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# Factors Affecting Behaviour Intentions in the Adoption of Mobile Applications for Agricultural Risk Management

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## ABSTRACT

The aim of this study is to examine at farmer adoption of agricultural-related mobile apps by finding variables that signal a desire to use mobile apps for agrarian data. The unified theory of acceptance and use of technology UTAUT2 model was utilized in this study. The sample frame includes the farmers using mobile application. The study's participants were selected by systematic random selection from western Uttar Pradesh. A total of 350 responses were collected, with 33 responses being deleted owing to missing or ineligible entries, for a total of 317 respondents in the final sample. A regression analysis was also performed to test the linear relationship between different constructs of UTAUT2 model. The results reveal that farmers' behavioural intentions to use a mobile application for agricultural risk management were positively influenced by effort expectancy and performance expectancy while hedonic Motivation, social influence, facilitating conditions, and habit do not affect farmer's behavioural intention. The present study provides valuable insight for the policymakers, researchers, and program implementing agencies to address the problems related to mobile applications in rural areas. Because most farmers in rural regions are illiterate, the agricultural extension agency must encourage data collection by using mobile application.

***Key words*:** Risk management, Mobile applications, Adoption, Behaviour intentions

Globally, agriculture faces new and severe challenges ranging from globalization and food market integration to climate change. Climate change is responsible for around a third of worldwide crop output variability in important crops such as maize, rice, and wheat [1], and the impact of increased variability of extreme climate events can also be seen on agricultural economies of India [2]. Food price rises have forced around 40 million people into poverty since 2010, demanding efficient agricultural programmes [3]. The world's population is growing rapidly, with the world's population anticipated to reach 9 billion by 2050, increasing demand for food and putting a pressure on finite resources. To feed this large population, food production will have to expand by 70% [4]. To attain adequate food production and create sustainable agriculture, farmers and associated stakeholders move towards Information and Communication Technologies (ICTs) [5-8].

ICTs (Information and Communication Technologies) are a broad word that includes computer hardware and software, digital broadcasting, and various sources of information that can be offline or online, as well as other communications technologies [9]; hence ICTs are a set of services, applications, instruments, hardware and soft wares that helps in the quicker way of communication. It also can improve the user's life and use ICTs in various sectors such as agriculture, transportation, public, private, education are few names [10]. The term e-agriculture, also associated with Information and Communication Technologies (ICTs), aims to ameliorate agricultural and rural development with appropriate dispersal of information and communication processes. The usage of ICTs in agricultural development includes activities from decision support systems to trading farmers' produce. Availability of right, timely information and its appropriate utilization is indispensable for farmers [11].

Information and Communication Technologies (ICTs) also facilitate agricultural risk management. For instance, according to a study conducted in Sri Lanka, cost information assists farmers in making decisions ranging from plantation to wholesale market production and can account for up to 11% of total production costs. A finding also includes asymmetry in information and one of the vital contributors to the overall cost of the transaction [12]. Mobile phones, the Internet, and smartphones are the latest in a long line of technologies (the television, telegraph, telephone, radio, and newspaper), networked computers that help support risk management strategies by distributing, acquiring, processing, and sharing information [13]. Pre-planting (information on inputs of agriculture such as seed, weather, fertilizer, pesticide, credit, soil testing), pre-harvesting (good farming practices, pest management, harvesting time and techniques, packaging), post-

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harvesting (market information, postharvest management, grading and standardization, logistics, storage) and market information are all things that farmers need to know about the crop cycle and market (Consumer behaviour ,Alternative market channels, Wholesale market price information, Commodity prices) [14]. The agribusiness of India behemoth ITC and its e-Chaupal service provide an excellent example of how ICTs may be used in agriculture. This service provides information on market pricing, expert guidance, pest management, and weather conditions to 4 million farmers. ITC earns money by collecting commodities and selling agricultural inputs to farmers through its information service kiosks [15].

It is evident from the study in Uganda where the Grameen Foundation detected the banana disease, and it's spreading nearby. Help was needed to take appropriate action to prevent the infectious plant they owned. As a result, the relationship between agricultural consulting services and risk reduction is essential, as knowledge alone is insufficient for risk management [16]. Reuters Market Light can also share agricultural data. Thompson Reuters Information Company owns and develops it, and it offers highly specific and professional knowledge to the Indian farming community. It operates in 13 Indian states in 8 local languages, covering 250 crops, 3000 weather locations, and 1000 markets [17]. The delivery of information is received through farmers' mobile phones in text messages, and the subscription of RML can be taken from local shops, banks, post offices, and input suppliers. There is a need to perform empirical studies regarding the determination of the quantitative relationship amid the availability of information and risk mitigation implications. For instance, a Sri Lankan study concluded that timely information might prevent around 40% of post-production losses [18].

Climate change has an impact on farmers' ability to cope with uncertainty. Farmers use a variety of adaptation measures to reduce the negative effects of climate change, including crop insurance, agricultural diversification, advance savings, crop sharing, and changing sowing time and variety [19-22]. Similarly, ICTs assist farmers in managing with agricultural risks in a timely and efficient manner. People in their social groups, such as local farmers and agricultural experts, work hard to reduce the adverse impacts of climate change. Importantly, Mittal [23] claimed that anticipated hazards in the agriculture industry can be reduced if farmers are informed and have the capacity to use ICTs exclusively. Furthermore, Venkatesh *et al*. [24] stated that various ICT tools may aid in the advance preparedness and identification of hazards encountered by farmers in diverse places.

## MATERIALS AND METHODS

The questionnaire was adapted from the literature. The construct identified from the literature includes Performance expectancy, Effort Expectancy, Social influence, Habit, Facilitating conditions, Hedonic Motivation, and behavioural intention from the literature survey. The measuring items for our research model's constructs, derived from earlier investigations, have been shown in appendix. A total of 26 measurement items were rigorously developed for agricultural field data collection utilizing a mobile application, based on prior studies. Each variable was rated on a five-point Likert scale, with 1 indicating "strongly disagree" and 5 indicating "strongly agree." The area selected for the study is the western region of Uttar Pradesh because it is the area highest productivity in Uttar Pradesh [25]. he study is based on primary data sources, and the respondents of the survey are farmers; the data was collected from July 2021 to December 2021. The questionnaire was divided into two parts and was designed to meet the study's objectives. The first section consisted of questions on the farmers' socio-demographic characteristics. The responses to the factors indicated in our conceptual model are included in the second section. There are 30 districts in the western region of Uttar Pradesh (District wise development indicators 2019, UPDATES). The list of districts in the sample was selected using systematic sampling. The first district was selected randomly, and every 6$^{th}$ district at a fixed interval from the first selected district was included in the sample. Seventy respondents were personally interviewed from each district, taking a total sample size of 350. After the data collection process, a data cleaning exercise was carried out to identify missing entries and either ineligible or ambiguous responses. In the final editing, 33 responses were deleted; thus, the final sample size is 317. The data was analyzed by SPSS. With the help of the following equation:

$$Y = a + bx_1 + x_2 + x_3 + x4 + x_5 + x_6$$

Where;
Y= Behavioural intention,
a = Constant
b = Slope
$x_1$ = Performance expectancy
$x_2$ = Effort expectancy
$x_3$ = Social influence
$x_4$ = Facilitating conditions
$x_5$ = Hedonic motivation
$x_6$ = Habit

## RESULTS AND DISCUSSION

The (Table 1) shows the characteristics of the farmers who took part in this research. Males made up the majority of the responders (75.32%). Most of the respondents (56.8%) were between the ages of 35 and 45, and their education levels were mostly up to high school (58.86%). The bulk of those polled (30.69%) have been using cell phones for 6-10 years.

Table 1 Socio-demographic profile

| Characteristics | Number | Percent |
|---|---|---|
| Gender | | |
| Male | 238 | 75.32 |
| Female | 78 | 24.68 |
| Marital status | | |
| Married | 279 | 88.29 |
| Unmarried | 37 | 11.71 |
| Age group | | |
| <25 | 20 | 6.32 |
| 25-35 | 72 | 22.78 |
| 35-45 | 112 | 35.44 |
| 45-55 | 96 | 30.37 |
| >55 | 16 | 5.06 |
| Educational level | | |
| Illiterate | 29 | 9.18 |
| Up to high school | 186 | 58.86 |
| Intermediate | 88 | 27.85 |
| Graduate | 13 | 4.11 |
| Post Graduate | - | - |
| Years of using mobile | | |
| <2 | 48 | 15.18 |
| 2-4 | 68 | 21.51 |
| 4-6 | 97 | 30.69 |
| 6-10 | 88 | 27.84 |
| >10 | 15 | 4.74 |

Table 2 Regression analysis

| Constructs | Behavioural intention | | | Decision | Impact? |
|---|---|---|---|---|---|
| | Beta | t-value | P-value | | |
| Performance expectancy | 0.412 | 54.019 | 0.000 | $H_{01}$: Rejected | Yes |
| Effort expectancy | 0.281 | 13.996 | 0.000 | $H_{02}$: Rejected | Yes |
| Social influence | 0.021 | 1.103 | 0.351 | $H_{03}$: Supported | No |
| Facilitating conditions | 0.004 | 1.003 | 0.201 | $H_{04}$: Supported | No |
| Hedonic Motivation | 0.104 | 1.542 | 0.198 | $H_{05}$: Supported | No |
| Habit | 0.091 | 1.011 | 0.125 | $H_{06}$: Supported | No |

R: 0.581
R-square: 0.337
Constant: 1.349
F- value: 24.674 (0.000*)

The (Table 2) shows the regression analysis. The value of R square is 0.337, which means that the independent variables explain 33% of the variability in the dependent variable. R-value is 0.581, and the P-value is 0.000, which means the model is statistically significant. The standardized beta value of performance expectancy and behaviour intention is 0.412, and the P-value is less than 0.05; hence, a substantial association between performance expectancy and behaviour intention may be inferred. Behaviour Intention will rise by 0.413 units for every unit increase in performance expectation [26]. Ho1 is rejected at a 5% level of significance since the P-value is less than 0.05. Similarly, the standardized beta value for the relationship between effort expectation and behaviour intention is 0.281; the P-value is less than 0.05, implying that effort expectancy influences behaviour intention considerably. An increase in effort anticipation by unit 1 results in a 0.282 rise in behaviour intention. Ho2 is rejected at a 5% level of significance since the P-value is less than 0.05. The relationship between social influence and behaviour intention has a standard beta value of 0.021 and a P-value greater than 0.05, indicating that social influence has no meaningful impact on behaviour intention. A one-unit increase in social influence raises Behaviour Intention by 0.021 units [27]. Ho3 is accepted at a 5% level of significance since the P-value is greater than 0.05Similarly, the standard beta value for the association between facilitating conditions and behavioural intention is 0.004, and the p-value is larger than 0.05, suggesting that the facilitating condition has no influence on behavioural intention [28]. A one-unit increase in the enabling condition leads to a 0.005 unit rise in behaviour intention. Because the P-value is larger than 0.05, Ho4 is accepted at a 5% level of significance. Hedonic motivation and behavioural intention have a standard beta value of 0.104 and a P-value larger than 0.05, suggesting that hedonic desire has no significant influence on behavioural intention. A one-unit increase in social influence equals a 0.021-unit increase in behavioural intention. Because the P-value is larger than 0.05, H05 is accepted at a 5% level of significance [29]. The standardized beta value of habit is 0.091 and the P-value is larger than 0.05, indicating that it has no influence on behavioural intention. A one-unit increase in social influence corresponds to a 0.021-unit increase in behavioural intention. H06 is accepted at a 5% level of significance since the P-value is larger than 0.05 [30].

## CONCLUSION

Mobile applications have started to transform Indian agriculture by providing the free flow of information to farmers about newer and better production techniques, agricultural management, commodity prices, agricultural marketing, and agricultural risk management. The present study tests a model to understand the farmer's behavioural intention and satisfaction regarding using the mobile application for agricultural risk management. The results reveal that farmers' behavioural intentions to use a mobile application for agricultural risk management were positively influenced by performance expectancy and effort expectancy while social influence, facilitating conditions, hedonic Motivation and habit do not affect farmer's behavioural intention. Agricultural departments must also assure that using mobile applications for agrarian data collecting provides farmers with practical benefits Given that performance expectancy has a substantial impact on farmers' decision to use a mobile application, agricultural department officials make sure that using a mobile application for collecting data in agriculture gives farmers with practical benefits. Offering area-specific expert assistance or response based on data acquired by the app, which might which might aid management decisions of farmers to increase output of agriculture, could be an example of an applied practical advantage of employing mobile apps for data providing. Furthermore, the impact of effort expectations on farmers' intentions to embrace mobile applications demonstrates the need for application developers to provide user-friendly mobile applications, which will also be beneficial to improve on the part of service providers to improve the farmer's interface for making mobile applications convenient. It should be necessary for the mobile application developers to reach the users timely and accurately. Moreover, the developers need to look after mobile applications' reliability, ease of use, and responsiveness. The present study provides valuable insight for the policymakers, researchers, and program implementing agencies to address the problems related to mobile applications in rural areas. Because most farmers in rural regions are illiterate, the agricultural extension agency must encourage data collection by using mobile application. It is witnessed that there is an ample number of agricultural applications such as e-Nam, Kisan Suvidha, Kheti-Badi, Agri-Market, which requires farmer friendly interface. Although the most significant factors influencing technology adoption differ by region, testing the reliability of the model with farmers from other states would be beneficial both conceptually and practically. Additionally, this study was designed to evaluate an application-based data-gathering technique in the context of western Uttar Pradesh; caution should be exercised when extrapolating to other geographies with different communications infrastructures.

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