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Farmers' Beliefs about Using Mobile Devices for Livestock Management: Case of Turkey

Zuhal Tanrikulu and Meltem Ozturan
Department of Management Information Systems, Bogazici University, Istanbul, Turkey

Abstract: Due to the increase in use of information technology in various sectors, beliefs about using this technology, especially mobile devices have become an important issue for acceptance of e-Livestock Systems. The main objectives of this study are to explore Turkish farmers' beliefs about using mobile devices for livestock management and to seek whether there are relationships between farmers' and their employed farms characteristics and these beliefs. Results indicate that beliefs of Turkish farmers about using mobile devices for livestock management are mostly favorable except employee related issues and these beliefs show differences between age groups, education levels, income levels and computer user and non-user groups of farmers. However, no differences are seen between farmers' employed farm characteristics.

Key words: Livestock management, beliefs, farmers, e-Livestock, information technology, Turkey

INTRODUCTION

Information Technology (IT) use penetration is continuously increasing especially due to the new comer technologies, especially mobile technology and is changing the life styles of people by giving opportunities for e-Learning, e-Agriculture, e-Health and e-Livestock, etc. On the other hand, livestock management of which the primary focus is to maintain the well-being and productivity of animals is an important component of modern farming. Yet, time spent for compiling lists, filing veterinary records and detailing transactions in livestock management leaves little time for physically looking after livestock. In this context, IT-based, especially mobile-based e-Livestock management systems play an important role for cutting down this amount of time spent on paperwork (Maru, 2003).

However, an important issue that needs to be considering is the acceptance of these e-Livestock systems. Therefore, readiness assessment becomes an essential requirement for the successful implementation and use of these systems. Related to the utilization of e-Livestock environment, previous studies show that there are various factors that determine farmers' attitudes towards about e-Livestock systems as shown in Table 1. Many of the factors that determine farmers' attitudes towards e-Livestock systems shown in Table 1 are similar with the determinants of IT usage in general as stated in findings of the related studies (Choudrie and Dwivedi, 2006; Taylor, 2002; Chau and Hu, 2001; Venkatesh and Davis, 2000). Age, income, education level and computer experience are the most significant factors that are declared in these findings. This is an expected situation since e-Livestock itself is an IT application usage environment. But besides those common factors as it can be seen from Table 1, there are also some other factors that are specific to livestock industry and affect e-Livestock readiness where farm size, employee size, herd size and usability of the device are the most common ones. All of the studies mentioned above have examined the determinants of IT acceptance in livestock

Table 1: Literature review on factors determining farmers' attitudes towards e-Livestock Systems

References	Factors determining farmers' attitudes towards e-Livestock Systems
Zingale *et al.* (2005)	Design of the device
Batte (2005)	Farm size, education and age
Boyles and McCutcheon (2007)	Mobility of the device
El-Osta and Morehart (1999)	Age, farm size, education and number of hired employees
Gillespie and Grisham (2008)	Age, education, farm size and income
Grisham (2005)	Labor quality, labor availability
Poupyrev *et al.* (2002)	Usability of the device
Sanders and McCormick (1993)	Design of the device
Rogers (1962)	Information about the new technology
Satyanarayanan (1996)	Usability of the device
Trevarthen (2005)	Desire to control the farm
Zepeda (1994)	Education, farm size and age
Ziefle (1998)	Design of the device
Alvarez and Nuthall (2006)	Education, herd size and computer usage
Ali (2011)	Education, social category, income, farm size and farm type
Agwu *et al.* (2008)	Farming experience, age and social participation
Ramfrez and Shultz (2000)	Education, labor availability, farm size, farm type, age and farming experience
Gelb and Offer (2008)	Herd size
Rahelizatova and Gillespie (2004)	Farm size and education

Corresponding Author: Zuhal Tanrikulu, Department of Management Information Systems, Bogazici University, Istanbul, Turkey

management but have not researched mobile devices specifically and most of these studies have focused on developed countries and not much for developing countries. On the other hand, livestock sector which is characterized by small scale farms and domestic breeds in Turkey is a very important and a traditional sector in this country where by the end of year 2010, percentage increase in number of great cattle has been 6% and of small cattle has been 9.3% (TUIK, 2011). Meanwhile, mobile phone usage ratio in Turkey has come out to be 85% indicating that people living in rural areas are very familiar with mobile devices (TUIK, 2010). Regarding above issues, the aim of this study is depicted to explore the beliefs of Turkish farmers about using mobile devices for livestock management and to seek whether there are relationships between some of the determinants of e-Livestock acceptance and these beliefs.

MATERIALS AND METHODS

Considering the aim of this study, objectives of the study are determined as:

- To explore the beliefs of Turkish farmers about using mobile devices for livestock management
- To seek whether there are relationships between some of the determinants of e-Livestock acceptance and these beliefs

Based on the first objective of this study, the research question has been stated as: what are the beliefs of Turkish farmers about using mobile devices for livestock management? Related to the second objective, the following hypotheses have been developed regarding these beliefs:

- H1: there is a difference between farmers with different age groups in terms of their beliefs
- H2: there is a difference between farmers with different education levels in terms of their beliefs
- H3: there is a difference between farmers with different income levels in terms of their beliefs
- H4: there is a difference between computerate and non-computerate farmers in terms of their beliefs
- H5: there is a difference between farmers with different mobile phone usage experience levels in terms of their beliefs
- H5: there is a difference between farmers who have and who have not faced mobile phone design related problems in terms of their beliefs
- H7: there is a difference between farmers working in farms with different employee size in terms of their beliefs
- H8: there is a difference between farmers working in different types of farms in terms of their beliefs
- H9: there is a difference between farmers working in farms with different herd size in terms of their beliefs

The research was conducted by means of a questionnaire which was developed based on previous researches and theories. About 17 questions of the questionnaire were designed according to the research question and hypotheses stated above. Four of the questions were about the demographic profile of the respondents in terms of gender, age, education, income and three were related to their computer and mobile phone usages.

Three of the questions were about the characteristics of the farm that the respondents work in as number of employees, farm type and herd size. Seven of the questions were items for exploring the respondents' beliefs about using mobile devices for livestock management and were measured by 5 point Likert scale (5 = I strongly agree ... 1 = I strongly disagree). Before getting to the phase of data collection, the questionnaire was modified according to a pilot study applied to five farmers. The data for this study were gathered through a survey which was administered personally for a convenience sample in the farms close to Istanbul where this study was done. At the end, a total of 134 usable data were collected from the respondents and the data were analyzed by using SPSS 18.0.

RESULTS

The results for the profile of the respondents are shown in Table 2 and the characteristics of the farm they

Table 2: Profile of respondents (n = 134)

Characteristic	Percentage
Gender	
Female	40.3
Male	59.7
Age (year)	
<18	9.0
18-28	14.2
29-39	19.4
40-50	32.1
>50	25.3
Education level	
Primary school or lower	44.8
Secondary school	37.3
High school or higher	17.9
Personal income	
Less than subsistence level	42.5
Equal or more than subsistence level	57.5
Computer usage	
Yes	35.1
No	64.9
Mobile phone usage (year)	
<1	19.4
1-5	35.8
>5	44.8
Problem due to mobile phone design	
Yes	27.6
No	72.4

work are shown in Table 3. According to the results, about 40% of the respondents are female and more than half of the respondents' ages are 40 or above (57.4%). It is seen that the education levels of the farmers are very low; only about one fifth of the participants (17.9%) are high school or university graduates. About 42.5% of the participants' personal monthly income are less than the subsistence level determined for Turkey. Almost 45% of the respondents have been using mobile phones for >5 years whereas approximately only 35% of them are using computer. Related to the characteristics of the farms, it is seen that the farms are mostly small (about 86% of them have <20 employees and 78% of them have <50 cattle) and mostly raise great cattle (82.4%).

Table 4 shows the respondents' beliefs about using mobile devices for livestock management with seven items for which the Cronbach's alpha value is found to be 0.557. For this reason, the most unsuitable two items are excluded from the analyses and the Cronbach's alpha value is increased to 0.738. It can be seen from Table 4 that beliefs of Turkish farmers about using mobile devices for livestock management are favorable except the beliefs related to employees which have been excluded from the analyses due to the low Cronbach's alpha value.

For instance, >90% of Turkish farmers agree that using handheld device will enable livestock farmers to obtain required information in a short time to obtain herd information easily and to reduce error-rate while doing livestock farm works. Furthermore, more than half of the respondents think that they may use handheld device in their farm (59%) and learning how to use handheld device will not be difficult (54%). However, they don't think that using handheld device will enable livestock farmers to have better control over their employees or will reduce employee number in the farm. Table 5 shows the results of ANOVA and t-tests for the hypotheses. In all of these tests, mean of five beliefs have been used considering a Cronbach's alpha value of 0.738. According to the significance levels of the tests shown in Table 5, in terms of farmers' beliefs about using mobile devices for livestock management, hypotheses 1-4 are accepted signifying that there are differences between farmers:

- With different age groups
- With different education levels
- With different income levels
- Belonging to computer user and non-user groups

Which are consistent with the findings of the previous studies whereas hypotheses 5 and 6 are not supported indicating that there are no differences between farmers:

- With different mobile phone usage experience levels
- Who have and who have not faced mobile phone related problems

Which are contrary to the findings of the associated researches. On the other hand, hypotheses 7-9 which are related to the farms' characteristics are also not supported indicating that there are no differences between farmers working in farms:

- With different employee size
- Of different types
- With different herd size

In terms of the farmers' beliefs about using mobile devices for livestock management which are also contrary

Table 3: Characteristics of the farms (n = 134)

Characteristic	Percentage
Number of employees	
<10	41.0
10-20	44.8
>20	14.2
Farm type	
Small cattle	17.6
Great cattle	82.4
Herd size	
50 or less	78.4
>50	21.6

Table 4: Turkish farmers' beliefs about using mobile devices for livestock management (n = 134)

	Frequencies					
Farmer's believes	Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)	Mean (out of 5)
Using handheld device will enable livestock farmers to obtain required information in a short time	-	-	11	87	36	4.19
Using handheld device will enable livestock farmers to obtain herd information easily	-	-	12	89	33	4.16
Using handheld device will reduce error-rate while doing livestock farm works	2	-	18	89	25	4.02
I think I may use handheld device in my farm	1	17	37	61	18	3.58
Learning how to use handheld device will not be difficult	6	27	28	63	10	3.33
Using handheld device will enable livestock farmers to have better control over their employees*	30	42	47	15	-	2.35
Using handheld device will reduce employee number in the farm*	35	39	45	15	-	2.30

*Excluded from ANOVA and t-test all analyses

Table 5: Results of ANOVA and t-tests

Hypothesis	Parameters	Mean of beliefs using mobile devices in livestock management (Mean)	F/t value	Sig.
Hypothesis 1 (Accepted)	**Farmer's age (year) group**			
	<18	4.17		
	18-28	4.16	F = 8.92	0.000
	29-39	4.10		
	40-50	3.71		
	>50	3.57		
Hypothesis 2 (Accepted)	**Farmer's education level**			
	Primary school or below	3.70	F = 9.83	0.000
	Secondary school	3.86		
	High school or above	4.23		
Hypothesis 3 (Accepted)	**Farmer's income level**			
	Less than subsistence level	3.97	t = 2.09	0.039
	Equal or more than subsistence level	3.77		
Hypothesis 4 (Accepted)	**Farmer's computer usage**			
	Yes	4.18	t = 32.45	0.000
	No	3.68		
Hypothesis 5 (Rejected)	**Farmer's mobile phone usage experience**			
	<1 year	3.75	F = 1.04	0.357
	1-5 years	3.83		
	>5 years	3.92		
Hypothesis 6 (Rejected)	**Farmer's mobile phone related problem**			
	Yes	3.91	t = 0.83	0.408
	No	3.83		
Hypothesis 7 (Rejected)	**Employee size of the farm that farmer is working**			
	<10	3.87	F = 0.03	0.973
	10-20	3.84		
	21-31	3.86		
	>31	3.86		
Hypothesis 8 (Rejected)	**Type of the farm that farmer is working**			
	Cattle	3.87	t = -0.24	0.981
	Sheep or goat	3.87		
Hypothesis 9 (Rejected)	**Herd size of the farm that farmer is working**			
	50 or less	3.85	t = 0.16	0.875
	>50	3.87		

to previous studies. These may be due to the composition of the sample where all of the farmers, independent of their demographic characteristics are mostly working in small size farms that are raising great cattle (about 80%).

DISCUSSION

The need in livestock industry and the growth in usage of the mobile devices have created opportunities for using mobile-based systems for livestock management. Based on this trend, mobile-based e-Livestock readiness of farmers has become an important issue to be explored for livestock owners. This study has explored the beliefs of Turkish farmers about using mobile devices for livestock management. According to these findings, majority of farmers agree that using handheld device will enable livestock farmers to obtain required information in a short time will enable livestock farmers to obtain herd information easily and will reduce error-rate while doing livestock farm works. This shows that Turkish farmers are closely interested in using mobile devices in livestock management. Another finding of this research shows that Turkish farmers with different demographic characteristics in terms of age, education level, income level and computer usage show significant difference in terms of their beliefs about using mobile devices in livestock management where beliefs become favorable as age decreases as education and income levels increase and as farmers get use to use computers as stated in previous studies.

On the other hand, it is found that there are no significant differences between farmers working in farms with different characteristics in terms of their beliefs which are contrary with related researches. The composition of the sample where all of the farmers, independent of their demographic characteristics are mostly working in small size farms that are raising great cattle may be the reason of this finding. The research findings bring some implications to various stakeholders. Related to livestock owners and/or managers, findings imply that they should start to use mobile device based e-Livestock Systems in their farms since farmers have positive beliefs in using them. Although, results seem encouraging, they are at the initial stage. This research may be used as a basis by researchers to examine the farmers' beliefs in greater details and to identify more relationships and/or effects of these beliefs. Even though the research results provide few new insights, these should be considered in the light

of several limitations associated with this study. One such limitation is the composition of the sample it has included only farmers from Turkey who are mostly working in small size farms that are raising great cattle. Therefore, generalization about the entire population of Turkish farmers cannot be done. Another limitation is that this study has investigated beliefs of Turkish farmers only. For this reason, the findings of this study cannot be generalized for worldwide farmers without understanding the cultural influence.

CONCLUSION

Although, the empirical findings of the study seem useful the limited size and nationality of the dataset make it difficult to draw any generalized conclusions. Therefore, as future study, considering that this study is concentrated on population of Turkey which is a developing country, this research can also be undertaken in other countries in order to provide a more representative sample size. Overall, besides its limitations, it can be concluded that the findings of this study can assist livestock owners for enhancing their understanding of e-Livestock readiness of their farmers and for improving livestock management.

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