

**Adoption of e-commerce technologies by farmers in the developing countries.  
Framework of the revised technology acceptance model**

**Научный руководитель – Sikos Tamas T**

***Мейрманова Айгуль Махмутовна***

*Аспирант*

Университет в Будапеште, Будапешт, Венгрия

*E-mail: aygulmeyr@mail.ru*

The absolute value of the e-commerce market is increasing in small and medium-sized, large farms around the world. Nowadays the digital technologies of the Fourth Industrial Revolution, including artificial intelligence, blockchain, cloud computing, the Internet of Things and autonomous delivery devices (e.g. drones and robots) are shaping new business models in the e-marketplace ecosystem. E-marketplaces in the agriculture offer farmers a greater reach and provide them large-scale alternatives from different suppliers. Generally, there are some quantitative and qualitative studies on the adoption of information communication technologies (ICT) by farmers [9].

It is believed that e-commerce will embrace all businesses, and the majority of business transactions will be conducted electronically by the year 2050 [5]. Researches on the adoption of technologies in agriculture and on the innovative farmer behaviour, their perception and knowledge have been common in western countries, but less is known about farmers' adoption behaviour, perception and knowledge with regarding technologies in the non-western world [6]. The aim of this study is to create the technology acceptance model that can demonstrate acceptance and usage behaviour of the farmers in using e-commerce technologies and applications in Kazakhstan.

The theory of acceptance and use of technology (UTAUT) model was selected due to its comprehensiveness and a strong background in explaining the various factors of adoption and use of electronic commerce technologies and applications. Taylor and Todd suggested that a combination of strong different constructs from various models give a better results than using a single model [8]. Hardgrave and Johnson proposed that combination of constructs from various models and theories generate a more efficient explanatory model [2]. Generally, intention and usage are the key variables in order to measure "the behaviour" of the individuals on the adoption of technologies [7]. Intention or/and usage were the main dependent variables in the previous studies, which were focused on adoption of the information technologies and applications.

The individual reactions to use the information technology may influence intentions to use the information technology and consequently, intentions to use of the information technology may influence actual use of the information technology as shown in Figure 1.

The proposed research model comprised three important types of variables as shown Figure 2.

1) There are five core constructs (independent variables) are perceived usefulness (PU), perceived ease of use (PEOU), perceived risk (PR), facilitating condition (FC) and Compatibility. These core constructs are expected to influence usage behaviour in farming (FARMTASK).

2) There are two dependent variables are usage behaviour in farming (FARMTASK) and behaviour intention in farming (BIFARMTASK). Usage behaviour in farming is expected to influence behaviour intention task.

Based on the proposed research model, several hypotheses will be tested:

1) whether core constructs (PU, PEOU, PR, FC, and Compatibility) may have any significant influence on usage behaviour (FARMTASK).

2) whether usage behaviour (FARMTASK) may significantly influence on behaviour intention

(BIFARMTASK).

The questionnaire were disseminated to 370 farmers, 315 were valid for the research. The complete data entered into SPSS 23.0 data sheet for the preliminary analysis, subsequently AMOS 23.0 was used for further analysis. Respectively, Cronbach's alpha values were calculated for each determinants of the proposed model and alpha values as shown in Figure 3 are acceptable with the threshold value 0.7 [3]. Furthermore to the measurement of alpha values, average variance extracted (AVE) and construct reliability (CR) values are also considered to assess the construct validity. Figure 3 shows the cutoff values for AVE and CR are 0.5 and 0.7 respectively. Higher value proposes that adequate determinant validity is there to proceed further analysis.

The model fit statistics reveal that proposed model can be accepted indicating good fit indices: the chi-square/degrees of freedom CMIN/df value was 2.71, indicating an acceptable fit by Joreskog and Sorbom's suggestion between two and five; root mean square residual (RMR) index shows a good fit of 0.045 and the value for GFI = 0.91; NFI = 0.90; CFI = 0.92 and TLI = 0.88 all indicating a good fit [1, 4]; and RMSEA value is 0.064, which is less than 0.08 [1]. The SEM was used to examine 6 hypotheses proposed in this study, 6 hypotheses were strongly supported, while the remaining paths are all significant at the 0.01 level. Perceived usefulness (PU) has a significant impact on the actual usage ( $\beta = 0.367$ ,  $p < 0.01$ ). The perceived ease of use (PEOU) positively influence on the actual usage ( $\beta = 0.45$ ,  $p < 0.01$ ), while social influence ( $\beta = 0.32$ ,  $p < 0.01$ ) and facilitating conditions ( $\beta = 0.43$ ,  $p < 0.01$ ) both have positive effect on the actual usage. The compatibility ( $\beta = 0.15$ ,  $p < 0.01$ ) has a significant impact on the actual usage also. The result shows that actual usage ( $\beta = 0.54$ ,  $p < 0.01$ ) positively and directly influences in usage intention.

### Источники и литература

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Иллюстрации

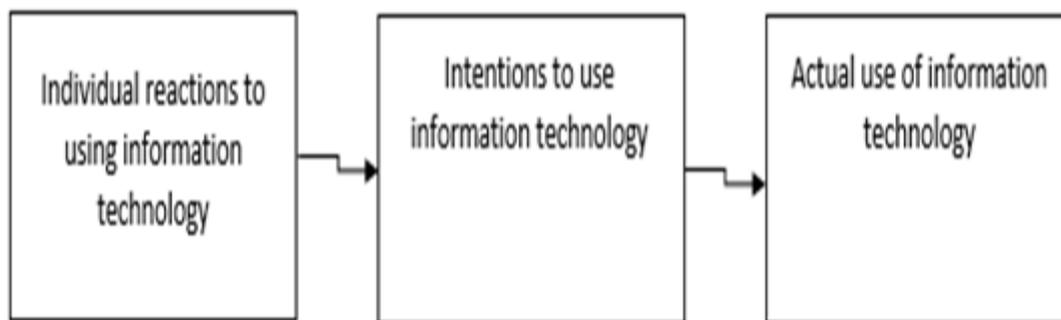


Рис. 1. Basic concept of the Underlying User Acceptance Models, Adapted from Venkatesh et al. (2003)

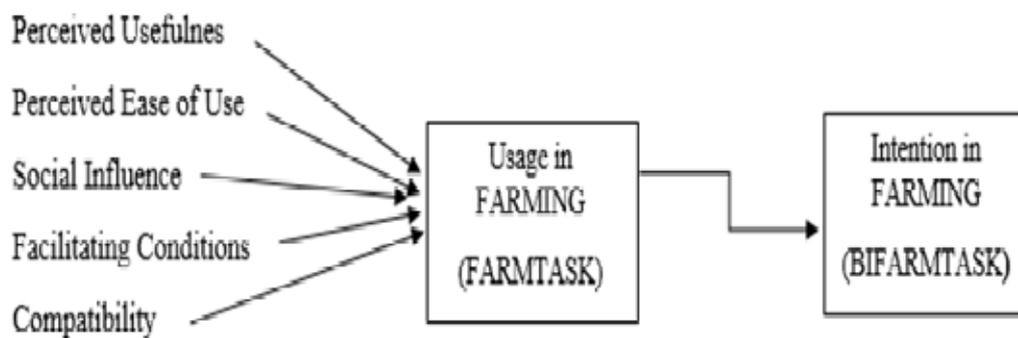


Рис. 2. Proposed Research Model

Constructs	Cronbach's $\alpha$	AVE	CR
Perceived Usefulness	0.891	0.73	0.91
Perceived Ease of Use	0.915	0.77	0.84
Social Influence	0.728	0.69	0.87
Facilitating Conditions	0.749	0.83	0.93
Compatibility	0.864	0.75	0.91
Usage Behaviour	0.956	0.81	0.88
Behavioural Intention	0.785	1.00	1.00

Рис. 3. Assessment of the construct reliability and validity