 2 show the values of range, mean, Std. deviation, skewness, and Kurtosis of the constructs. The standard error associated with all the variables being negligible, the observed sample mean values can be interpreted in general. In NAM, the observed mean value of the construct upon relatively more or less significance of that constructs over others. Detailed analysis of observed mean values of framework constructs is described in Table 2.

Table 2: Univariate Statistical Analysis

Construct	Mean	Observed Variables	N	Minimum	Maximum	Mean	Std. Deviation	Skewness	Kurtosis
Performance Expectancy	4.16	Useful in Job	40	3	5	4.38	.540	.016	-.970
		Accomplish Task Quickly	40	3	5	4.15	.700	-.215	-.871
		Help get raise / bonus	40	3	5	3.95	.677	.060	-.708
Effort Expectancy	3.28	Interaction with system is clear and understandable	40	2	5	3.43	1.059	.139	-1.160
		System is easy to use	40	2	5	3.30	.939	.325	-.664
		Learning to operate system is	40	2	5	3.13	.853	.012	-1.088
Facilitating Conditions	3.28	I have the necessary knowledge and resources	40	2	5	2.95	.986	.611	-.782
		System has compatibility issues	40	2	5	3.13	.911	.385	-.617
		Help is available when required	40	2	5	3.78	.862	-.547	-.081
Trust	3.62	Information (valid, credible and	40	2	5	4.03	.920	-.676	-.282
		Trust in Seller	40	2	5	3.58	.781	-.432	-.108
		Trust in Buyer	40	2	5	3.25	.670	.202	.176
Cost	3.41	Transaction cost	40	2	5	3.58	.813	-.255	-.291
		Produce Cost	40	2	5	3.25	.670	.202	.176
Social Influence	4.37	People (Important, Influencer)	40	3	5	4.45	.639	-.737	-.395
		Senior management is helpful	40	3	5	4.23	.480	.608	.106
		Organization support use of	40	3	5	4.43	.636	-.649	-.483

The mean value of "Social Influence" construct (4.37) is relatively high. No wonder, when we asked NAM users and officials at Meerut APMC market, all quoted as the government and senior management pushing the use of NAM as the preliminary reason for adoption in this early stage. Next highest mean value (4.16) is for "Performance Expectancy" construct, given that once a user starts using the digital platform of NAM, they get a quick response and faster process (e.g. electronic payment), which impress them, but also increases their expectations to get personal benefits, which respondent said has not occurred at personal level. Though at the business level, the seller, are realizing better produce prices from traders and buyers, but mean value of "cost" construct (3.41) as well as price realization has a scope of improvement.

The mean value (3.62) of "Trust" construct is also on the relatively high side, given that website Information is accurate and NAM platform is owned by the government and mandatory for

select Agri-commodities. We found that similar observations when the Author spoke to respondents about IFFCO bazaar but when we discussed the other private platform, respondent were either unaware or gave low ratings.

The construct “effort expectancy” and “facilitating conditions” has relatively low mean value (3.28), which was evident by high dependency of user on NAM contract staff, availability of only two labs for sampling and testing, low promotion and training of users (only one promotional event per month at the APMC market level) and high user dependency on authorized market facilitators. The traders are successfully using the NAM mobile applications which need to be highly promoted at farmer level.

Conclusion

Based on the modified UTAUT, this study proposes a comprehensive adoption framework for the B2B e-commerce adoption in Indian Agriculture sector. The univariate statistical analysis gives us a better understanding of the relationship between adoption and framework constructs. The survey analysis shows a positive relationship as all the influencing constructs as the mean value between 3.28 and 4.37 on the scale of 1 to 5. For the explicit variable level also, the relationship is positive as the mean value range between 2.9 and 4.45.

As per the results of an opinion survey conducted in the Meerut APMC market, the NAM project is characterized by high observed values of adoption, intent to adopt and influencing variables. This finding highlighted the need to manage the influencing factors/variables so as to improve both the intent and the actual adoption of NAM.

Looking for specific recommendations of this survey-based research, the quality and amount of information on NAM website and the mobile application shall be improved as the author found some information missing. Also, the main NAM portal response speed was slow given that broadband connectivity is only 1 Mbps and that too is not 100% available. This need to be improved.

In view of significant social influence, the influencers (participants who can affect their peer group) shall be given special attention and promotional offers to be made to early adopters. In our review of Meerut APMC, we found that though there are 6000 farmers and 735 traders registered on the NAM, on average daily only 6 trades are completed (with e-payments) and 30 (without e-payments), thus there is a huge need for awareness promotion, education, and training. The monthly promotional meet (Mela) has to be better advertised and organized fortnightly or monthly at multiple locations.

In addition, looking at resistance to adoption from the trading community, the NAM shall develop partners' expansion plan from the beginning including promotional efforts to improve perceptions of benefits. Also, the technological and financial assistance may be provided to potential participants with low organizational readiness and carefully in-act influence strategies to reduce resistance (Iacovou, 1995).

For trust, the strong authentication shall be used as well as the payment mechanism properly encrypted. Its use in terms of number of e-payment backed transactions percentage need to be improved from the process improvement point of view. Beside rest, the operational and transaction costs on NAM can be further lowered by direct benefit transfer to users as well as direct salary payment to operational staff.

For facilitating conditions, the working hours of quality check labs in NAM mandis may be increased and the government may encourage startups in the vegetable delivery sector to also procure crops from NAM.

Going forward to earn profits, the government shall amend the State Agricultural Produce Marketing Committee Act (APMC) Acts (in tune with the central government model APMC Act 2017) plus ensure physical logistic support to farmers (Yadav & Sharma, 2017) e.g. case study of Meerut APMC shows that as of now logistics is left to traders to handle.

Another, point emanating from literature review is to fasten the interoperability of the central government provided e-trading platform with state e-trading platforms with/without spot-future market integration.

The literature review of the end user grievances, the few other improvements suggested are Geotag existing storage facilities, analyse demand, the supply gap in storage, accredit storage units and establish a dispute resolution mechanism for NAM (none exists as of now), and include timelines to existing implementation progress tab to monitor milestones in Mandi integration (DARPG, 2017).

The officials have to ensure that markets do not get cornered gain by speculators or cartels that drive prices up or down (the author found that role of APMC market “Secretary” and “market inspector” is paramount in this criterion).

Limitations

The research study suggests that it is quite possible that framework variables may be influencing the intent and actual adoption of B2B E-commerce in Indian Agriculture sector. The framework and linkage (between constructs) hypotheses can be tested further based on a detailed study across more APMC markets and a larger survey of more NAM users/participants.

In fact, the Structural Equation Modelling may be used on a larger dataset of responses, to establish the influencing plus direct-indirect relationship in the adoption framework. The framework can be further tested for applicability on different Industries or organizational characteristic perspective. The B2B E-commerce adoption framework fit will be also improved with a larger survey dataset and a better mix of respondents.

The study is cross-sectional since it measured perceptions and intentions at a single point in time. However, perceptions may change over time with experience (Venkatesh & Davis, 2000; O'Neill, 2003), thus a longitudinal study may add some more insights on causality and interrelationships. The effect of mediating context variables (Respondent Type) is not analyzed in the present study, but it is further explored in the future study.

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