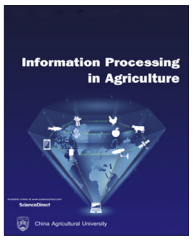
Available at www.sciencedirect.com

INFORMATION PROCESSING IN AGRICULTURE xxx (xxxx) xxx

journal homepage: www.elsevier.com/locate/inpa



Rural E-marketing in Iran; Modeling villagers' intention and clustering rural regions

Seyed Jaber Alavion, Ahmad Taghdisi *

Faculty of Geographical Sciences and Planning, University of Isfahan, Isfahan, Iran

ARTICLE INFO

Article history:
Received 22 June 2019
Received in revised form
24 February 2020
Accepted 27 February 2020
Available online xxxx

Keywords:
Structural equation modelling
K-means clustering
Rural e-marketing
Intention to adopt
Rural ICT offices
Iran

ABSTRACT

The rural population of Iran has a serious need for ICT application to launch e-marketing in order to increase employment. The important point is that most villagers are small holders, and an e-marketing model should be proposed which is adopted and can be operationalized. Therefore, the purpose of the present study was modeling villagers' intention to adopt e-marketing and performing rural provincial clustering. Data were collected from approximately 1000 villages with ICT offices in all provinces. The research model was designed in a way that the Theory of Planned Behavior (TPB) was developed, and Rural Economy Geography was added as background. Therefore, the Geographic Model of Planned Behavior (GeoTPB) was proposed. The innovation of the current research is in using a combined model (behavioral and geographical) to adopt rural technology, which has presented a better understanding of adoption. Additionally, a two-stage structural equation modeling approach was used, which means that since the model was large and complicated, in the first stage, the non-significant paths were removed, and in the second stage, the model was simplified and proposed with the significant paths. This model predicted 76% of villagers' intention to adopt e-marketing. Also, the K-means clustering showed that based on economic and behavioral factors, the rural districts of Iran constituted 6 clusters. The interesting point was that the southern and southeastern provinces of Iran, which have been reported by the statistics center to be the less developed areas, were found to be the superior cluster in e-marketing adoption in the results of the current research. Therefore, the villages of Sistan and Baluchestan and Hormozgan provinces will be suitable as pilot provinces for e-marketing implementation. Considering the results of the GeoTPB model, priority would better be given to villages with appropriate access and a population with the potential to use technology. Additionally, regarding the government's aim to develop rural businesses, it is suggested that the Transaction Services Model be launched as the national business and the related facilities be provided.

1. Introduction

For nearly three decades, ICT applications in different rural areas have been instrumental in providing information for, and management of, employment and rural businesses. In

* Corresponding author: Faculty of Geographical Sciences and Planning, University of Isfahan, Postal code 8174673441, Isfahan, Iran.
E-mail address: a.taghdisi@geo.ui.ac.ir (A. Taghdisi).
Peer review under responsibility of China Agricultural University.
https://doi.org/10.1016/j.inpa.2020.02.008

Please cite this article as: S. J. Alavion and A. Taghdisi, Rural E-marketing in Iran; Modeling villagers' intention and clustering rural regions, Information Processing in Agriculture, https://doi.org/10.1016/j.inpa.2020.02.008

North America, sales websites for agricultural products began to work in the 1990s. Its old examples are the Online Farmers Market[1] (offering a variety of crops, gardens, livestock and aquaculture with rental booths to sellers and the potential to send orders to anywhere in the US or Canada) and the Maryland Livestock Online Market[2] (with the possibility of registering the villagers on the site for online sales of their livestock) [1]. With the expansion of rural businesses, websites[3] with social goals arose. In California, for example, a "California Fresh Works" website was launched to provide healthy food and services to low-income rural communities [2]. With the aim of ICT expansion in the geographical domain, regional projects related to rural digital technology were defined at a given time interval. Examples include "EORN" in Canada, which expanded the access of rural areas to ICT services. The result of the first phase of the project in 2014 was the financing obtained from diverse sources, social media participation, and skills training and marketing [3]. In the EU, a ten-year Rural Digital Agenda (2005–2015) was implemented in rural areas, covering different socio-economic objectives in villages [4]. Also, in Europe, the topic of rural tourism is especially taken into consideration. In this context, a project called "Dante" (Digital Agenda for New Tourism Approach in European Rural and Mountain Areas) [4]was implemented. For example, in Spain, the "Toprural" website[5] is widely used for rural tourism [5]. In Moldova, there is a comprehensive website[6] called "moldova-tourism", related to the National Association of Rural, Ecological and Cultural Tourism [6].

Looking at other places in the world, in South Asia there exists one of the largest micro rural communities. In Bangladesh, the Rural Advancement Committee established a project called "Gonokendra" - meaning the people's center library - in rural areas that aims at villagers' education [7]. In the first decade of 2000, in India, the marketing information network (Agmarknet) was established. It was a network that provided market information at a national level and facilitated the sale of products and the licensing of marketing to entrepreneurs to promote the potential of the villagers. Using this network, a project called "e-Choupal" was formed which was an information and communication system for agricultural products in nine Indian states with 6500 Internet kiosks covering about 4 million villagers [8].

Africa, supported by global organizations, has also benefited from rural ICT services. In 2005, with FAO support, an information and communication system called "Esoko" was designed which covered the agricultural markets of fifteen African countries and provided a link between the villagers and the market and improved villagers' marketing know-how. For example, the results of a study on this system which was conducted in Ghana shows that villagers use technology to predict weather conditions, receive agricultural production advice and get information about current prices [9]. With the expansion of mobile use in the rural areas of Africa, it has become possible to provide newer services. The ability to activate multiple mobile phone numbers on a family-owned SIM card was provided by "Movritu Inc" in Tanzania and Madagascar [10] and an animal information service named "ICOW" in Kenya, which provides services including the nutrition, reproduction and medical care of livestock [11] are examples of the technology of rural communities.

In the Middle East, Iran, with the establishment of rural ICT offices in 2004, is one of the leading areas in rural development. These offices provide banking, postal and telecommunication services [12]. At the moment, the access of Iranian villages to infrastructure and IT facilities is improving. The number of villages with a high-speed Internet connection has reached 24,205 (out of 61,000 villages), which includes 40 percent of all the country's villages. The expansion of rural ICT offices, a 50 percent availability of personal computers to rural households, and a penetration rate of 70 percent for mobile phones are other examples of this progress [13]. However, the important point is that the progress in communication has not increased the rural population over the last two decades. The main reason is that information technology has failed to promote entrepreneurship, employment, and the growth of income effectively. One solution is the use of information technology to develop rural business and e-marketing provides this opportunity. The purpose of rural e-marketing is to give villagers the opportunity to offer agricultural products, handicrafts and tourism services using an electronic system in the network of rural ICT offices [14]. Therefore, in the present research, two main purposes are investigated. First, rural region clustering is carried out based on behavioral and economic factors related to e-marketing with the targets being the rural districts of the country which have better conditions for adoption of rural e-marketing. Second, the villagers' intention to adopt e-marketing is evaluated by the Geographical Model of Planned Behavior with structural equation analysis.

2. Literature review

2.1. *Technology adoption in rural and agricultural communities*

In North America, one of the first studies conducted in the west of the United States in the past two decades (1999) in relation to the adoption of new information technologies in small rural businesses showed that a company with relative advantages (communications, cost management and proper arbitration), appropriate size and support has a higher adoption rate. External pressure (suppliers and customers) and competitive pressure (marketing competition) were among the variables that influenced the rate of adoption. When external pressure is on, the company must take advantage of new technology to communicate with suppliers and customers [15]. In a study that was conducted about a decade later, entitled "The adoption of the Internet in rural America (Kentucky)," the study of social adoption was targeted. Before villagers get information about the benefits of broadband Internet, they must learn to use and assume a positive atti-

[1] www.farmersmarketonline.com.
[2] www.sheepgoatmarketing.info.
[3] www.cafreshworks.com.
[4] www.danteproject.eu.
[5] www.toprural.com.
[6] www.moldova-tourism.md.

Please cite this article as: S. J. Alavion and A. Taghdisi, Rural E-marketing in Iran; Modeling villagers' intention and clustering rural regions, Information Processing in Agriculture, https://doi.org/10.1016/j.inpa.2020.02.008

tude towards it. The variables that had a direct impact on the adoption of the Internet included Internet experience, self-efficacy, expected outcomes and inactive learning [16]. Research conducted in Canada in connection with the farmer's decision to adopt agricultural technology showed that ease of use where technology is concerned has a positive relationship with adoption. In addition, farmers' tendencies towards technology, the ability to use technology and the level of education have been influential on adoption [17]. Moreover, the results of one of the most recent European studies on the willingness of German farmers' to accept e-commerce reports that farmers will be able to join other online retailers and be successful by lowering prices. Farmers' risk attitudes, prior online shopping experiences and education were among the effective factors for an online business in rural society [18].

In the Far East, researchers investigated the adoption and use of mobile phones in rural China to determine the impact of behavioral and psychological factors on mobile adoption. The psychological factors included perceived characteristics, perceived popularity and perceived need. Behavioral factors included adoption of technology, interpersonal communication and mass media use. The results showed that behavioral factors played a more important role in adoption than psychological factors, which had less prediction power. This finding showed that the impact of psychological factors on technology adoption is very limited in a rural society. Since the villagers had lower incomes and lower living standards than urban residents, they were less influenced by imagination and feelings in adopting and using new technology [19]. Two years later, Chinese researchers raised a question: "How does socio-economic structure influence rural users' acceptance of mobile entertainment?" This research was aimed at examining the adoption of mobile technology by villagers in northern and eastern China and explaining its social and economic roots. The findings showed that social influences in the villages of northern China and self-efficacy in those of eastern China were among the most important factors. Researchers saw the difference in the traditional interdependent society of northern China and the more independent society of eastern China [20]. But over time, the results differed somewhat in the adoption of technology, indicating a reduction in the digital divide. The results of government mobile adoption in rural China showed that perceived ease of use, usefulness, and social influence had a positive impact on technology adoption [21].

These results were also confirmed in another Asian country. Adoption of green fertilizer technology amongst Malaysian paddy farmers was such that attitude, subjective norm and perceived behavioral control had a positive and significant effect on adoption [22]. In India, adoption of e-commerce among Indian farmers showed that the adoption of a technology model is complete when variables such as infrastructure, perception and user trust, the security of technology, and information in the agricultural sector are taken into consideration [23].

In short, it can be said that the differences in technology adoption by villagers in the western and eastern hemispheres in the past two decades is evident. But with the development of information technology and increase in rural awareness and the access of rural society to rural ICT, the digital divide has decreased. Consideration is also given to the human factor and behavioral variables in the adoption of rural technology.

Various studies have been conducted in Iran on adoption-related behavior and the use of technology in different rural regions. The first rural ICT centers were established in northern Iran. This region of Iran has a temperate climate and the villages are near the cities. Khalili et al [24] studied the factors affecting ICT adoption and found that the behavioral characteristics of villagers affected the adoption. A few years later, Alavion and Alahyari [25] reported that, in addition to behavioral characteristics, rural economy also has an effect on adoption. The results of a study by Masouleh et al [26] indicated that in the agricultural organization, the human (motivation and skill) and educational (educational classes and practical use of technology) factors are among the most important factors which transfer ICT knowledge to villagers. Studies in northern Iran have indicated that ICT adoption is in good status. In western Iran (areas with mountainous climates), a study by Lashgarara et al [27] showed that socio-cultural factors affected the adoption and use of ICT. However, the authors suggested that the use of ICT centers was low and this issue was not inclusive. Alibaygi et al [28] obtained similar results in these geographical areas and stated that no relationship was observed between rural economy and ICT centers. A few years later, Arayesh [29] suggested that more attention should be paid to ICT management and infrastructure in order to boost E-commerce and implement E-marketing in western Iran. In general, the status of ICT adoption in western Iran has not been satisfactory. The regional agricultural index is higher in northwestern Iran than it is in other parts of the country. However, the attitude towards ICT is not as high. Bakhshizadeh et al [30] mentioned that some villagers in the study were not optimistic about the effect of ICT on rural development. Thus, rural ICT can have a positive effect on the village level if it is accompanied with local participation and investment. In relation to agricultural E-commerce, Mahmoudi et al [31] stated that this model is adopted when government support enhances the marketing mix. In addition, recent studies on this geographical area have showed that the female members of rural cooperatives lacked the desirable attitude towards ICT. In general, it can be said that the agricultural economy in the region had no positive effect on ICT adoption. The distance from the villages to the cities in the east and south-east of Iran with arid and semi- arid climates and the establishment of ICT centers has been vital for the development of these regions. Kord et al [32] considered the creation of growth centers as effective in relation to rural entrepreneurship. Salari and Maroosi [33] stated that saffron farmers had high ICT adoption and that behavioral and economic variables were effective in this regard. Dehghani and Shahdadi [34] emphasized the effectiveness of household economy and behavioral variables on the use of technology. As a result, the possibility of development using modern technology is considerable despite the relatively weak agricultural economy in southeast Iran. Finally, Alavion and Taghdisi [35] examined the effects of geographical economics on adoption in several regions of Iran. The obtained results showed that the rural regions in the

Please cite this article as: S. J. Alavion and A. Taghdisi, Rural E-marketing in Iran; Modeling villagers' intention and clustering rural regions, Information Processing in Agriculture, https://doi.org/10.1016/j.inpa.2020.02.008

northern and southern coasts of Iran had a higher capacity for the adoption of E-marketing. Furthermore, the effect of rural economy on technology adoption was confirmed. The authors stated that the rural residents of the studied areas were well familiar with ICT and considered the context of E-commerce as being appropriate.

2.2. *Technology acceptance model (Extending the Theory of Planned Behavior)*

One of the theories that provide a model for predicting technology adoption behavior is the Theory of Planned Behavior. Based on this theory, a person's behavior is guided by three factors, behavioral beliefs, normative beliefs, and control beliefs. The behavioral beliefs factor includes "belief" (positive or negative feelings) and "evaluation of the outcomes" (conclusion of emotions). The normative beliefs factor includes "motivation" and "specific referents" (friends, co-workers, family, and other groups). Finally, in the control beliefs factor, "self-efficacy" (inner ability of the individual) and "facilitating conditions" (external facilities) are examined [36] (Fig. 1a).

An interesting point about this theory is its citations; over the past few decades, several thousand articles have cited it. More significantly, it has been the basis of much research in agriculture and the rural sciences. The work of European researchers in recent years, especially in the field of animal sciences, can be mentioned as examples [37,38,39]. There have also been significant studies, remarkable in adopting the applications of new energies in rural areas, in eastern Asia and in Australia [40,41,42]. In other areas such as South America, studies have been carried out in the field of natural resources [43] and agriculture [44]. Finally, in the Middle East, a study in the adoption of e-marketing [14] has been done using this theory.

But can this theory alone accurately predict the behavior of technology adoption by villagers? The origin of this theory relates to the psychological sciences, and psychological models are human-centered. If we intend to expand it, we need to do so with more variables. For example, using expanded models of planned behavior in the agricultural and rural fields is seen in researches such as "Adoption of Soil Conservation Practices by Belgium Farmers" [45], "Ethiopia's Farmers' Attitudes toward Sustainable Agricultural Practices" [46] and "Farmers' Intention to Adopt Improved Natural Grassland in Brazil" [43].

One of the studies conducted involving the extension of the Planned Behavior Theory towards a new perspective was presented by German researchers who initiated a different approach to the explanation of human behavior by introducing the Geographical Theory of Planned Behavior (GeoTPB). The results showed that geographic structure explains a large part of the variance of behavioral beliefs and control beliefs [47]. In another study (in Australia), a model called the "Geographic Access Model" was introduced and compared with the main Planned Behavior model. The report suggests that the latter showed more appropriate results in relation to behavior connected to the use of green space [48]. Moreover, in studying the effective factors on villagers' behavior with the aim of educational services using the Geographic Model of Planned Behavior in the north of Iran, different results were obtained through Wang's Study. The authors stated that the planned behavior model could predict villagers' behavior with up to 45% accuracy. However, by adding the geographic control factor, behavior is influenced by geographical distance and spatial pattern, and the prediction percentage increases to 60 [49].

In another study conducted in a rural community, it was concluded that in the development of the Theory of Planned Behavior (TPB) Model which was carried out using geographical variables (geographical variables were considered as the background), the behavioral beliefs and control beliefs would have to affect the normative beliefs so that, overall, the effects in the model could be significant [35] (Fig. 1b).

2.3. *Online village*

The use of modern technologies in villages started in the opening years of 2000. Over time, and with increase in high-speed Internet connections, smart phones, mobile apps and social media, further access to information and services for rural residents has become possible [50]. In this regard, online

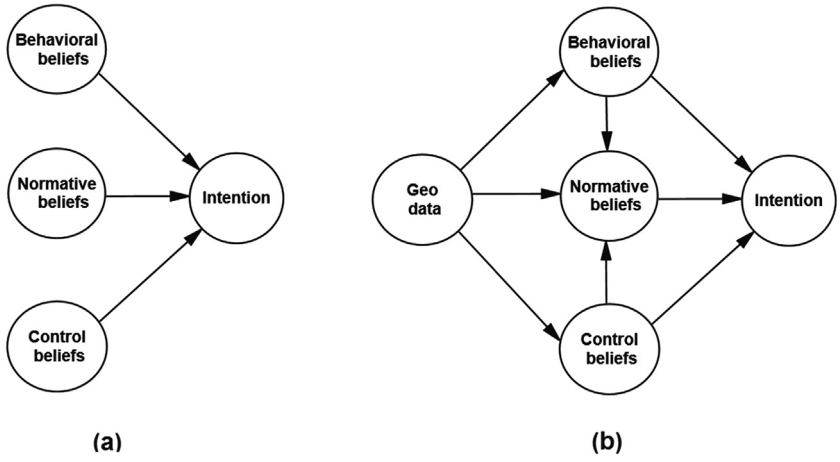


Fig. 1 – TPB model (a) – GeoTPB model (b).

Please cite this article as: S. J. Alavion and A. Taghdisi, Rural E-marketing in Iran; Modeling villagers' intention and clustering rural regions, Information Processing in Agriculture, https://doi.org/10.1016/j.inpa.2020.02.008

villages or rural areas connected to the Internet are expanding such that villagers are increasingly being included in the digital system.

In the US, "rural economic development innovation" (REDI) is a new project developed for regional planning. This program is aimed at supporting rural communities with a population under 5000 people. Financial resources are supplied by the Ministry of Agriculture and the programs are operated by four institutes. One of the goals is to provide high-speed internet access that has been prioritized as e-connectivity for rural America in rural development programs. Specifically, among the 47 rural areas, high-speed internet access and e-connectivity are provided in 4 areas in the states of Arizona, Colombia, Florida, and Washington. Furthermore, allocation of loans for the development of fiber optic-based broadband infrastructures has been considered as a plan to support agricultural companies. For example, in the villages of Lovington, the Okaw Farmers Coop with 300 farmers working in the area of cereal and grain cultivation was able to connect to the Chicago Metropolitan Market using modern communication tools [51].

In Europe, rural digital hubs have been established since the early 2000s. They have been considered as centers providing digital services as well as other services relevant to rural jobs and communities. The Cheviot digital hub located in the north of England is one of the first European centers established by support of the private sector (Glendale Gateway Trust) in 2001; its activity has been in social and rural business areas. For instance, this center has a website named Visitwooler which provides online services to connect unemployed locals to training centers. In 2005, the Cocotte Numérique digital hub was established in the south of France by support of the European Regional Development Fund (ERDF); it can be accessed on cocotte-numerique.fr. One of the main services provided by this center is supporting businesses. Also, it has established Fab Lab as a focal point for businesses and local entrepreneurs. In 2013, the Bronderslev digital hub was established in the north of Denmark by support of the ERDF and the local municipality, and aimed at empowering the villagers and attracting the entrepreneurs. In this center, there are 12 departments and other facilities for holding meetings, video conferences, and internet access. In 2016, the Skibbereen digital hub was established in the southwest of Ireland by support of a private institute; it can be accessed on ludgate.ie. In addition to social meetings and providing digital training courses, this center has helped the flourishing of local businesses. Meanwhile, eStreet is an electronic-commerce portal in Ireland through which retailers can supply their products [52].

In China, the Alibaba business group established a (C2C) retailing website named Taobao in 2003. It changed most of the Chinese villages into an online village called Taobao village. Rural families can sell their products at low costs on this platform. As most villagers use mobile phones, two applications were provided for retailers (the Qianqiu App) and online shops (the Taobao Mobile App). There are many express delivery companies in every village of Taobao. The employees of these shops deliver the goods even in the evenings. So, electronic retailers send their products on the same day as they receive the customers' order. This efficient delivery system has promoted satisfaction and the growth of electronic commerce. Furthermore, WeChat is the most popular social media in China used as a means of communication by Taobao users [53]. Taobao has had better performance than Amazon in the area of rural services. For example, Amazon Prime Now Service (delivery in 1–2 h) is only provided for residents of urban regions in Europe and the US, but these services are unavailable in rural areas. However, in Taobao, the collaboration between the local governments and Alibaba website has led to the creation of hundreds of small e-business enterprises in rural areas of China [54].

In Iran, online villages exist in two types: the first type includes the villages in which the residents are provided with internet access; the second type includes the villages where there is both internet access and rural ICT offices. The first village of Iran (Shahkooh in Golestan province) was provided with internet access in 2000. After 4 years, in 2004, the first ICT office was established by the innovation of a university professor and support of the Ministry of Communication in Gharnabad village in Golestan province (in the north of Iran). For this purpose, a two-floor building was equipped with an ATM device and electronic banking was established. Several rooms were allocated to the experts of telecommunication, agriculture, rural cooperative organizations, and post departments to take charge of implementing the administrative affairs of the villagers of the area and the surrounding regions. As a result of the success of this office, the government decided to promote these offices all over the country [12]. They were established to provide the villagers with postal, telecommunication, and bank services. The villages targeted for the establishment of ICT offices were selected out of those villages that had economic diversity and could support the surrounding villages. Currently, these villages have a good capacity of operating e-commerce related development programs.

2.4. *Transaction services model in Iran's online villages*

Most villagers own small areas of land or possess little capital. Therefore, the important issue is to design an online sale model to help with the e-marketing of products and services. A research study was conducted in the north of Iran to investigate the model of rural e-marketing preferred by the villagers as online sale persons. In this regard, the Transaction Services Model was introduced [55]. In this model, there is a national website. On this website, each rural ICT office has a user profile and transactions are done via the offices as mediator. Therefore, the villager has no direct relationship with the website. It should be noted that rural ICT offices offer banking and postal services. In the Transaction Services Model, in order to sell products, villagers will open an account in the rural Post Bank, and the crops or handicraft data is registered by paying a fee. After the customer visits the website and chooses the product, online payment is done and the money is deposited into the villager's account with a short message being sent to the villager to deliver the product to the office. Finally, the rural office sends the product by post to the customer (Fig. 2a). In the Transaction Services Model, in order to rent rural houses, the village residents open an account in the rural Post Bank upon obtaining a tourism

Please cite this article as: S. J. Alavion and A. Taghdisi, Rural E-marketing in Iran; Modeling villagers' intention and clustering rural regions, Information Processing in Agriculture, https://doi.org/10.1016/j.inpa.2020.02.008

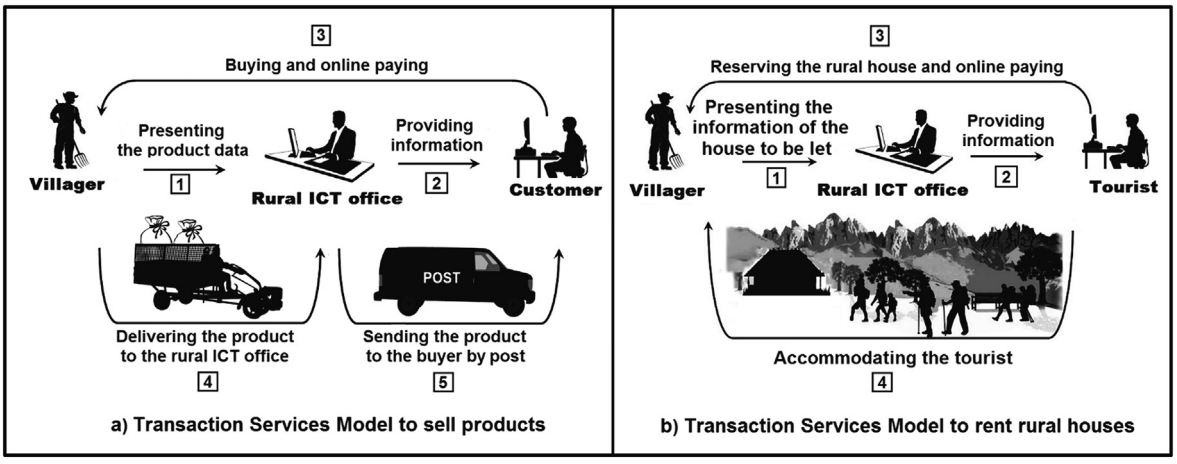


Fig. 2 – Transaction services model in rural e-marketing.

license, and after paying a fee, request to register the information of the house available for rent. On the other hand, after visiting the website and choosing the desired house, the tourist pays the rent online and the money is deposited into the villager's account at the Post Bank and a short message is sent to the villager for them to prepare the house for the tourist's accommodation (Fig. 2b). The assessment of this online sales model in the west of Iran [29] also showed positive results.

2.5. *Rural economic geography model*

The Rural Economic Geography Models typically focus on the rural population and agriculture, while forestry and mines can also be added to them. However, employment in these two latter variables is declining. Conversely, variables such as tourism which require facilities such as rural access are increasing. Unlike the past decades when regional researchers were not highly interested in rural areas [56], the expansion of electronic commerce has had a significant effect on rural economy and rural economic geography throughout the world in recent years. In addition, relevant studies have increased [4]. Regional studies on information technology and rural economic geography have indicated that the expansion of information technology has transformed the geographic space of rural areas in the UK from static to dynamic [57]. In other words, when Internet technology is used in the agricultural and natural resource sectors, it has a significant effect on rural economy. The results of some studies in Germany have indicated that the changes caused by the Internet in spatial characteristics have affected the inhabitants' behavior in rural areas. For example, they have enhanced increase in communication and income growth as well as inciting the return of immigrants [58]. In China, electronic commerce has become a catalyst for changing the rural economic geography and turned into a platform for a boom in rural economic activities such as agriculture, tourism, and handcrafts. Government support and rural elites have significantly helped this modernization process [59]. In Iran, Alavion and Taghdisi [35] proposed a rural economic geography model based on electronic marketing (e-marketing) including five variables of agriculture, rural tourism, rural handicrafts, rural access and rural population (Fig. 3). In this model, rural access referred to the access of villagers to ICT offices and the

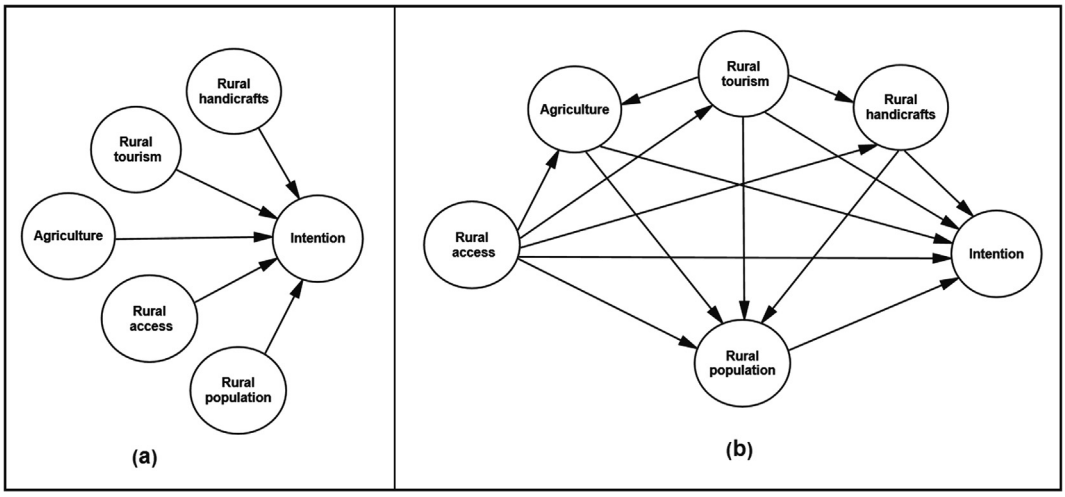


Fig. 3 – Rural Economic Geography Model in the adoption of rural e-marketing.

Please cite this article as: S. J. Alavion and A. Taghdisi, Rural E-marketing in Iran; Modeling villagers' intention and clustering rural regions, Information Processing in Agriculture, https://doi.org/10.1016/j.inpa.2020.02.008

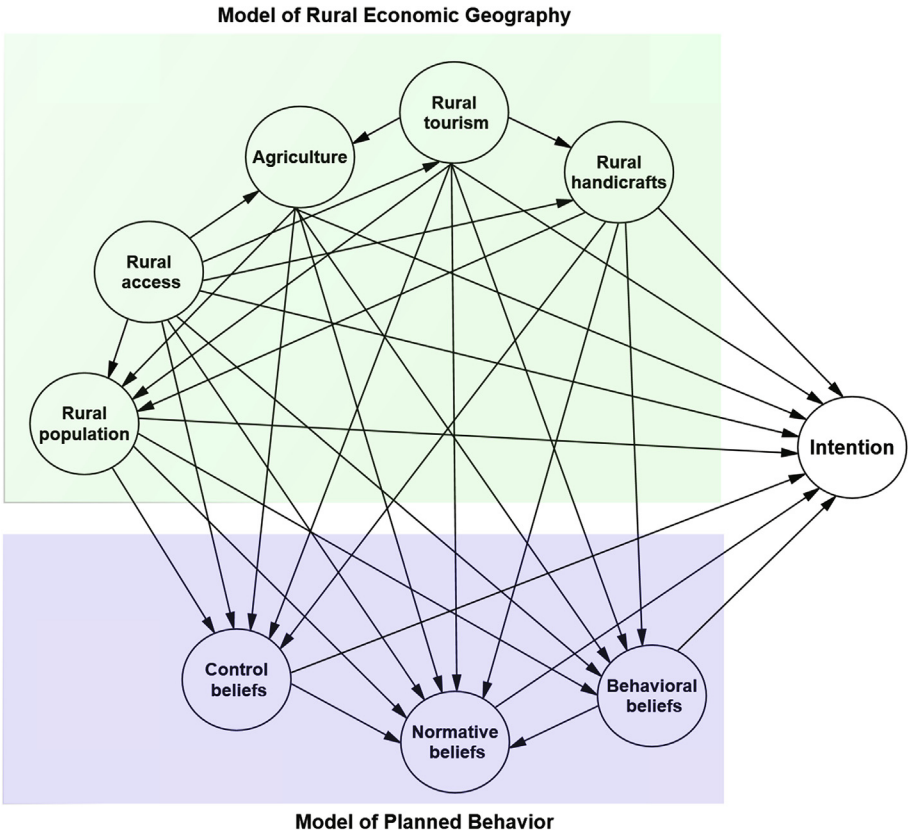


Fig. 4 – Conceptual model of research for villagers' intention to adopt e-marketing.

appropriateness of the roads connecting the village to the city. Rural tourism was defined as the tourist attractions of the region and the online renting of rural houses. Agriculture focused on the income earned from agricultural products, diversity of agricultural products, and online sales. Rural handicrafts evaluated the income earned from handicrafts, the attraction of regional handicrafts, and online handicraft sales. Finally, rural population included the population of the bank, post, and telecommunications clients. The primary model involved the direct effect of five variables on the decision of villagers to accept e-marketing (Fig. 3a). The completed model, the model fit of which was approved, included indirect relationships. The routes were designed in such a way that first, rural access affected the four variables of rural population, rural handicrafts, rural tourism, and agriculture. Second, rural tourism affected agriculture and handicrafts and third, tourism, handicrafts, and agriculture affected the rural population (Fig. 3b).

3. Model and research hypotheses

The model of the present study, the Geographic Model of Planned Behavior (Geo TPB), is a combination of two models (Model of Planned Behavior and Rural Economic Geography). The Model of Planned Behavior includes three variables, which are behavioral beliefs, normative beliefs, and control beliefs [36]. In the behavioral approach related to rural studies, it is required that TPB be developed [60]. In the current research, TPB was developed using geographical variables based on the study conducted by Alavion and Taghdisi [35]. For rural economic geography, the 5 variables of agriculture, rural tourism, rural handicrafts, rural access, and rural population were considered.

As seen in Fig. 4, in GeoTPB model, two types of relationship between the variables were considered: first, a direct relationship between eight independent variables and the dependent variable; and second, an indirect relationship, adjusted in a way to determine the variables of the Model of Rural Economic Geography as the primary effectives and the behavior variables as the final effectives. In other words, in the GeoTPB, rural economic geography was considered as a background factor.

In the following section, the variables and the assumptions related to each variable are listed;

3.1. *Behavioral beliefs*

Behavioral beliefs include "belief" and "evaluation of the outcomes" [36]. Several studies have emphasized that there is a positive correlation between behavioral beliefs and the adoption of technology in the rural community [22,14,46,61–65]. In rural e-marketing, "belief" means the person's attitude towards the effects of e-marketing on income, employment, and entrepreneurship. Additionally, "evaluation" refers to the good or bad evaluations of the villager. How do they evaluate the effect of e-marketing on the online sale of products and the online house rental scheme? Do they think e-commerce would be suitable for their village? How will they

Please cite this article as: S. J. Alavion and A. Taghdisi, Rural E-marketing in Iran; Modeling villagers' intention and clustering rural regions, Information Processing in Agriculture, https://doi.org/10.1016/j.inpa.2020.02.008

engage with adoption? [14,35]. Considering the above mentioned issues, the following hypothesis is proposed:

Hypothesis 1. *Behavioral beliefs affect villagers' intention to adopt e-marketing.*

3.2. Normative beliefs

Normative beliefs include "motivation" and "specific referents" [36]. Research studies indicate that there is a significant relationship between normative beliefs and adoption of technology in the rural community [22,44,46,61–65]. Motivation in e-marketing signifies the extent to which villagers are motivated to sell their products, or rent their houses online. The term "specific referents" refers to the organizations that affect the behavior of the villager. If the local residents in a village carry out online trading, what will the effect on the individual be? Or, how will the governmental policy in digital villages affect the villagers' adoption? [14,35]. Therefore, the following hypothesis is proposed in this regard:

Hypothesis 2. *Normative beliefs affect villagers' intention to adopt e-marketing.*

3.3. Control beliefs

Control beliefs include "self-efficacy" and "facilitating conditions" [36]. Several papers indicate that there is a significant relationship between control beliefs and the adoption of technology in a rural environment [22,44,61–65]. Self-efficacy refers to the villagers' skill in using technology, as well as their experience in online trading. Facilitating conditions in e-marketing refers to the practicalities of the facilities developed by the government in villages (banking and telecommunications) [14,35]. In this regard, the following hypothesis is presented:

Hypothesis 3. *Control beliefs affect villagers' intention to adopt e-marketing.*

3.4. Rural access

The results of studies in rural areas show that improved road access causes an increase in efficiency and affects the adoption of rural technology. Researchers in England state that rural access is one of the most important factors affecting rural economy, and that there is a positive relationship between efficiency and road infrastructure. The interesting point is that in spite of the development of ICT and virtual communications, market adjacency is still of paramount importance [66]. In Asia, it has been shown that proper access to the marketplace has led to the adoption of agricultural technology by villagers in India [67] and China [68]. These results are also seen in Africa. In East Africa, rural access has led to much increase in technology adoption [69]. Additionally, the results of a research in Nigeria, which investigated rural internet service centers, indicate that most rural residents need to pass long distances to access telephone and Internet services, and adjacency to service centers persuades the residents to use ICT services [70]. Over the past few decades, Iran's rural roads have been developed and there is evidence of proper access for villagers to city and local markets. Additionally, rural ICT centers have been capable of presenting postal and banking services to villagers due to this access [35]. Accordingly, the following hypothesis is proposed:

Hypothesis 4. *Rural access affects villagers' intention to adopt e-marketing.*

3.5. Rural tourism

Tourism plays an important role in many rural economies throughout Europe. The European Commission suggests that tourist companies engage in digital tourism. This indicates digital support for the tourist from the beginning to the end of the journey. Engaging in digital tourism is realized when an Internet connection and the skill to use it exist. A research conducted in northern Scotland showed that broadband connectivity is essential for tourism e-marketing in remote geographical areas [71]. On the other hand, the village residents should be considered. This was studied in the Rural Tour Marketing Project related to Central Eastern Europe. For example, in a region of Istria, an investigation of residents' attitude toward rural tourism showed that villagers should have local cooperation in tourism planning so that tourism marketing can reach the appropriate economic goals [72]. In Asia, the results of the study conducted on China's regional tourism efficiency show that trade openness, climate change, and the intensity of market competition have caused increase in tourism efficiency. Additionally, at the regional level, average tourism efficiency in the east of China has been higher than in the center and the west [73]. In a study conducted on China's rural tourism, it was confirmed that the rural regions of eastern China had better conditions. Rural tourism is a kind of market driven industry in China and its prosperity is mainly dependent on the availability of a rural tourism market. What has attracted the attention of researchers is that besides the role of tourists and developers, the role of local farmers (as the cultural symbol) should also be considered in tourism development [74]. Rural tourism is developing in Iran and is highly appreciated. There are also websites and startups in this regard. The results have shown that the rural regions along the sea coast have better conditions for rural tourism. Since landowners are entering the online tourism market, the amount villagers earn from tourism and the extent to which they are willing to rent homes online should be considered. Understanding this will help us determine adoption [35]. So the following hypothesis can be proposed:

Hypothesis 5. *Rural tourism affects villagers' intention to adopt e-marketing.*

3.6. Agriculture

The rural household economy in smallholder communities is financed by agriculture. Results from several studies conducted in India have shown that the rural household economy affects adoption. For example, a research study was conducted on farmers who were users of e-Choupal. Findings showed that the economy of this group of farmers strongly affected their attitude generally and on technology adoption specifically. The authors stated that the information and knowledge presentation through ICT can improve the decision making process in the agricultural community [75]. In another study, researchers report that the economic power

Please cite this article as: S. J. Alavion and A. Taghdisi, Rural E-marketing in Iran; Modeling villagers' intention and clustering rural regions, Information Processing in Agriculture, https://doi.org/10.1016/j.inpa.2020.02.008

of Indian farmers is associated with energy-related technology adoption [76]. This result was also approved in Nigeria, indicating that there is a positive relationship between the enhancement of rural household economy and technology adoption. Technology adoption has also helped with poverty reduction [77]. In Bangladesh, evidence indicates that the economic power and ownership of farmers who are users of ICT affects their decisions in marketing. The farmers of the area under study (Jamalpur District) used mobile phone technology in their marketing affairs [78]. The share of agricultural business in Iran is more than 30% of the country's businesses. The new approach of the Ministry of Agriculture is moving from agriculture towards agribusiness. Business development was initiated a few years ago with participation of the public-private sector. By providing banking facilities, the government supplies a part of the cost and the remaining costs are supplied by the villagers. The villagers propose their plans; then, these plans are studied by authorities specializing in the field and after being approved, they are referred to the bank. Statistics show that 40 thousand local agriculture-related job creation plans have been approved. On the other hand, the private sector independently establishes agriculture startups. For example, "Keshmoon" is one of these startups purchasing saffron cultivated by the smallholder farmers in the east of Iran. So far, about 40 agriculture startups have started their activity. The success of startups that work in local areas in different geographical regions helps the development of online trading, and startup activity will affect villagers' decisions for adoption [35]. To show the relationship between Iran's agriculture and e-marketing, this hypothesis is proposed:

Hypothesis 6. *Agriculture affects villagers' intention to adopt e-marketing.*

3.7. Rural handicrafts

The researchers' studies in the rural handicrafts sector indicate that in the digital era, handicrafts have been an empowering source, especially for rural women. This issue has been confirmed in two major Asian countries (China and India), which have large rural communities. For example, in 2005, a website was launched in the state of Tamil Nadu for the sale of handicrafts made by rural women; also, SMIL (Savitri Marketing Institute for Ladies Empowerment) institute was founded in Pune city, which helps with marketing and the sale of the handicrafts made by women [79]. In China, one of the largest online sale websites (Taobao) has paved the way for the presence of women in e-commerce. The growth of female Taobao store owners and operators in rural China is an indicator of the presence of women in Chinese e-commerce [80]. A study conducted in the Sabah state of Malaysia, which pioneers handicraft production, showed that female entrepreneurs in handicrafts have proper management power in planning women's empowerment-related affairs. These results were obtained due to the implementation of a government project called GESPs (government entrepreneurial support programs) [81]. About 80% of the rural handicrafts in Iran is related to carpets and rugs, which are often woven by rural women [35]. This industry is an important factor in the rural entrepreneurship of the country, and its online presentation will be of paramount importance in enhancing local economy. Accordingly, this hypothesis is presented:

Hypothesis 7. *Rural handicrafts affect villagers' intention to adopt e-marketing.*

3.8. Rural population

The rural population that uses technology is on the rise all over the world. Among the technologies is the mobile phone which is of particular importance for villagers and farmers. Most of the next one billion mobile subscribers will likely be people who live in rural and poor areas [82]. A growing body of evidence shows that the digital gap between city and village is being reduced in terms of the technology user population. For example, in China, the computer is one of the six widely used electrical appliances whose penetration in rural household will be the same as it is in the urban household by 2050 [83]. In India, the number of villagers who have access to online services is on the rise and is expected to equal that of townspeople by 2021 [84]. Iran's mobile penetration rate stands at 94%. This rate of internet penetration paves the way for e-commerce development. Online purchase centers have close cooperation with Iran's National Post Company which is trying to increase its activities using new technologies. In a service called «track consignments», the sender and receiver can track consignments and receive updates of the latest state of the transfer [85]. This postal service is used in Iranian villages also. In addition to using postal services, villagers of all ages have been using e-banking services over the past two decades. Most villagers use mobile phones as their communication tool, and of course, also have access to email and social networks women [35]. Therefore, villages are now more prepared to join online trading. Accordingly the following hypothesis is proposed:

Hypothesis 8. *Rural Population affects villagers' intention to adopt e-marketing.*

4. Material and methods

4.1. Measurement

A questionnaire using the 5-point Likert scale with four parts was utilized (see Appendix A). In the first part, socio-cultural characteristics and diversity of economic activities in the village were discussed. The second part included twenty questions, based on the Model of Planned Behavior, of which eight questions were associated with behavioral beliefs, six questions with normative beliefs and six questions with control beliefs [14,22,36]. In the third part, rural economic geography was evaluated on the basis of seventeen questions, three of which were associated with rural access, three with rural tourism, three with agriculture, three with rural handicrafts and five with the rural population. Finally, in the fourth part, four questions related to villagers' intentions were asked [14,18,35,48,81].

With regard to the investigation of the content validity of the questionnaire, the content validity ratio (CVR = 0.87) and content validity index (CVI = 0.87) were determined by conducting a survey among experienced professors. Additionally,

Please cite this article as: S. J. Alavion and A. Taghdisi, Rural E-marketing in Iran; Modeling villagers' intention and clustering rural regions, Information Processing in Agriculture, https://doi.org/10.1016/j.inpa.2020.02.008

in some provinces, a preliminary examination was done with the aim of determining reliability, and the obtained results were acceptable. This stage lasted 2 months (October and November 2017). According to Table 3, the Cronbach's Alpha (CA) coefficients for all the variables are greater than 0.7, which indicates the reliability of the measures. Moreover, the average variance extracted (AVE) and the composite reliability (CR) for all the variables are more than 0.5 and 0.8, respectively, ensuring the convergent validity of the variables [86].

4.2. Questionnaire items

4.2.1. Behavioral beliefs

Behavioral beliefs were measured with 8 questions. Four questions were related to belief including the belief in the impact of e-marketing on income (B1), the belief in the impact of e-marketing on prevention of immigration (B2), the belief in the impact of e-marketing on youth and female employment (B3), and the belief in the impact of e-marketing on rural economy (B4). The other four questions were related to evaluation, which included evaluating the impact of online rental of village houses on income (E1), evaluating the impact of online sales of agricultural products on income (E2), evaluating the impact of online sales of handicrafts on income (E3) and evaluating the impact of establishing a local marketing company on income (E4) [14,36].

4.2.2. Normative beliefs

Normative beliefs were measured with six questions. Three questions were related to motivation and three to specific referents. The questions concerning motivation include: motivation in online sales of handicrafts (M1), motivation in online sales of agricultural products (M2), and motivation in online renting of rural houses (M3). The questions concerning specific referents include: the willingness of colleagues in the application of e-marketing (SR1), the willingness of the government in setting up e-marketing (SR2), and the willingness of villagers in the application of e-marketing (SR3) [14,22,36].

4.2.3. Control beliefs

Control beliefs were measured with six questions, two of which were related to self-efficiency, and four to facilitating measures. Questions of self-efficiency include mastering the computer and the Internet (SE1) and familiarity with online rural shopping sites (SE2). Questions of facilitating measures include the speed of rural Internet (FC1), cell phone reception (FC2), post bank support (FC3) and post office support (FC4) [14,36].

4.2.4. Rural access

Rural access contained 3 questions, including the access of villagers to ICT offices (RA1), the suitability of the distance between village and city (RA2) and the suitability of the road between the two (RA3) [35,48].

4.2.5. Rural tourism

Rural tourism contained three questions, including the earned income from rural tourism (RT1), tourist attractions of the region (RT2), and the possibility of renting rural houses online (RT3) [35,74].

Hypothesis 5. *Rural tourism affects villagers' intention to adopt e-marketing.*

4.2.6. Agriculture

Agriculture contained three questions, including the earned income from agricultural products (AG1), the diversity of agricultural products (AG2), and the potential for online sales of agricultural products (AG3) [18,35].

4.2.7. Rural handicrafts

Rural handicrafts contained three questions, including the earned income from rural handicrafts (RH1), the attraction of regional handicrafts (RH2) and the potential of online sales of handicrafts (RH3) [35,81].

4.2.8. Rural population

Rural population contained five questions considering the young population of ICT users (RP1), the population of middle aged and elderly people (RP2), the population of banking users (RP3), the population of postal users (RP4), and the population of telecommunications users (RP5) [35].

4.2.9. Intention

Intention was measured as the dependent variable, with four questions: the intention to continue work in ICT offices (I1), the intention to carry out online shopping in the e-marketing system (I2), the intention to sell online individually (I3), and the intention to sell online in a corporative manner (I4) [35].

4.3. Study area and sampling procedure

Iran is located in the Middle East on the continent of Asia. By the end of 2016, the number of villages with rural ICT centers (online villages) in the country was about 8100 [13]. Sample size estimation of the villagers working in ICT offices was based on the study of 10% (800) of the villagers. The sampling method was stratified sampling and each province was considered to be a stratum (the whole country consisted of 31 strata) (Fig. 5), and the share percentage of the questionnaires of each province was determined according to the number ICT offices across the country. Sample selection in each area was carried out in proportion to the activity of the ICT offices, the size and the population of the villages. From October 2017 to September 2018, over 1000 questionnaires were distributed in target villages with the cooperation of Iran Post Company. After completion, 988 questionnaires were collected.

4.4. Analytical method

Amos24 software was used for modeling. The difference in the testing method of this research and that of other Structural Equation Modeling (SEM) tests was that it was done with a two-step approach. Thus, at first, a complete model was drawn and the model fit was approved. In the second step, by eliminating paths that were not significant, the model was simplified. The Bootstrap method was used for mediation test. By using this method, the direct, indirect, and total effects can be recorded for the variables. Using this method is common in reporting mediation analyses [87]. This

Please cite this article as: S. J. Alavion and A. Taghdisi, Rural E-marketing in Iran; Modeling villagers' intention and clustering rural regions, Information Processing in Agriculture, https://doi.org/10.1016/j.inpa.2020.02.008

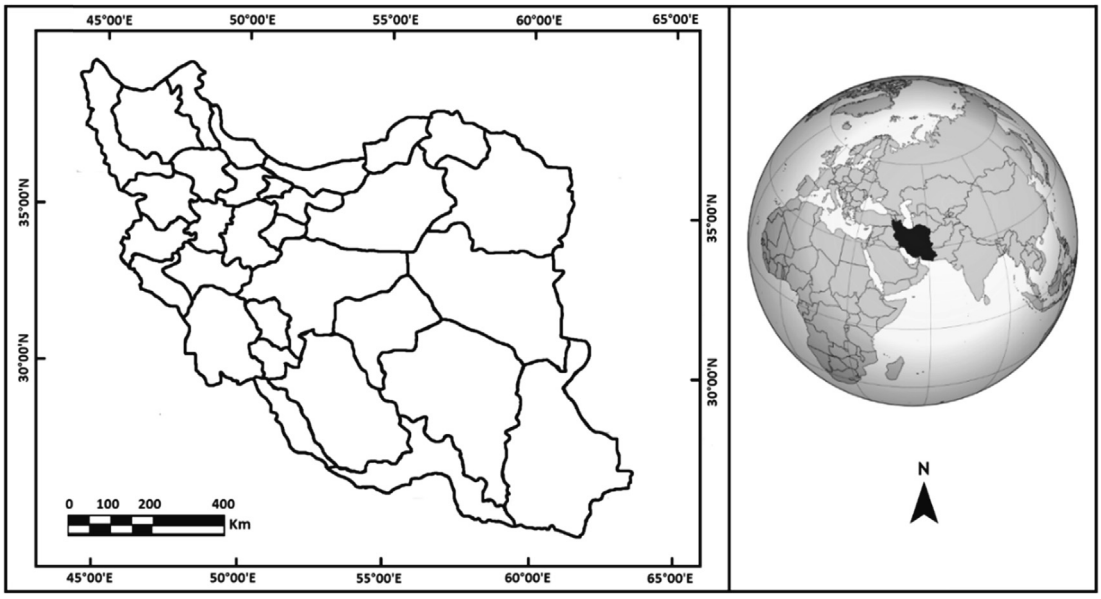


Fig. 5 – Research area under study.

method has also been used in studies related to adoption [88–90]. In this method, mediation effects are divided into partial and full mediation effects. Partial mediation refers to the situation in which direct and indirect effects are significant. However, full mediation refers to the situation in which the indirect effect is significant but the direct effect is not [91]. For the purpose of doing the test in Amos software, in View/Analysis Properties, under the Output tab, the box for Indirect, direct & total effects was checked and the model was run. Subsequently, the Estimates/Matrices option was double-clicked. Next, Indirect/ direct /total effects were selected [92].

Also, the k-means clustering was used in order to separate the rural areas, and the data was displayed on a scatter plot. A scatter plot is a kind of diagram showing the relationship between two series of data in the Cartesian coordinate system at several points; there are two numerical axes in this system. In this kind of plot, the points are characterized by two values: the first is the value of the horizontal axis, and the second shows the value of the vertical axis.

5. Results

5.1. *Social characteristics of respondents*

70% of the rural respondents were men, and 30%, women. Also, the highest frequency was in the 31–40 years old age group, which included 51%. 41% of the villagers working at rural ICT offices had a diploma and 59% a university degree. 20% of the people had work experiences of 5 years, 32% up to 10 years, 25% up to 15 years, 17% up to 20 years and 5.5% had had occupational activities for over 20 years. In association with the Transaction Services Model, 30% of villagers selected the Transaction Services Model in Tourism, 60% selected the Transaction Services Model in Selling Rural Products, and 10% selected both models. The communication tool used by about 49% of villagers was telephone contact and short message. Moreover, 28% used social networks, and 23% used telephone, short message, email, and social networks simultaneously (Table 1).

5.2. *Economic diversity of the studied villages*

The results of the diversity of agricultural products and economic activities in Iranian online villages (the villages studied in this research) are presented in Table 2. In terms of agricultural products, the main products include: Horticultural crops (40%), cereals crops (30%), and grains crops (12%). The rural handicrafts include the following: loom weaving (80%) and other types of weaving (20%). Tourism attractions include the following: natural attractions (51%), cultural attractions (29%), and food attractions (20%).

5.3. *Variables analysis results*

The behavioral and economic variables in the villages with ICT offices indicate that the overall status is satisfactory (Table 3). Villagers have a good understanding of e-marketing, and the economy of the target villages is ready to include online businesses.

In the case of the behavioral beliefs variable, the average villager's belief in the impact of rural e-marketing on preventing migration, improving youth employment and rural economy was between moderate to good. Moreover, respondents had similar evaluations about the impact of online sales of rural products and services on income.

In the case of the normative beliefs variable, the motivation for online sales of agricultural products (3.26 out of 5), the motivation for online sales of handicrafts (3.16) and the motivation for online tourism services (3.1%), indicated that respondents are motivated in these respects. In the case of specific referents that influenced the attitudes of villagers, the results showed that the use of technology by friends and family had the biggest influence (3.09 out of 5).

Please cite this article as: S. J. Alavion and A. Taghdisi, Rural E-marketing in Iran; Modeling villagers' intention and clustering rural regions, Information Processing in Agriculture, https://doi.org/10.1016/j.inpa.2020.02.008

Table 1 – Social characteristics of respondents.

Characteristics	Classifications	Percent
Gender	Female	30
	Male	70
Age (years)	20–30	19.2
	31–40	51.2
	41–50	25.3
	51–60	3.9
	61–70	0.4
Communication tool	Tel & sms	49
	Social networks	28
	Tel, sms & social networks	23
Education level	High school diploma	41.3
	University degree	58.7
Experience (years)	1–5	20.5
	6–10	32
	11–15	25
	16–20	17
	21–25	5.5
Transaction services model	model in tourism	30
	model in selling products	60
	Both models	10

Table 2 – The main rural products and services in the studied rural areas.

Rural products and services	Diversity of rural activities	Major products	Percent
Agriculture	Horticultural crops	Dried fruits and dates	40
	Cereals crops	Wheat, barley, and rice	30
	Grains crops	Bean, lentil, pea	12
	Spice crops	Saffron and barberry	10
	Animal products	Honey, sheep wool, egg	8
Handicrafts	Loom weaving	Carpet weaving and kilim weaving	80
	Other types of weaving	Crochet, needlework, mat weaving	20
Tourism	Natural tourism	Rivers, mountains and hills, gardens and plains	51
	Cultural tourism	Historical and ancient places and pilgrimage sites	29
	Food tourism	Dairy products, soups, bread, and cookies	20

In the instance of the control beliefs variable, computer and Internet mastery had a good score (3.84), but familiarity with online rural shopping sites was lower than average (2.78). The villagers had 3G and 4G Internet with good speed. Regarding the organizational support of ICT offices, the post office, post bank and telecommunications, performance was evaluated as being good.

In the instance of the rural economic geography variable, the findings showed that in the studied villages, the average income from agriculture was from moderate to good, but the average income from handicrafts and tourism was lower than moderate. Also, villages had suitable access to the city, and the villagers (from young to old) welcomed postal, banking and telecommunications services. Moreover, the decision to operate (buy or sell) in the rural e-marketing system was from average to high, which is satisfactory. Finally, the factor loading score also had acceptable weight (all scores were higher than 0.5).

5.4. *Model evaluation*

As mentioned in Section 3, the research model entitled "Geographic Model of Planned Behavior" (GeoTPB) is composed of the two models of planned behavior and rural economic geography. First, each model was separately evaluated. The results showed that the TPB model could predict 61% (Fig. 6), and the rural economic geography model could predict 54% of the villagers' intention to adopt e-marketing (Fig. 7). As seen in Fig. 8, in the Geo TPB mode (initial state), the covariance between the error terms was tested until the appropriate model fit was confirmed (CMIN/DF $\leq$ 3, GFI $\geq$ 0.95, CFI $\geq$ 0.95, NFI $\geq$ 0.95, TLI $\geq$ 0.95, RMSEA $\leq$ 0.05) [93]. The results of the model fit are reported in Table 4. Also, the squared multiple correlation was recorded up to 82%. Standardized total effects for all variables had a significance of less than 0.05 (Table 5).

So far, it has been shown that all eight variables affect the dependent variable and all eight hypotheses have been confirmed. However, of the eight independent variables, only two had a direct impact on intention, and six had an indirect relationship in the form of full mediation. This means that in the case of the six variables, a direct effect was not significant, but an indirect effect was. So, the model has non-significant paths.

To simplify the model, the paths that were not significant would have to be omitted. Thus, the p-value was checked

Please cite this article as: S. J. Alavion and A. Taghdisi, Rural E-marketing in Iran; Modeling villagers' intention and clustering rural regions, Information Processing in Agriculture, https://doi.org/10.1016/j.inpa.2020.02.008

Table 3 – Variable analysis results.

Variables		Items	Mean	SD	Variance	Factor loadings	CA	CR	AVE
Variables of Planned Behavior	Behavioral beliefs	B1	3.19	1.14	1.30	0.78			
		B2	3.07	1.21	1.47	0.74			
		B3	3.04	1.13	1.29	0.80			
		B4	3.21	1.12	1.27	0.83	0.91	0.94	0.82
		E1	2.80	1.20	1.46	0.73			
		E2	3.02	1.13	1.29	0.80			
		E3	3.12	1.14	1.30	0.78			
		E4	3.23	1.17	1.38	0.80			
	Normative beliefs	M1	3.16	1.15	1.32	0.84			
		M2	3.26	1.13	1.28	0.85			
		M3	3.10	1.24	1.62	0.81	0.88	0.91	0.76
		SR1	2.78	1.19	1.41	0.69			
		SR2	3.02	1.21	1.46	0.70			
		SR3	3.09	1.21	1.48	0.68			
	Control beliefs	SE1	3.84	0.90	0.82	0.59			
		SE2	2.78	1.09	1.19	0.57			
		FC1	3.63	1.07	1.16	0.69			
		FC2	3.59	1.14	1.30	0.69	0.89	0.92	0.73
		FC3	3.46	1.03	1.07	0.57			
		FC4	3.97	0.93	0.87	0.55			
Variables of Rural Economic Geography	Rural Access	RA1	3.85	0.95	0.91	0.72			
		RA2	3.56	0.87	0.76	0.71	0.81	0.87	0.71
		RA3	3.63	1	1	0.58			
	Rural tourism	RT1	2.27	1.46	2.15	0.53			
		RT2	3.01	1.16	1.35	0.68	0.83	0.85	0.68
		RT3	2.62	1.18	1.41	0.82			
	Agriculture	AG1	3.45	1.10	1.21	0.58			
		AG2	3.01	1.13	1.29	0.71	0.81	0.86	0.71
		AG3	3.08	1.12	1.26	0.76			
	Rural handicrafts	RH1	2.38	1.07	1.15	0.85			
		RH2	2.60	1.06	1.14	0.88	0.89	0.93	0.76
		RH3	2.72	1.18	1.41	0.76			
	Rural population	RP1	3.35	0.99	0.98	0.75			
		RP2	3.53	1.02	1.05	0.63			
		RP3	3.35	1.14	1.13	0.63	0.82	0.84	0.62
		RP4	3.33	1.02	1.04	0.78			
		RP5	3.53	1.12	1.26	0.65			
Dependent Variable	Intention	I1	3.84	1.07	1.16	0.57			
		I2	3.21	1.12	1.26	0.57	0.94	0.96	0.59
		I3	3.38	1.15	1.32	0.73			
		I4	3.29	1.23	1.15	0.69			

with Standardized Regression Weights. According to Table 6, twelve relationships were significant and Twenty-two relationships were eliminated.

Finally, the model was simplified (Fig. 9) and again it was implemented in software; new coefficients were determined and the causal order was drawn. The variables of Rural Economic Geography are on the left side, and the Planned Behavior model is on the right. The variables of the Rural Economic Geography model (other than the population) have only indirect influence on intention. In other words, they influence behavioral variables first. In the subsequent stage, behavioral variables influenced the intention; so, the model does not have partial mediation and the mediator explains part of the relationship. But there is full mediation, and the behavioral factor explains the whole relationship indicating its importance. Despite the removal of half of the model paths, squared multiple correlation was recorded up to 76% (Table 7).

5.5. *Results of k-means clustering*

In this section, Iran's rural areas were clustered based on behavioral and economic factors. The behavioral factor incorporated behavioral beliefs, normative beliefs, and control beliefs; rural access, rural tourism, agriculture, rural handicrafts and rural population constituted the economic factors. The k-means clustering was used in order to answer the research purpose. After several tests and drawing different scatter plots, we came to the conclusion that six clusters indicate the best provincial division of Iran's villages in relation to e-marketing (Fig. 10). In the anova table, the sig value indicates that all factors were significant (Table 8).

The result of clustering was that Sistan & Baluchestan, Hormoagan and Khouzestan provinces in cluster 1 were the leading regions in e-marketing adoption. Guilan, Mazandaran, Golestan, Alborz, South Khorasan, West Azerbaijan,

Please cite this article as: S. J. Alavion and A. Taghdisi, Rural E-marketing in Iran; Modeling villagers' intention and clustering rural regions, Information Processing in Agriculture, https://doi.org/10.1016/j.inpa.2020.02.008

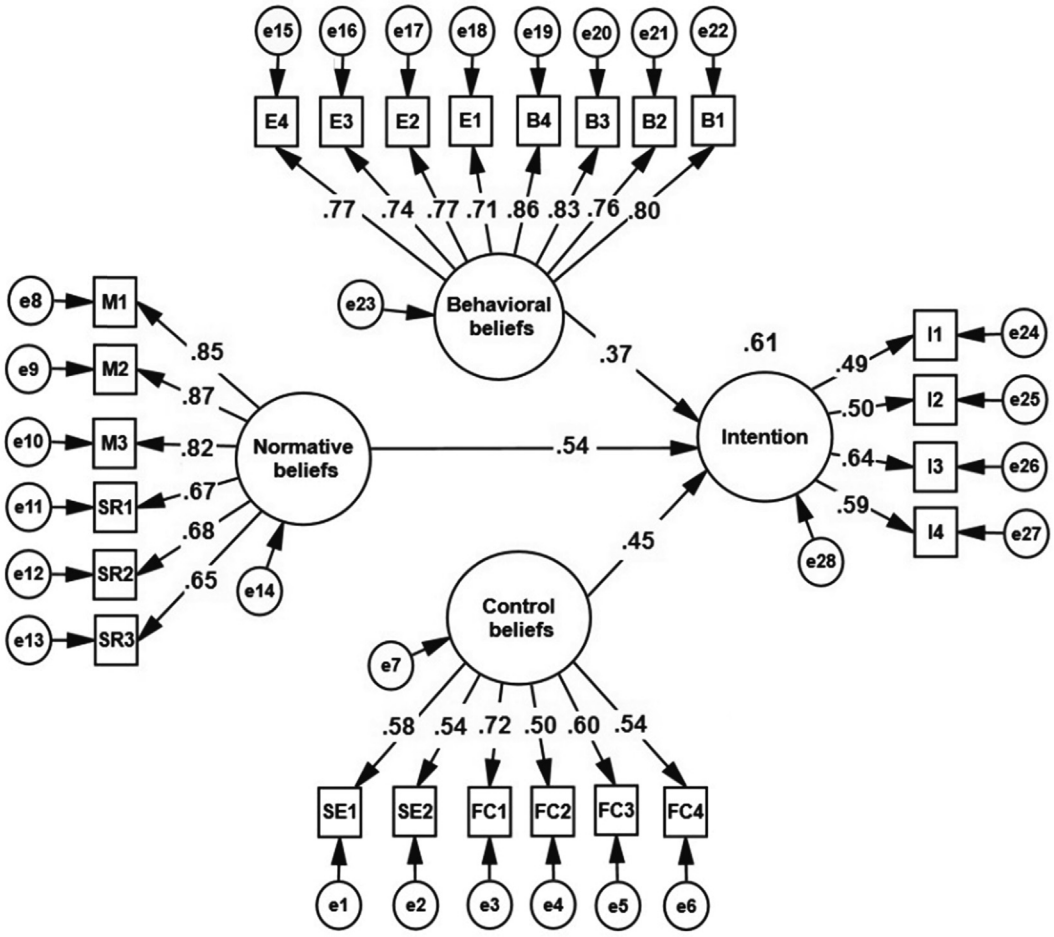


Fig. 6 – Planned Behavior Model for villagers' intention to adopt e-marketing.

Hamedan and Ilam provinces fell in cluster 2. Ardabil, East Azerbaijan, Zanjan and Qazvin provinces fell in cluster 3. Tehran, Qom, Markazi, Semnan, Yazd, Isfahan, Fars, Kerman, Razavi Khorasan and North Khorasan provinces fell in cluster 4. Kermanshah province fell in cluster 5. Kordestan, Lorestan, Kohgiluyeh & Boyer-Ahmad, Chaharmahal & Bakhtiari and Bushehr provinces fell in cluster 6 (Table 9).

The scatter plot showed that an increased economic factor leads to an increase in the behavioral factor; however, this correlation was not present in all clusters. Given the regression line, it is observed that the points around the line are not exactly centralized; therefore, this decentralization mitigates the severity of the relationship between the two factors. For instance, in cluster 3 (Ardebil, East Azerbaijan, Zanjan, and Qazvin provinces), the behavioral factor decreased with increase in the economic factor. Again, although cluster 5 (Kermanshah province) had a similar economic level to cluster 6 and similar behavioral levels were expected for both clusters, as observed, despite the low economic factor, cluster 5 had a higher behavioral factor. R^2 indicates that the economic factor clarifies 64% of the behavioral factor. Moreover, this coefficient also means that there is a relatively high correlation between the economic and behavioral factors (Fig. 11).

6. Discussion

6.1. Hypothesis discussion

Hypothesis 1.. *Behavioral beliefs had an indirect effect on villagers' intention to adopt e-marketing with a medium effect size (Total Effects = 0.439).* Although in the Main Model of Planned Behavior, behavioral beliefs have a direct effect on adoption, in the present study a direct effect was not observed, but rather, behavioral beliefs indirectly affected intention by influencing normative beliefs. This means that the positive attitude of villagers towards e-marketing boosts motivation and the motivated person will adopt technology. The indirect effect of behavioral beliefs on adoption has also been confirmed in studies such as the intention of Brazilian farmers in diversifying their agricultural products [44,61], and the adoption of green fertilizer technology amongst Malaysian paddy farmers [22].

Hypothesis 2.. *Normative beliefs had a direct effect on villagers' intention to adopt e-marketing with a large effect size (Total Effects = 0.676).* This variable had the biggest effect among all variables on villagers' intentions. The adoption of e-

Please cite this article as: S. J. Alavion and A. Taghdisi, Rural E-marketing in Iran; Modeling villagers' intention and clustering rural regions, Information Processing in Agriculture, https://doi.org/10.1016/j.inpa.2020.02.008

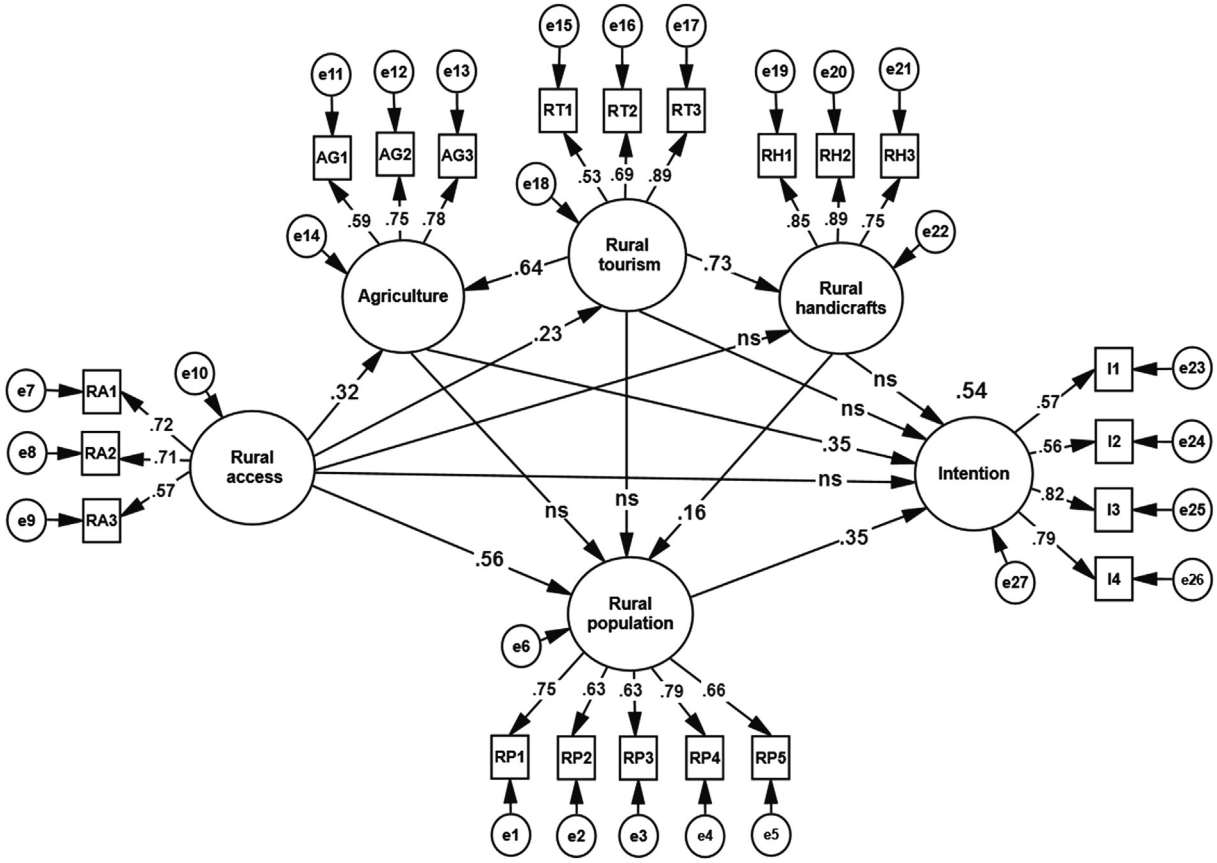


Fig. 7 – Rural Economic Geography Model for villagers' intention to adopt e-marketing.

marketing by farmers in northern Iran [14] also confirmed this result as did the adoption of innovation by farmers in northwestern Iran [94]. In addition, the influence of normative beliefs on farmers' intention to adopt improved natural grasslands in Brazil is also consistent with the results of the study [43]. In the villages of Iran, the impact of behavioral variables as a full mediation factor in the adoption of technology is very important. Accordingly, it can be said that the studied villages are equipped with ICT offices and have a much smaller digital gap compared to the city. But Chinese researchers stated that the effect of behavioral variables in the adoption of technology was low, due to the traditional structure of the villages studied at that time [19].

Hypothesis 3.. *Control beliefs had an indirect effect on villagers' intention to adopt e-marketing with a medium effect size (Total Effects = 0.217).* The control beliefs of villagers affected their motivation. This means that the more skilled the villager, the greater the support they receive from the government for ICT, and consequently, the higher the motivation they have for technology adoption. The positive impact of government support for ICT centers has also been confirmed by other studies performed in Iran [95,96]. In China also, a study was conducted that shows the indirect effect of government support on behavioral and social variables is effective in technology adoption [21]. But there are some studies that are not consistent with the results of this study. For example, control beliefs did not affect the adoption of soil conservation practices by Belgium farmers [45] and the effect of behavioral control on the attitudes of Ethiopian farmers toward sustainable agricultural practices was not confirmed [46].

Hypothesis 4.. *Rural access had an indirect effect on villagers' intention to adopt e-marketing with a large effect size (Total Effects = 0.541).* In the present study, rural access is the starting point in reaching the adoption of technology. The importance of rural access is that it affects villagers' intention and influences all variables of the model (direct or indirect). Since one-third of the Iranian population lives in villages, it is of great importance to pay attention to roads and rural access. Currently, there are about 200,000 km of rural roads which is four times that of three decades ago. The reports of the Statistical Center of Iran indicate that economic growth rate has increased in villages with roads [97]. Regional studies on villages in different areas (desert, forest, or metropolitan margins) confirm that the rural road is one of the factors of urban-rural reciprocal interaction and has helped the improvement of employment and income [89,98,99]. Thus, the conducted studies confirm the research model for the effect of rural access on economy (agriculture and tourism). In relation to the effect of rural access on adoption, a study was conducted in northern Iran reporting that rural access has had an important role in the adoption of technology by villagers, which is consistent with the research model [49]. One of the important

Please cite this article as: S. J. Alavion and A. Taghdisi, Rural E-marketing in Iran; Modeling villagers' intention and clustering rural regions, Information Processing in Agriculture, https://doi.org/10.1016/j.inpa.2020.02.008

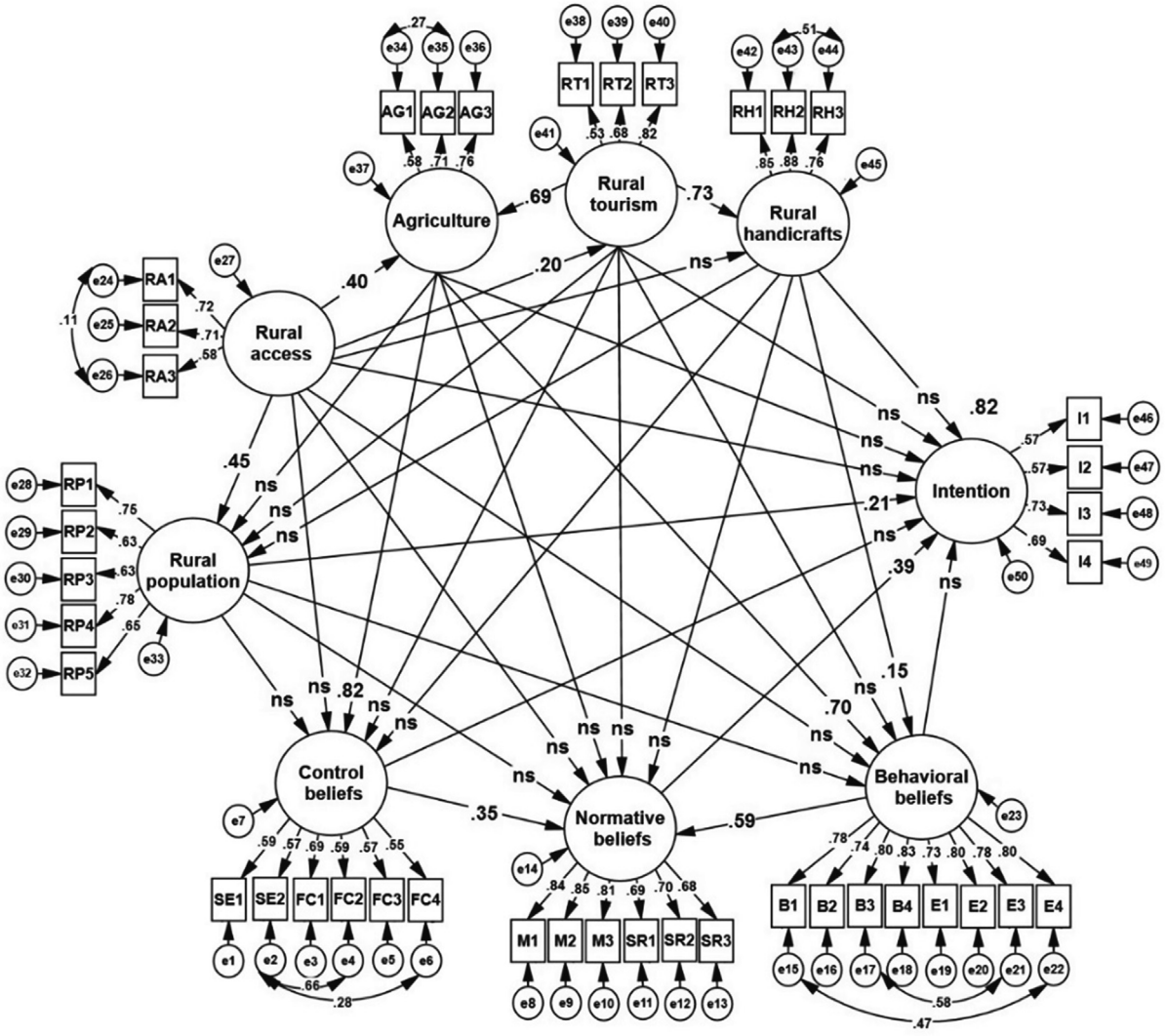


Fig. 8 – GeoTPB Model (initial version).

Table 4 – Model fit summary.

Model	CMIN/DF	GFI	RMSEA	Baseline Comparisons		
				NFI	TLI	CFI
Model of Planned Behavior	2.872	0.971	0.041	0.959	0.947	0.972
Model of Rural Economic Geography	2.881	0.947	0.053	0.947	0.956	0.961
Geographic Model of Planned Behavior	2.982	0.953	0.048	0.952	0.963	0.955

reasons for the positive impact of road construction on adoption was that the telecommunications network was strengthened and rural ICT centers were established due to the ease of transport between city and village. These centers strengthened the attitude of the local residents towards E-marketing by enabling Internet and E- banking services.

Hypothesis 5.. *Rural tourism had an indirect effect on villagers' intention to adopt e-marketing with a medium effect size (Total Effects = 0.289).* Thus, if rural tourism in Iran flourishes, it will have a positive effect on the agriculture and handicrafts of the region, and consequently, lead to rural intention by affecting the behavioral variables. The direct effect of tourism on the economy of villages [100] and its indirect effect on the behavior of Iranian villagers have been shown [35]. In Germany also, it was found that the spatial features of new villages helped the increase of tourism and income and affected the villagers' behavior [58]. The tourist attractions of the studied villages include 51 percent natural attractions (rivers, mountains, hills, gardens, and plains), 29 percent site attractions (historical, ancient, and pilgrimage sites), and 20 percent food tourism. On a national level, about 1000 tourist villages have been registered in recent years, and hundreds

Table 5 – Results of geographic model of planned behavior (initial state).*

Geographic model of planned behavior	Hypotheses	Direct effects (significance)	Indirect effects (significance)	Total effects (significance)	Relationship	Conclusion
Model of Planned Behavior	H1: Behavioral beliefs → Intention	0.388	0.002	0.003	Full Mediation	Supported
	H2: Normative beliefs → Intention	0.002	–	0.002	Direct Effect	Supported
	H3: Control beliefs → Intention	0.120	0.006	0.010	Full Mediation	Supported
Model of Rural Economic Geography	H4: Rural access → Intention	0.947	0.003	0.002	Full Mediation	Supported
	H5: Rural tourism → Intention	0.710	0.032	0.006	Full Mediation	Supported
	H6: Agriculture → Intention	0.303	0.009	0.011	Full Mediation	Supported
	H7: Rural handicrafts → Intention	0.586	0.006	0.049	Full Mediation	Supported
	H8: Rural population → Intention	0.024	0.951	0.024	Direct Effect	Supported

*squared multiple correlation: 0.82.

of ecotourist guest houses have been created for accommodation of tourists [97]. These guest houses have the capacity for cultural, natural and food tourism. On the other hand, the villagers' own homes are also suitable for hosting the tourists. As stated in the results, in the research model, tourism has had a direct effect on agriculture and handicrafts. Concerning the relation between tourism and agriculture, agritourism can be mentioned. Regional studies have shown that in recent years, agritourism has attracted the attention of tourists in rural regions of Iran. In this type of tourism, tourists cooperate with the villagers in agricultural activities while residing in the villages, and become familiarized with the farms. Studies on this type of tourism have been carried out in the east [101] and in the south Alborz regions [102]. The relation of tourism and agriculture motivates villagers to enhance their agricultural activities. Also, signs of the relation between tourism and handicrafts suggest that tourism in rural regions (especially in the central and southeast areas) has helped the development of the latter. Finally, the villagers' familiarity with the e-commerce websites has facilitated the effect of rural tourism on adoption. By presenting the images of, and giving information about, available houses and proposing the rents, these websites enable people to do tourism marketing easily all over the country.

Hypothesis 6.. *Agriculture had an indirect effect on villagers' intention to adopt e-marketing with a medium effect size (Total Effects = 0.424).* Consistent with the results of the present study, this proposition has also been reported for Saffron farmers in eastern Iran [33], flower and ornamental plant growers in the southern Alborz region of Iran [103], and wheat farmers in western Iran [104]. The impact of agriculture and horticulture on the adoption of e-marketing by Belgian villagers has been confirmed [105]. Also, a study conducted in the United States showed that the agricultural potential and spatial factors of the village were effective on farmers' intention [106]. Over 70% of the agricultural production of the studied villages in this research includes horticultural and grain crops; 40% of the horticultural crops includes dry fruits and nuts and date palms, 30% grains (wheat, rice and buds) and 12% beans (beans, lentils and peas). This means that villages are better prepared for online sales of this group of products. The government should make macro investments on a national level for development of agribusiness. Since online trading in agriculture is so different from handicrafts and tourism, most consumers of agricultural products prefer to make purchases in person so as to make sure of product quality beforehand. Obviously, quality checks are not possible in online trading. The solution to gaining customer trust and monitoring various issues such as packing, quality standards, storage, and education can be resolved by government policies and the intervention of certain ministries. In summary, if we hope to increase the share of agriculture in gross domestic production in the upcoming decades and provide the possibility of a favorable income for villagers, online trading in agriculture should be considered as a priority in government plans. If all goes well, Iranian farmers and villagers will properly adopt this new kind of business.

Please cite this article as: S. J. Alavion and A. Taghdisi, Rural E-marketing in Iran; Modeling villagers' intention and clustering rural regions, Information Processing in Agriculture, https://doi.org/10.1016/j.inpa.2020.02.008

Table 6 – Standardized regression weights.

Path	Estimate	p-value
Rural access → Intention	−0.010	0.903
Rural access → Rural population	0.447	***
Rural access → Agricultural	0.396	***
Rural access → Rural tourism	0.203	***
Rural access → Rural handicrafts	0.017	0.717
Rural access → Behavioral beliefs	0.015	0.667
Rural access → Normative beliefs	0.057	0.787
Rural access → Control beliefs	0.037	0.321
Agricultural → Intention	0.149	0.366
Agricultural → Rural population	−0.139	0.392
Agricultural → Normative beliefs	−0.054	0.657
Agricultural → Behavioral beliefs	0.696	***
Agricultural → Control beliefs	0.821	***
Rural population → Intention	0.212	0.006
Rural population → Normative beliefs	−0.057	0.294
Rural population → Behavioral beliefs	0.082	0.192
Rural population → Control beliefs	0.082	0.192
Rural tourism → Intention	0.059	0.651
Rural tourism → Agricultural	0.695	***
Rural tourism → Rural handicrafts	0.733	***
Rural tourism → Normative beliefs	0.077	0.474
Rural tourism → Behavioral beliefs	−0.112	0.360
Rural tourism → Control beliefs	−0.482	0.125
Rural tourism → Rural population	0.244	0.110
Rural handicrafts → Intention	−0.041	0.546
Rural handicrafts → Rural population	0.081	0.297
Rural handicrafts → Normative beliefs	0.094	0.132
Rural handicrafts → Behavioral beliefs	0.151	0.027
Rural handicrafts → Control beliefs	0.191	0.240
Normative beliefs → Intention	0.392	***
Behavioral beliefs → Normative beliefs	0.592	***
Behavioral beliefs → Intention	0.091	0.291
Control beliefs → Intention	0.221	0.426
Control beliefs → Normative beliefs	0.354	***

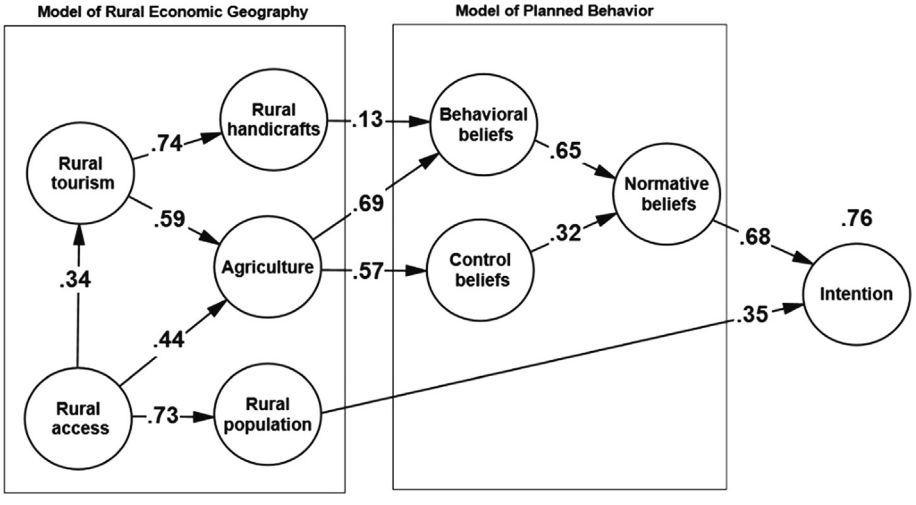


Fig. 9 – GeoTPB Model (modified version).

Hypothesis 7.. *Rural handicrafts had an indirect effect on villagers' intention to adopt e-marketing but with a small effect size (Total Effects = 0.055).* Among all the variables, this had the smallest effect. However, Iranian village handicrafts such as carpets are known nationally and internationally. The research findings showed that nearly 60% of the handicrafts of the studied villages were carpets and rugs. The research model indicated that rural handicrafts are greatly influenced

Please cite this article as: S. J. Alavion and A. Taghdisi, Rural E-marketing in Iran; Modeling villagers' intention and clustering rural regions, Information Processing in Agriculture, https://doi.org/10.1016/j.inpa.2020.02.008

Table 7 – Results of geographic model of planned behavior (modified state)*.

Geographic Model of Planned Behavior	Hypotheses	significance	standardized total effects	Effect size	Relationship	Conclusion
Model of Planned Behavior	H1: Behavioral beliefs → Intention	0.003	0.439	Medium	Indirect	Supported
	H2: Normative beliefs → Intention	0.004	0.676	Large	Direct	Supported
	H3: Control beliefs → Intention	0.004	0.217	Medium	Indirect	Supported
Model of Rural Economic Geography	H4: Rural access → Intention	0.003	0.541	Large	Indirect	Supported
	H5: Rural tourism → Intention	0.002	0.289	Medium	Indirect	Supported
	H6: Agriculture → Intention	0.004	0.424	Medium	Indirect	Supported
	H7: Rural handicrafts → Intention	0.018	0.055	Small	Indirect	Supported
	H8: Rural population → Intention	0.003	0.355	Medium	Direct	Supported

*squared multiple correlation: 0.76.

by rural tourism (β = 0.74). However, they have remained in the traditional trading environment and, given the small effect they have on villagers' intention, do not have the appropriate condition for online sales. The research done on handicrafts in India showed that they need much manipulation to gain acceptable results in the competitive market [107]. Four hundred and fifty thousand Iranian people, of which 75% are females, are formally active in the field of Iranian handicrafts. Over the last few years, the condition of handicrafts has improved somewhat in terms of organization, and expanding e-commerce has been aimed at. In the past, there were a limited number of handicraft e-commerce websites, but nowadays, e-sales of handicrafts fares better, and almost 200 websites and online businesses are selling handicrafts online [97].

Hypothesis 8.. ***Rural population had a direct effect on villagers' intention to adopt e-marketing with a medium effect size (Total Effects = 0.355).*** As stated, the rural population means the population of ICT users. Interestingly, the population of rural ICT users did not affect the behavioral variables. Reports indicate that the rural populations residing in ICT centers in Iran are technology users and well familiar with the Internet and smart phones, and population variables can facilitate online business adoption without affecting behavioral variables [35]. This is contrary to the findings obtained from certain villages in China, which state that rural populations are effective on individual behavioral variables and thereby affect the adoption of mobile phone technology [19]. To discuss this issue more clearly, in our research, rural population refers to the potential of a population for the use of technology; thus, if there is a village in Iran where most residents deal with ICT (Internet banking, smart phone services, online postal systems), it is a good sign of the residents' readiness to adopt e-marketing, and it is not crucial to investigate the behavioral variables (behavioral beliefs and control beliefs) to determine the feasibility of e-marketing. However, this claim is not true about the other variables of rural economic geography (tourism, agriculture, and handicrafts); in other words, if a village in Iran has a good economy, its effect on behavioral variables should be tested.

6.2. *Clustering discussion*

The results showed that the geographical factor affected the behavioral factor. To explain this issue, we can refer to Zhang's finding, indicating that the geographical space of villages in the e-commerce era has become a catalyst changing the economic behavior of its inhabitants [59]. Other results show that provinces with similar climates have similar statistics (Fig. 12). In cluster analysis in USA in relation to ICT utilization, it was shown that geography had been effective on utilization of technology [108]. Interestingly, in our study, the highest average of e-marketing adoption was in provinces that are registered as less-developed villages in official statistics reports and this showed that technological development has been effective on the digital literacy of the residents. 31 instances of clustering for provincial regions in China in rela-

Please cite this article as: S. J. Alavion and A. Taghdisi, Rural E-marketing in Iran; Modeling villagers' intention and clustering rural regions, Information Processing in Agriculture, https://doi.org/10.1016/j.inpa.2020.02.008

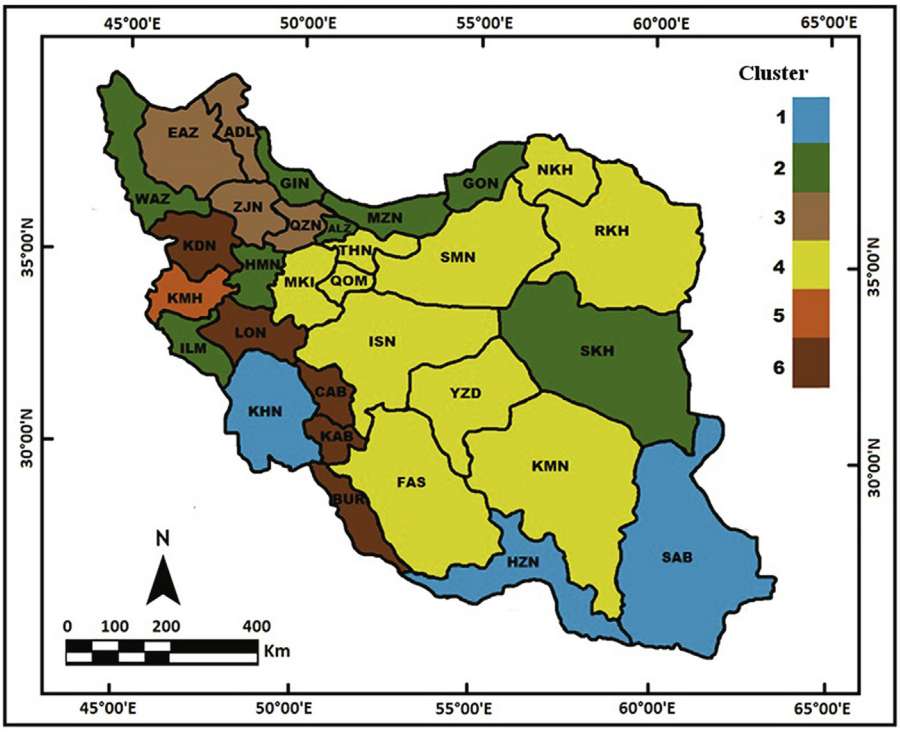


Fig. 10 – Map of provincial clustering of villages.

Table 8 – Anova results.

Factor	Cluster		Error		F	Sig
	Mean Square	df	Mean Square	df		
Economic Factor	111.801	15	0.145	25	150.621	0.0000
Behavioral Factor	107.378	15	0.612	25	175.590	0.0000

Table 9 – Provincial clustering of villages.

Cluster	Cluster centers		Province
	Behavioral factor	Economic factor	
1	70.67	56.03	Sistan & Baluchestan (SAB), Hormozagan (HZN), Khouzestan (KHN)
2	65.17	53.47	Guilan (GIN), Mazandaran (MZN), Golestan (GON), Alborz (ALZ), South Khorasan (SKH), West Azerbaijan (WAZ), Hamedan (HMN), Ilam (ILM)
3	56.49	52.43	Ardabil (ADL), East Azerbaijan (EAZ), Zanjan (ZJN), Qazvin (QZN)
4	60.66	51.51	Tehran (THN), Qom, Markazi (MKI), Semnan (SMN), Yazd (YZD), Isfahan (ISN), Fars (FAS), Kerman (KMN), North Khorasan (NKH), Razavi Khorasan (RKH)
5	62.73	49.21	Kermanshah (KMH)
6	58.09	49.54	Kordestan (KDN), Lorestan (LON), Chaharmahal & Bakhtiari (CAB), Kohgiluyeh & BoyerAhmad (KAB), Boushehr (BUR)

tion to rural inequality verify our results as regards the effect of human resource training in rural districts [109]. Our results showed that the most susceptible provinces in executing e-marketing designs were rural districts with ICT offices in the southern parts (Khouzesran, Hormozgan and Sistan & Baluchestan provinces). Equipping the villages of these regions with ICT offices caused economic improvement and this improved the views and behavior of residents in relation to technology adoption. Studies done on technology adoption in this region [63,110,111] verify the results of our research. In cluster 2, the rural districts were in the northern parts (Guilan, Mazandaran and Golestan provinces), the rural areas of south Alborz (Alborz provinc), the eastern parts of the country (South Khorasan provinc), the northwest (West Azerbaijan

Please cite this article as: S. J. Alavion and A. Taghdisi, Rural E-marketing in Iran; Modeling villagers' intention and clustering rural regions, Information Processing in Agriculture, https://doi.org/10.1016/j.inpa.2020.02.008

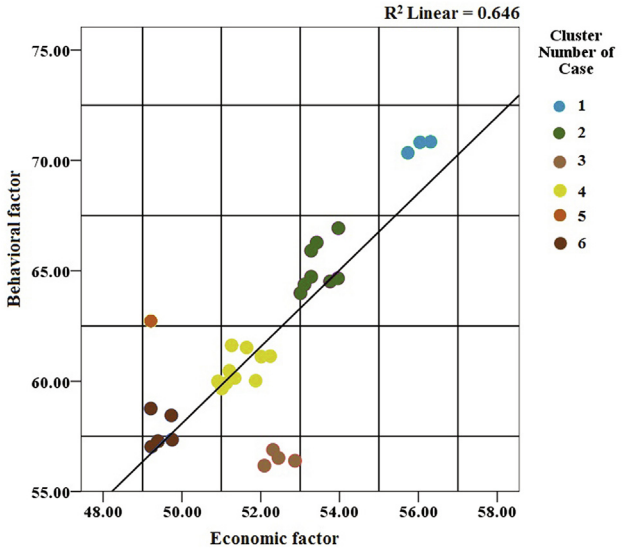


Fig. 11 – Scatter plot.

provinc), and the west (Ilam and Hamedan provinces). Studies that were done in the north [25,112] and west of Iran [29] verify technology adoption in these regions. However, in this study, there was a notable point in cluster 3. Although it had a behavioral factor higher than the behavioral factors of clusters 4, 5 and 6, it had a low behavioral factor; in other words, no correlation was observed between economic and behavioral factors in cluster 3. The analysis of ICT utilization in Central European enterprises [113] showed that there was a correlation between economic condition and geographical region which is in contrast to the results related to the northwest of Iran. In cluster 4 that covers much of the country's rural districts and is situated in desert and semiarid climates, the conditions were similar and at an average level; proper readiness for the adoption of e-marketing was not observed. The weakest economic and behavioral conditions in relation to rural e-marketing (clusters 5 & 6) were seen in the adjacent provinces of Zagros (Lorestan, Kohgiluyeh and Boyer-Ahmad, Chaharmahal and Bakhtiari, Kordestan and Kermanshah provinces). Clustering studies of 47 provinces of Japan on ICT utilization [114] showed that topographic barriers lead to a digital divide that is in line with the results of this research.

7. Conclusion

The innovation of the current research is in using a combined model (behavioral and geographical) to adopt rural technology, which has presented a better understanding of adoption. Additionally, a two-stage structural equation modeling approach was used, which means that since the model was large and complicated, in the first stage, the non-significant paths were removed, and in the second stage, the model was simplified and proposed with the significant paths.

The initiator of villagers' intention in the model is rural access that influences the rural population (β = 0.73) which in turn has a direct effect on intention (β = 0.35). Also, rural access promotes agriculture (β = 0.44) and tourist visits to villages (β = 0.34). Tourism will help in selling agricultural products (β = 0.59) and handicrafts (β = 0.74). Although income from handicrafts has a very small effect on the behavioral beliefs of the villagers (β = 0.13), agriculture in contrast, has an appropriate effect on behavioral beliefs (β = 0.69) and control beliefs (β = 0.57). Ultimately, behavioral and control beliefs

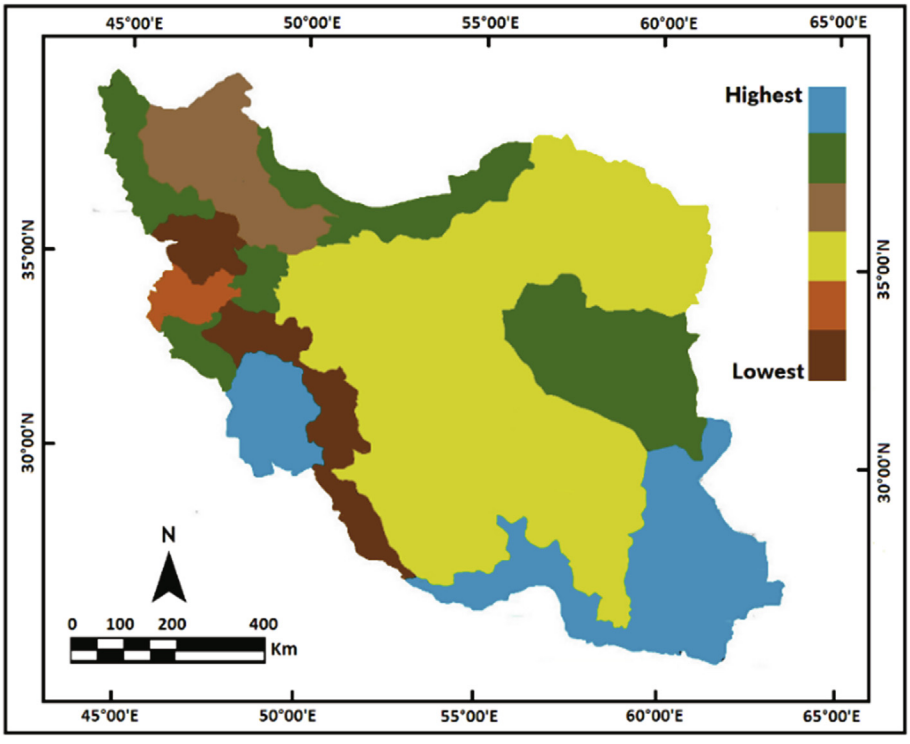


Fig. 12 – Rural climatic separation based on behavioral-economic factors.

Please cite this article as: S. J. Alavion and A. Taghdisi, Rural E-marketing in Iran; Modeling villagers' intention and clustering rural regions, Information Processing in Agriculture, https://doi.org/10.1016/j.inpa.2020.02.008

affect normative beliefs which result in intention with considerable effect (β = 0.68).

Generally, rural economic variables had a direct effect (64%) on behavioral variables, and subsequently, behavioral variables (as full mediation) influenced adoption. In other words, the behavioral factor had a more important role. This model predicted 76% of villagers' intention on e-marketing adoption and the remaining 24% is related to variables that were not considered in the research, variables which should necessarily be considered in future research. Also, it should be noted that the highest average of e-marketing adoption was in provinces that are registered in official statistics reports as less developed villages. This showed that technology development has been effective on the digital literacy of these regions. The placement of less-developed provinces in a superior cluster confirmed that research on behavioral geography is very important in programming for rural e-marketing.

In the final conclusion of the research and in connection with Rural ICT in the world (especially in developing countries), it is noteworthy that in the new age, and the so-called Fourth Industrial Revolution, digital technologies are creating new opportunities [50] and national policies play an important role in the digital development of countries. Seemingly in today's world, different political systems with various geographic dispersions have been able to achieve success in the area of ICT. For example, reports suggest that, considering the surplus value index of ICT services, the top 10 economies from the western hemisphere (the United States and the European Union) to the eastern hemisphere (India and China) [115] have achieved good results by employing ICT in different economic sectors (including the agricultural and rural sectors). Online villages are one of these achievements. Online villages have been locally established with different systems depending on the needs of the geographic area. Taobao in China, E-Choupal in India and rural digital hubs in Europe, are examples of the online villages that were launched natively, according to the needs of each geographic region, and provided e-commerce. Given the high risk of rural e-commerce, it is perhaps better if the government takes control of the implementation of national projects in this sector. However, if the government does not have sufficient financial resources, then it is necessary to use the private sector's capacity and the government is responsible in terms of a regulatory role.

8. Suggestions

8.1. *The necessity to pay attention to behavioral economic studies in academic research and government planning*

If the economic results of the Statistical Yearbook of Iran are reviewed, or the research studies conducted to classify rural regions based on the Employment and Human Development Index are investigated, the result will be the placement of southern provinces such as Sistan and Hormozgan as the most deprived areas, while in the current research, conducted based on behavioral geography, these two provinces appeared foremost. It is suggested that researchers and government planners consider models of behavioral geography.

8.2. *Pilot provinces in implementation of rural e-marketing*

Considering that, according to the five-year development plan, the government is going to provide employment programs in thousands of the country's villages to strengthen the rural economy, if the decision is made to operationalize rural e-marketing, it is suggested that the pilot provinces in order of priority are in Sistan and Hormozgan. Results showed that villages with active ICT offices in these provinces have the best conditions for implementation of such projects. Additionally, priority had better be given to villages with proper access and a population of technology users.

8.3. *Rural Transaction Services Model as the basis of a national business*

Considering the government's objective in rural business development of providing occupational opportunity in villages, it is suggested that the Transaction Services Model which has been welcomed by villagers be used as the basis of a national business and its related facilities be provided.

Funding

This paper was supported by the "Iran National Science Foundation" (INSF) Grant No. 96001269.

Declaration of Competing Interest

The author declare that there is no conflict of interest.

Acknowledgements

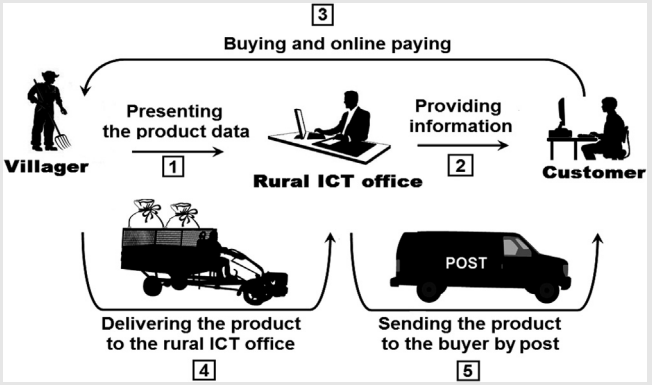
This paper is part of a PhD thesis. The authors declare their gratitude to Iran Post Company and the villagers who helped us in the distribution and completion of the survey. We are also very thankful to the anonymous reviewers for their critical and constructive comments, which greatly improved the quality of the paper.

Appendix A

GeoTPB questionnaire

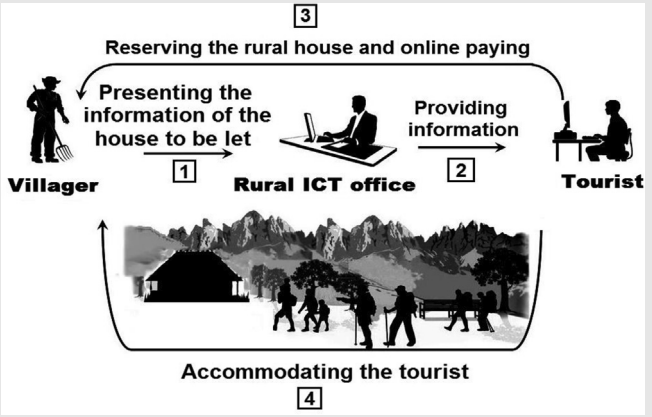
Province? . . . . . Age? . . . . . .
Gender? . . . . . Work experience in year? . . . . . .

Out of the two rural marketing models, which one do you think is suitable for your village?
Transaction Services Model to sell products ☐In the transaction services model, in order to sell products, villagers open an account in the rural post-bank branch, and then the data for crops or handicrafts is registered by paying a fee. After the customer visits the website and chooses the product, online payment is done and the money is deposited to the villager's account and a short message is sent to the villager to deliver the product to the rural ICT office. Finally, the office sends the product by post to the customer.



Education level? High school diploma ☐ University degree ☐
Communication tool? Tel & SMS ☐ Social networks ☐ Tel & SMS & Social networks

Transaction Services Model to rent rural houses ☐In the Transaction Services Model, in order to rent rural houses, the village residents open an account in the rural post-bank branch upon obtaining a tourism license, and after paying a fee, they request to register the information of the house to be let. On the other hand, after visiting the website and choosing the desired house, the tourist will pay the rent online and the money is deposited to the villager's account at the Post Bank and a short message is sent to the villager to prepare the house for tourist accommodation.



Please name the agricultural production of the village (crops and dry fruits).
Please name the villagers' main handicrafts.
Please name the tourism attractions of the village.

Please cite this article as: S. J. Alavion and A. Taghdisi, Rural E-marketing in Iran; Modeling villagers' intention and clustering rural regions, Information Processing in Agriculture, https://doi.org/10.1016/j.inpa.2020.02.008

Part 2 – Model of planned behavior

	Belief	None (Not at all)	Low	Moderate	High	Very high (Certainly)
Behavioral Beliefs	B1: How much do you believe in the positive impact of e-marketing on villagers' income?	☐	☐	☐	☐	☐
	B2: How much do you believe in the positive impact of e-marketing on prevention of immigration?	☐	☐	☐	☐	☐
	B3: How much do you believe in the positive impact of e-marketing on youth and female employment?	☐	☐	☐	☐	☐
	B4: How much do you believe in the positive impact of e-marketing on rural economy?	☐	☐	☐	☐	☐
	Evaluation					
	E1: What is your evaluation of the impact of online rental of village houses on villagers' income?	☐	☐	☐	☐	☐
	E2: What is your evaluation of the impact of online sales of agricultural products on villagers' income?	☐	☐	☐	☐	☐
	E3: What is your evaluation of the impact of online sales of handicrafts on villagers' income?	☐	☐	☐	☐	☐
	E4: What is your evaluation of the impact of establishing a local marketing company on villagers' income?	☐	☐	☐	☐	☐
Normative Beliefs	Motivation					
	M1: How much motivation do you have for online sales of the village's handicrafts?	☐	☐	☐	☐	☐
	M2: How much motivation do you have for online sales of agricultural products?	☐	☐	☐	☐	☐
	M3: How much motivation do you have for online renting of rural houses?	☐	☐	☐	☐	☐
	Specific referents					
	SR1: How willing are your colleagues to use e-marketing?	☐	☐	☐	☐	☐
	SR2: How willing is the government to set up e-marketing?	☐	☐	☐	☐	☐
	SR3: How willing are the villagers to use e-marketing?	☐	☐	☐	☐	☐
Control Beliefs	Self-efficacy					
	SE1: How capable are you at Internet and computer skills?	☐	☐	☐	☐	☐
	SE2: How familiar are you with online rural shopping websites?	☐	☐	☐	☐	☐
	Facilitating conditions					
	FC1: How fast are Internet connections in your village?	☐	☐	☐	☐	☐
	FC2: How good is cell phone reception in your village?	☐	☐	☐	☐	☐
	FC3: How much support does the ICT office get from the post bank?	☐	☐	☐	☐	☐
	FC4: How much support does the ICT office get from the post?	☐	☐	☐	☐	☐

Please cite this article as: S. J. Alavion and A. Taghdisi, Rural E-marketing in Iran; Modeling villagers' intention and clustering rural regions, Information Processing in Agriculture, https://doi.org/10.1016/j.inpa.2020.02.008

Part 3 – Model of rural economic geography

		None (Not at all)	Low	Moderate	High	Very high (Certainly)
Rural Access	RA1: How suitable is the villagers' access to the rural ICT office?	☐	☐	☐	☐	☐
	RA2: How suitable is the distance between the village and the city?	☐	☐	☐	☐	☐
	RA3: How suitable is the road between the village and the city?	☐	☐	☐	☐	☐
Rural Tourism	RT1: How much is the income earned from rural tourism?	☐	☐	☐	☐	☐
	RT2: How high is the level of the region's tourist attractions?	☐	☐	☐	☐	☐
	RT3: What is the potential of your village for renting out rural houses online?	☐	☐	☐	☐	☐
Agriculture	AG1: How much is the income earned from agricultural products?	☐	☐	☐	☐	☐
	AG2: How diverse are the village agricultural products?	☐	☐	☐	☐	☐
	AG3: What is the potential of your village for online sales of agricultural products?	☐	☐	☐	☐	☐
Rural Handicrafts	RH1: How much is the income earned from rural handicrafts?	☐	☐	☐	☐	☐
	RH2: How high is the attraction level of regional handicrafts?	☐	☐	☐	☐	☐
	RH3: What is the potential of your village for online sales of handicrafts?	☐	☐	☐	☐	☐
Rural Population	RP1: How young is the rural ICT users' population?	☐	☐	☐	☐	☐
	RP2: How middle aged and old is the rural ICT users' population?	☐	☐	☐	☐	☐
	RP3: How many banking users are there in your village?	☐	☐	☐	☐	☐
	RP4: How many postal users are there in your village?	☐	☐	☐	☐	☐
	RP5: How many telecommunications users are there in your village?	☐	☐	☐	☐	☐

Part 4 – Dependent Variable

Intention	I1: How strong is your intention to continue work in ICT offices?	☐	☐	☐	☐	☐
	I2: How strong is your intention to do online shopping in an e-marketing system?	☐	☐	☐	☐	☐
	I3: How strong is your intention to sell online in an e-marketing system individually?	☐	☐	☐	☐	☐
	I4: How strong is your intention to sell online in an e-marketing system in a corporative manner?	☐	☐	☐	☐	☐

Please cite this article as: S. J. Alavion and A. Taghdisi, Rural E-marketing in Iran; Modeling villagers' intention and clustering rural regions, Information Processing in Agriculture, https://doi.org/10.1016/j.inpa.2020.02.008

REFERENCES

[1] Alavion SJ, Alahyari MS. An overview of the electronic agricultural studies in trading and marketing sections. Agric Manage/Lucrari Stiintifice Seria I Manage Agricol 2012;14 (2):123–32.
[2] Ramirez AS, Rios LKD, Valdez Z, Estrada E, Ruiz A. Bringing produce to the people: implementing a social marketing food access intervention in rural food deserts. J Nutrit Educat Behav 2017;49(2):166–74.
[3] Pant LP, Odame HH. Broadband for a sustainable digital future of rural communities: a reflexive interactive assessment. J Rural Stud 2017;54:435–50.
[4] Roberts E, Anderson BA, Skerratt S, Farrington J. A review of the rural-digital policy agenda from a community resilience perspective. J Rural Stud 2017;54:372–85.
[5] Nieto J, Hernández-Maestro RM, Muñoz-Gallego PA. Marketing decisions, customer reviews, and business performance: the use of the Toprural website by Spanish rural lodging establishments. Tourism Manage 2014;45:115–23.
[6] Cosciug C, Timofti E, Timofti G. Development trends and promotion methods of the rural tourism in the Republic of Moldova. Agric Manage/Lucrari Stiintifice Seria I, Manage Agricol 2017;60(2):237–45.
[7] Ashraf M, Hoque R. An illustration of information communication technology (ICT)-mediated innovation–adoption–implementation in rural Bangladesh. Tékhne 2016;14(1):45–51.
[8] Behera BS, Panda B, Behera RA, Nayak N, Behera AC, Jena S. Information communication technology promoting retail marketing in agriculture sector in India as a study. Procedia Comput Sci 2015;48:652–9.
[9] Munthali N, Leeuwis C, VanPaassen A, Lie R, Asare R, VanLammeren R, et al. Innovation intermediation in a digital age: Comparing public and private new-ICT platforms for agricultural extension in Ghana. NJAS-Wageningen J Life Sci 2018;86:64–76.
[10] Karippacheril TG, Nikayin F, DeReuver M, Bouwman H. Serving the poor: Multisided mobile service platforms, openness, competition, collaboration and the struggle for leadership. Telecommun Pol 2013;37(1):24–34.
[11] Kshetri N. Creation, deployment, diffusion and export of Sub-Saharan Africa-originated information technology-related innovations. Int J Inf Manage 2016;36 (6):1274–87.
[12] Jalali AA, Okhovvat MR, Okhowat M. A new applicable model of Iran rural e-commerce development. Procedia Comput Sci 2011;3:1157–63.
[13] Statistical Center of Iran. Annual statistical year book, Tehran: Statistical Center of Iran. 2016 [in Persian].
[14] Alavion SJ, Alahyari MS, Shukri AlRimawi A, Surujlal J. Adoption of agricultural E-marketing: application of the theory of planned behavior. J Int Food Agribusiness Marketing 2017;29(1):1–15.
[15] Premkumar G, Roberts M. Adoption of new information technologies in rural small businesses. Omega 1999;27 (4):467–84.
[16] LaRose R, Gregg JL, Strover S, Straubhaar J, Carpenter S. Closing the rural broadband gap: promoting adoption of the Internet in rural America. Telecommun Pol 2007;31(6–7):359–73.
[17] Aubert BA, Schroeder A, Grimaudo J. IT as enabler of sustainable farming: An empirical analysis of farmers' adoption decision of precision agriculture technology. Decis Support Syst 2012;54(1):510–20.
[18] Fecke W, Danne M, Mußhoff O. E-commerce in agriculture – the case of crop protection product purchases in a discrete choice experiment. Comput Electron Agric 2018;151:126–35.
[19] Wei L, Zhang M. The adoption and use of mobile phone in rural China: a case study of Hubei, China. Telemat Inform 2008;25(3):169–86.
[20] Liu J, Liu Y, Rau PL, Li H, Wang X, Li D. How socio-economic structure influences rural users' acceptance of mobile entertainment. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems. New York, USA; 2010. p. 2203–2212.
[21] Liu Y, Li H, Kostakos V, Goncalves J, Hosio S, Hu F. An empirical investigation of mobile government adoption in rural China: a case study in Zhejiang province. Govern Inform Quart 2014;31(3):432–42.
[22] Adnan N, Nordin SM, Ali M. A solution for the sunset industry: adoption of Green Fertilizer Technology amongst Malaysian paddy farmers. Land Use Pol 2018;79:575–84.
[23] Jamaluddin N. Adoption of e-commerce practices among the Indian farmers, a survey of Trichy district in the State of Tamilnadu, India. Procedia Econ Financ 2013;7:140–9.
[24] Khalili MB, Khatounabadi A, Kalantari K. Factors affecting the degree of ICT adoption in the ICT integrated services center of gharanabad village in golestan province of IRAN. Village Dev 2008;11:51–76 [In Persian with English abstract].
[25] Alavion SJ, Alahyari MS. Socio-cultural characteristics of rice e-marketing users (case of Rasht Township, Iran). J Central Eur Agric 2013;14(1):400–6.
[26] Masouleh ZD, Allahyari MS, EbrahimiAtani R. Operational indicators for measuring organizational e-readiness based on fuzzy logic: a challenge in the Agricultural Organization of Guilan Province, Iran. Inform Process Agric 2014;2:115–23.
[27] Lashgarara F, Karimi A, Mirdamadi SM. Effective factors on the villagers use of rural telecentres (case study of Hamadan province, Iran). Afr J Agric Res 2012;7:2034–41.
[28] Alibaygi A, Karamidehkordi M, Karamidehkordi E. Effectiveness of rural ICT centers: a perspective from west of Iran. Procedia Comput Sci 2011;3:1184–8.
[29] Arayesh MB. Investigating the financial and legal-security infrastructure affecting the electronic marketing of agricultural products in Ilam Province. Procedia-Soc Behav Sci 2015;205:542–9.
[30] Bakhshizadeh H, Hosseinpour M, Pahlevanzadeh F. Rural ICT interactive planning in Ardabil province: Sardabeh case study. Procedia Comput Sci 2011;3:254–9.
[31] Mahmoudi Meimand M, Ghorbani A, Bakhtazmay Bonab M. E-Commerce admission obstacles in the industry of dried fruits export, case study: east Azerbaijan Province. J Product Manage 2012;5(4):179–210 [In Persian with English abstract].
[32] Kord B, Abtin A. Review the factors affecting on development of rural entrepreneurship in Sistan and Baluchestan Province (with focus on developing rural growth centers, developing in formation and communication technologies and empowerment of rural women). Geogr Dev 2013;11(32):1–14 [In Persian with English abstract].
[33] Salari A, Maroosi A. Survey the factors affecting adoption of information and communication technology by saffron farmer (Case Study: Rurals of Torbat Heydareih Region). J Rural Dev Strat. 2018;5(4):531–46 (In Persian with English abstract).
[34] Dehghani A, Shahdadi A. Investigating and analyzing performance of ICT offices in providing services to rural regions (case study: rural regions of Jiroft Township). J Studi Human Settlements Plan 2018;13(2):411–25 [In Persian with English abstract].
[35] Alavion SJ, Taghdisi A. Analysis of rural E-marketing based on geographic model of planned behavior. Geographical Space. 2021; 21(73). [In Persian with English abstract].

Please cite this article as: S. J. Alavion and A. Taghdisi, Rural E-marketing in Iran; Modeling villagers' intention and clustering rural regions, Information Processing in Agriculture, https://doi.org/10.1016/j.inpa.2020.02.008

[36] Ajzen I. The theory of planned behavior. Organ Behav Hum Decis Process 1991;50(2):179–211.
[37] Bruijnis B, Hogeveen H, Garforth C, Stassen E. Dairy farmers' attitudes and intentions towards improving dairy cow foot health. Livestock Sci 2013;155:103–13.
[38] Kauppinen T, MikkoVesala K, Valros A. Farmer attitude toward improvement of animal welfare is correlated with piglet production parameters. Livestock Sci 2012;143(2):142–50.
[39] Poppenborg P, Koellner T. Do attitudes toward ecosystem services determine agricultural land use practices? An analysis of farmers' decision-making in a South Korean watershed. Land Use Pol 2013;31(1):422–9.
[40] Liu W, Wan C, Mol A. Rural public acceptance of renewable energy deployment: the case of Shandong in China. Appl Energy 2013;102(1):1187–96.
[41] Read DL, Brown RF, Thorsteinsson EB, Morgan M, Price L. The theory of planned behaviour as a model for predicting public opposition to wind farm developments. J Environ Psychol 2013;36(1):70–6.
[42] Li X, Li H, Wang X. Farmers' willingness to convert traditional houses to solar houses in rural areas: a survey of 465 households in Chongqing China. J Energy Pol 2013;63 (1):882–6.
[43] Borges JAR, Lansink AG, Ribeiro CM, Lutke V. Understanding farmers' intention to adopt improved natural grassland using the theory of planned behavior. Livestock Sci 2014;169:163–74.
[44] Senger I, Borges JAR, Machado JAD. Using the theory of planned behavior to understand the intention of small farmers in diversifying their agricultural production. J Rural Stud 2017;49:32–40.
[45] Wauters E, Bielders C, Poesen J, Govers G, Mathijs E. Adoption of soil conservation practices in Belgium: an examination of the theory of planned behavior in the agri-environmental domain. Land Use Pol 2010;27(1):86–94.
[46] Zeweld W, VanHuylenbroeck G, Tesfay G, Speelman S. Smallholder farmers' behavioural intentions towards sustainable agricultural practices. J Environ Manage 2017;187:71–81.
[47] Strambach S, Doring L. Geographic Theory of Planned Behavior (GeoTPB): An Interdisciplinary Approach for the Explanation of Mobility Behavior. Link: https://www.uni-marburg.de/de/fb19/forschung/reihen/geofocus-marburg-pdf/geofocus5.pdf. 2009 (publishing time)/2020 (referencing time).
[48] Wang D, Brown G, Liu Y, Mateo-Babiano I. A comparison of perceived and geographic access to predict urban park use. Cities 2015;42:85–96.
[49] Nouri SH, Alavion SJ. Analyzing effective factors on villagers' behavior to apply educational services in Guilan Province. J Res Rural Plan 2016;4(4):163–76 [In Persian with English abstract].
[50] FAO. Digital technologies in agriculture and rural areas. Rome: Food and Agriculture Organization of the United Nations; 2019.
[51] USAD. Rural Economic Development Innovation. Washington: U.S. Department of Agriculture; 2019.
[52] ENRD. EU RURAL REVIEW. Luxembourg: European Network for Rural Development; 2019.
[53] Lin, Y. E-urbanism: E-commerce, migration, and the transformation of Taobao villages in urban China. Cities. 2019;91:202–212.
[54] Moriset B. e-Business and e-Commerce. International Encyclopedia of Human Geography 2020;4:1–10.
[55] Alavion SJ, Chizari M, Alahyari MS. Application of theory of planned behavior on e-marketing adoption by agricultural experts. Org Resour Manage Res 2014;4(2):107–27 [In Persian with English abstract].
[56] Schmitt B. Economic geography and contemporary rural dynamics: an empirical test on some French regions. Reg Stud 1999;33(8):697–711.
[57] Galloway L, Sanders J, Deakins D. Rural small firms' use of the internet: from global to local. J Rural Stud 2011;27:254–62.
[58] Harrison J, Growe A. From places to flows? Planning for the new 'regional world' in Germany. Eur Urban Reg Stud 2012;21(1):21–41.
[59] Zhang Y, Long H, Ma L, Tu S, Li Y, Ge D. Analysis of rural economic restructuring driven by e-commerce based on the space of flows: the case of Xiaying village in central China. Journal of Rural Studies; 2018 [In Press, Available online 17 December 2018].
[60] Burton RJ. Reconceptualising the behavioral approach in agricultural studies: a socio-psychological perspective. J Rural Stud 2004;20(3):359–71.
[61] Borges JAR, WillianTauer L, Lansink AGO. Using the theory of planned behavior to identify key beliefs underlying Brazilian cattle farmers' intention to use improved natural grassland: a MIMIC modelling approach. Land Use Pol 2016;55:193–203.
[62] Hyland JJ, Heanue K, McKillop J, Micha E. Factors influencing dairy farmers' adoption of best management grazing practices. Land Use Pol 2018;78:562–71.
[63] Rezaei R, Ghofranfarid M. Rural households' renewable energy usage intention in Iran: extending the unified theory of acceptance and use of technology. Renew Energy 2018;122:382–91.
[64] Wang C, Zhang J, Yu P, Hu H. The theory of planned behavior as a model for understanding tourists' responsible environmental behaviors: the moderating role of environmental interpretations. J Cleaner Prod 2018;194:425–34.
[65] Wang Y, Liang J, Yang J, Ma X, Li X, Wu J, et al. Analysis of the environmental behavior of farmers for non-point source pollution control and management: an integration of the theory of planned behavior and the protection motivation theory. J Environ Manage 2019;237:15–23.
[66] Agarwal S, Rahman S, Errington A. Measuring the determinants of relative economic performance of rural areas. J Rural Stud 2009;25(3):309–21.
[67] Agarwal S. Do rural roads create pathways out of poverty? Evidence from India. J Dev Econ 2018;133:375–95.
[68] Qin Y, Zhang X. The road to specialization in agricultural production: Evidence from rural China. World Dev 2016;77:1–16.
[69] Dorosh P, Wang HG, You L, Schmidt E. Crop production and road connectivity in Sub-Saharan Africa: a spatial analysis. World Bank Working Paper. 2010;No:5385.
[70] Samuel KJ, Ayeni B. A GIS-based analysis of geographical accessibility to shared information and communications technology (ICT) infrastructure in a remote region of Nigeria. Afr J Sci Technol Innovat Dev 2019;11(1):121–9.
[71] Philip L, Williams F. Remote rural home based businesses and digital inequalities: understanding needs and expectations in a digitally underserved community. J Rural Stud 2019;68:306–18.
[72] Bitsani E, Host Kavoura A. Perceptions of rural tour marketing to sustainable tourism in Central Eastern Europe. The case study of Istria, Croatia. Procedia-Soc Behav Sci 2014;148:362–9.
[73] Chaabouni S. China's regional tourism efficiency: A two-stage double bootstrap data envelopment analysis. J Destinat Market Manage 2019;11:183–91.
[74] Shen S, Wang H, Quan Q, Xu J. Rurality and rural tourism development in China. Tourism Manage Perspect 2019;30:98–106.

Please cite this article as: S. J. Alavion and A. Taghdisi, Rural E-marketing in Iran; Modeling villagers' intention and clustering rural regions, Information Processing in Agriculture, https://doi.org/10.1016/j.inpa.2020.02.008

[75] Ali J, Kumar S. Information and communication technologies (ICTs) and farmers' decision-making across the agricultural supply chain. Int J Inf Manage 2011;31(2):149–59.
[76] Aklin M, Bayer P, Harish SP, Urpelainen J. Economics of household technology adoption in developing countries: evidence from solar technology adoption in rural India. Energy Econ 2018;72:35–46.
[77] Wossen T, Alene A, Abdoulaye T, Feleke S, Rabbi IY, Manyong V. Poverty reduction effects of agricultural technology adoption: the case of improved cassava varieties in Nigeria. J Agric Econ 2019;70(2):392–407.
[78] Tonny NBW, Palash MS, Moniruzzaman M. Use of ICT in decision making of agricultural marketing: Factors determining of farmers' involvement. J Bangladesh Agricultural University 2019;17(2):226–31.
[79] Mishra A. Women Empowerment through Digital Technology. J Account Finance Market Technol 2019;2 (3):38–41.
[80] Yu H, Cui L. China's E-Commerce: Empowering Rural Women?. The China Quart 2019;238:418–37.
[81] Topimin S, Buncha MR. Gender sensitivity and enterprise support programmers: the experience of Bumiputera Women Handicraft Entrepreneurs in SABAH. J Business Innovat 2019;4(1):66–75.
[82] Fao. The future of food and agriculture: Trends and challenges. Rome: Food and Agriculture Organization of the United Nations; 2017.
[83] Li M, Shan R, Hernandez M, Mallampalli V, Patiño-Echeverri D. Effects of population, urbanization, household size, and income on electric appliance adoption in the Chinese residential sector towards 2050. Appl Energy 2019;236:293–306.
[84] Mahajan N. Digital India: empowering to rural economy. J Soc Sci Multidiscipl Manage Stud 2019;2(3):37–43.
[85] Ecommerce Foundation. Global Ecommerce Report. Netherlands: Ecommerce Foundation; 2018.
[86] Hair JF, Black WC, Babin BJ. Anderson RE. Multivariate Data Analysis. New Jersey, Pearson Prentice Hall; 2010. p. 34–37.
[87] Rucker D, Preacher K, Tormala Z, Petty R. Mediation analysis in social psychology: current practices and new recommendations. Social Personal Psychol Compass 2011;5) 6(:359–71.
[88] Cao C, Meng Q, Shang L. How can Chinese international students' host-national contact contribute to social connectedness, social support and reduced prejudice in the mainstream society? Testing a moderated mediation model. Int J Intercult Relat 2018;63:43–52.
[89] Rezaei Motlagh A, Parsakhoo A, Adeli K, Moayeri M. Investigating the effect of forestry road network development on services to communities in forest villages (Case study: Chegeni region of Lorestan province). J Forest Res Dev 2018;4(2):257–71 (In Persian with English abstract).
[90] Shankar A, Jebarajakirthy C, Ashaduzzaman M. How do electronic word of mouth practices contribute to mobile banking adoption?. J Retail Consum Serv 2020;52:101–20.
[91] Cheung GW, Lau RS. Testing mediation and suppression effects of latent variables: bootstrapping with structural equation models. Org Res Methods 2008;11(2):296–325.
[92] Woody E, An SEM. Perspective on evaluating mediation: what every clinical researcher needs to know. J Exp Psychopathol 2011;2(2):210–51.
[93] Hooper D, Coughlan J, Mullen MR. Structural equation modelling: Guidelines for determining model fit. Electron J Business Res Methods 2008;6(1):53–60.
[94] Safi Y, Karami-Dehkordi E, Hosseini SM. Analyzing the social capital of actors and information sources of agricultural innovation systems in adopting innovations by farmers: an investigation in the Shabestar township of the EAST AZARBAYEJAN Province. J Agricul Extension Educat Res 2014;35–49 [In Persian with English abstract].
[95] ZamaniMiandashti N, PezeshkiRad G, Pariab J. The influence of telecenters on rural life and their success correlates: lessons from a case study in Iran. Technovation. 2014;34(5–6):306–14.
[96] Seydaie SE, Alavion SJ. Factor analysis of effective variables on the job satisfaction of managers of rural information and communication technology offices in Guilan Province. J Res Rural Plan 2015;4(9):173–83 [In Persian with English abstract].
[97] Statistical Center of Iran. Annual statistical year book, Tehran: Statistical Center of Iran; 2018 [In Persian].
[98] Shafiei Sabet N, Azharianfar S. Urban-rural reciprocal interaction potential to develop weekly markets and regional development in Iran. Habitat Int 2017;61:31–44.
[99] Mirlotfi M, Kamanbaz M. Relationship analysis of road markets with socio-economic stability of villages in Sistan region. Researches in Geographical Sciences. 2017;17(46):1–21 (In Persian with English abstract).
[100] Sadatasl Z. Distribution of Rural Tourism Income between Key Sectors of the Economy. Tour Manage Stud 2018;13 (41):137–56 [In Persian with English abstract].
[101] Anabestani A, mozaffari Z. Explaining the Factors Influencing the Attitude of Villagers to Agricultural Tourism (Case Study: Sample Tourism Villages of Fazl Village, Neishabour Township). J Tour Plan Dev. 2018;7(24):123–145 [In Persian with English abstract].
[102] Varmazyari H, Rahimi A, Babaii M. An analysis of preferred agro-tourist activities and services case study: Tourists in the East Alamut. J Tourism Plan Dev 2017;6(21):77–95 [In Persian with English abstract].
[103] Khani F, Sadat Mousavi S. Evaluation of the factors affecting the entrepreneurship adoption among rural communities (Case study: Kan-Souleghan). Human Geogr Res 2018;49 (4):917–34 [In Persian with English abstract].
[104] Movahedi R, Izadi N, Vahdat AR. Investigating factors affecting farmers' adoption of pressurized irrigation technology in Asadabad County, Hamedan Province. Iran J Water Res Agricult 2017;31(2):287–300 [In Persian with English abstract].
[105] Taragola NM, VanLierde DF. Factors affecting the Internet behaviour of horticultural growers in Flanders, Belgium. Comput Electron Agricult 2010;70(2):369–79.
[106] Manson SM, Jordan NR, Nelson KC, Brummel RF. Modeling the effect of social networks on adoption of multifunctional agriculture. Environ Modell Software 2016;75:388–401.
[107] Menon V. Art of marketing village crafts; challenges in applying quantitative marketing to resist recession. Int Rev Bus Res Pap. 2010;6(5):196–205.
[108] Pick JB, Sarkar A, Johnson J. United States digital divide: State level analysis of spatial clustering and multivariate determinants of ICT utilization. Socio-Econ Plan Sci 2015;49:16–32.
[109] Gao J, Liu Y, Chen J, Cai Y. Demystifying the geography of income inequality in rural China: a transitional framework. Journal of Rural Studies 2019 [In Press, Available online 25 January 2019].
[110] Raeisi A, Bijani M, Chizari M. The mediating role of environmental emotions in transition from knowledge to sustainable use of groundwater resources in Iran's agriculture. Int Soil Water Conserv Res 2018;6 (2):143–52.
[111] Eslami M, Ghasemi E, Chizari M. A survey on the factors affecting use of e-commerce in medium industries in fisheries industry of Sistan and Baluchestan. Epistemologia 2014;11(02):102–14.

Please cite this article as: S. J. Alavion and A. Taghdisi, Rural E-marketing in Iran; Modeling villagers' intention and clustering rural regions, Information Processing in Agriculture, https://doi.org/10.1016/j.inpa.2020.02.008

[112] Abdollahzadeh G, Sharifzadeh MS, Damalas CA. Motivations for adopting biological control among Iranian rice farmers. Crop Prot 2016;80:42–50.

[113] Bucciarelli E, Odoardi I, Muratore F. What role for education and training in technology adoption under an advanced socio-economic perspective?. Procedia-Soc Behav Sci 2010;9:573–8.

[114] Nishida T, Pick JB, Sarkar A. Japan's prefectural digital divide: a multivariate and spatial analysis. Telecommun Pol 2014;38(11):992–1010.

[115] UNCTAD. Digitalization, Trade and Development. New York: United Nations Conference on Trade and Development; 2017.

Please cite this article as: S. J. Alavion and A. Taghdisi, Rural E-marketing in Iran; Modeling villagers' intention and clustering rural regions, Information Processing in Agriculture, https://doi.org/10.1016/j.inpa.2020.02.008