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The Role of Skill Development in Improving the Performance of Agricultural Extension Agents in Iran Using Structural Equation Modeling and Grounded Theory

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Abstract

The present study aimed to investigate the role of skill development in improving the performance of agricultural extension agents in Iran. In this qualitative and quantitative research, grounded theory (GT) and survey methods were used to collect the information. Three hundred sixty-six extension agents were sampled for the study using Cochran's formula. The required data were collected using structured and unstructured questionnaires. GT demonstrated that the core strategy for skill development could develop educational infrastructure to train extension agents. Confirmatory factor analysis indicated that communicative skills had the strongest impact on the performance of agents. The policymakers and planners in Iran would employ the results of this study to find out the current situation of skills and ways to enhance the efficiency and effectiveness of extension agents. This research contributes to the theory of performance perception of extension agents by providing a theoretical model which explains the relationship between the development of skills and the performance of agents.

Keywords: Skill development, Agricultural extension agent, Iran, Grounded theory

1. Introduction

Nowadays, as the concept of human resources is introduced into the theories of development, an indispensable indicator to assess the development of each country is the status and level of empowerment. It is a dynamic and quantitative process that can be measured and explained using different methods (Mahmud et al., 2012). Paying attention to people's roles in the continuance of human life in various fields such as politics, society, and economics is necessary due to the development and advancement of human culture and the emergence of the latest ideas. The modifications made to the constitutions and other written laws of countries around the world and the reviews made to change such laws indicate the beginning of an intellectual revival, and empowerment is a dimension of sustainable development in this regard (Khalvati, 2009).

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Knowledge-oriented employees play a significant role in creating innovation in an organization. They endeavor to resolve their mental challenges and expand their technical knowledge. The developed human resources meticulously investigate the process of performing activities and attempt to provide organizations with their knowledge and skill in the most convenient possible manner (Atafar & Shari'atmanseh, 2007).

The economic growth and development of countries are significantly influenced by educational growth and development, and skill-based education is among the most significant part of any educational system. Shortages and limitations in the educational system of the country and the need for skillful and semi-skillful workers convinced the policymakers in the educational system to meet that basic need by making fundamental changes in the formal and informal educational framework of the society. Establishing and expanding skill-based courses in the educational system were among the outcomes of that decision. In their research, Elliot et al. (2018) referred to a trend, indicating that there is a need for adapting and upgrading the skills of workers to improve the national economy in the United States.

The importance of formal training in the workplace cannot be neglected in skill building for employers and such training is a prerequisite for advancement in the workplace (Bassanini & Brunello, 2008, 2011). Such training courses can enhance people's knowledge and skills and make it possible for people to actualize their hidden talents.

Capable human forces can establish their businesses and manage them toward development and advancement based on their characteristics, expertise, and strength. In this regard, training is an attempt to change people's behavior via the process of learning that is performed to increase their effectiveness. In addition to accompanying improvement and transcendence, training increases people's insight and foresight and provides them with the necessary knowledge, wisdom, and skill to perform their duties. People are exposed to different environments throughout their lives, and socio-cultural and technological conditions affect their level of knowledge and awareness. These technological changes have increased the need for skill development (Desjardins & Warnke, 2012).

Katz (1955), in a study about skills in the workplace, suggested that effective administration requires three basic personal skills (i.e., technical, human, and conceptual skills). Pelta (2023) pointed out several skills that companies want, including problem-solving, analytical reasoning, creativity, communication, leadership, critical thinking, teamwork, and adaptability. Behera and Gaur (2022) defined skill as "one's ability, competence, proficiency, and talent to execute a given job/task successfully. One may either possess it naturally or develops it gradually over time. It may be soft skills that signify one's traits and attributes such as people skills, communicative skills, leadership skills, or hard skills that are honed with education/training and experience." Scandura (2016) referred to two discourses in definitions of skill. Social scientists define the skill as ability, competence, talent, and expertise of an individual in a certain field, while psychologists define the concept of skill as competence that is required to do a given task. Kaynakçı and Boz (as cited in Lovett, 2019) categorized competencies into behavioral and technical competencies. Technical competency refers to the knowledge and skills of people to perform an activity, while behavioral competency is related to the individual characteristics of agents that they show while performing the activity. In the field of occupational psychology, competence is measured based on standards that are required to perform a job, while basic skills are the ones that are necessary to perform a job (Green, 2011).

Based on the report by the World Bank (2021), in today's economy, the labor market needs to develop skills that are needed by the workforce. The comprehensive set of skills is composed of cognitive, socio-emotional, technical, and digital skills. Scandurra and Alberio (2021) pointed out the relationship between education attainment and skills and indicated that other factors are likely to affect skill acquisition. It is important to declare that skill formation is a dynamic process that involves the interaction among different components.

Birner and Anderson (2007) asserted that agricultural extension faces several challenges that hinder the effectiveness of the system. Extension agents in fulfilling their duties to overcome these challenges confront the performance problem. Many experts believe that agriculture extension as one of the main components of agricultural development in Iran has not achieved its goals in various areas of human resource development, capacity building, empowerment, technology transfer, food security, poverty alleviation, social justice, and environmental issues (Karimi et al., 2009).

Iran's extension system with about 60 years of experience still has some problems, obstacles, and limitations. In addition to the weak legal basis, there are also major problems, including a lack of skills of staff, especially field staff to meet the needs of the rural population (Karbasioun & Mulder, 2004). This sector has also had little success in planning, and almost 32% of extension experts have indicated that the performance of the extension system in Iran has been highly unsatisfactory and that extension service in Iran needs reconstruction in various dimensions.

Extension organizations attempt to convince farmers to accept innovations that eventually diffuse the innovation to the community. Agents who lack communication skills and use no appropriate extension methods will not be successful in spreading innovations. The extension agent should be competent in professional (knowledge types) and personal (skill-specific) issues to properly and effectively perform separate roles (Kaynakçı & Boz, 2019). The success of extension agents in achieving the desired goals of promoting and disseminating innovation and transferring the necessary technology from researchers to farmers and reducing farmers' resistance to favorable change requires the empowerment and skills of extension agents and experts in technical fields. Irby (as cited in Boyd, 2003) referred to the insufficient training for extension agents and indicated that there is a need for learning experiences that provide critical skills and knowledge.

Certainly, the effectiveness of the extension agents plays a key role in promoting success, and this efficiency depends on the skills and competencies that the agents must possess. Triaieyari et al. (2010), in a study about the competencies of extension agents in Malaysia, pointed out the importance of competencies for the performance of extension agents in the process of technology transfer. Fathali et al. (2018) conducted a study to present a skill-oriented plan to optimize the presence of institutions and organizations in the process of skill learning and employment and stated that skill-oriented training programs are among the indispensable pillars of development programs (particularly economic development) due to their roles in empowering human forces. They added that such programs can play significant roles in the achievement of development goals, and skill-oriented training, skill development, and empowerment are implemented in the modern world to create employment opportunities, facilitate the process, and stabilize employment.

Skills development is the process of identifying skill gaps and developing these skills. Factors that improve skill development will be a mixed strategy of all the best practices on need-based analysis and requires introspections and revisions periodically (Behera & Gaur, 2022). In their research about modeling skills in OECD countries, Scandurra and Calero (2016) indicated that many factors such as educational level, family background, age, and gender influence skills acquisition and loss, and the interaction among these factors is necessary to develop a complex analytical approach.

To lead the development of skills, several factors need to be taken into consideration. The mentioned factors, in terms of which skills are utilized, would provide solutions to several types of problems and challenges. The cultural, social/knowledge, economic, and political factors can directly or indirectly influence individuals' skills, and indirect factors can both function as obstacles against the capacity building and strengthen the training and refinement of human forces.

Accordingly, it is important to identify factors affecting the skill gap among extension agents. The identification of factors and taking necessary actions to eliminate the skill gap will significantly contribute to

increasing the efficiency and effectiveness of extension services in Iran. Thus, this research aimed at analyzing the role of skill development in the performance of agricultural extension agents in Iran.

2. Material and Methods

The current study was performed using a mixture of qualitative and quantitative approaches to investigate the role of skill development in improving the performance of agricultural extension agents in Iran. Qualitative research can be used in a wide range of settings and encompasses multiple methodologies based on phenomena and issues with limited literature. The present study adopted a grounded theory (GT) research design to analyze the data collected via individual interviews. The GT procedure was applied to evaluate the perception of respondents about the relationship between skill development and performance. This method is utilized to describe the structure and process of phenomena. The participants of the study were agricultural extension agents, and the purposive sampling method was used to select the respondents. The snowball sampling technique was employed to select the sample. Such sampling continued until data saturation. The data from the interview reached saturation through in-depth individual interviews with 18 participants.

Regarding the quantitative approach, the survey method was applied to collect the data. The population consisted of the agricultural extension agents (N=8142) employed by the agricultural centers in five main regions of the country determined by the Ministry of Agriculture. To determine the sample size, 366 extension agents were chosen as a sample population of the study by using the Cochran formula (Table 1).

Table 1 Sample population

Sample Group	Number of People
Region 1	72
Region 2	61
Region 3	58
Region 4	122
Region 5	53
Total	**366**

A structured self-determined questionnaire was developed, and data were collected by interviewing the respondents. This research used descriptive methods to provide information about the opinion of respondents. Table 1 presents calculated information about the mean, mode, median, and standard deviation for each question. The model of measuring the performance of agents was analyzed using Structural Equation Modeling (SEM). The collected data were analyzed by using AMOS software to use the SEM method to identify the relationship between variables. The structural model is employed to determine the model's predictive capabilities and the association between dependent and independent variables.

Combined reliability (CR), convergent validity, divergent validity, R^2 criterion, Q^2 criterion, Redundancy criterion, and goodness of fit criterion were measured to determine the reliability of the model. Based on the results of Table 2, the χ^2/df ratio was 2.45, which was below and indicated the convenient fit of the model. Moreover, the obtained values for the goodness of fit index (0.92), comparative fit index (0.93), and normed fit index (0.90) coefficients were above 0.90, representing the convenient fit of the model with the data. Furthermore, the obtained root mean square error of the approximation index (0.06) was less than 0.08, which was considered acceptable. Consequently, the revised model of measuring performance with its five sub-scales and twenty-nine items had acceptable construct validity.

Table 2 The goodness of fit indicators of the proposed model to measure skill development

Model	RMSEA	NFI	CFI	GFI	P	$df^2\chi$
The proposed model	0.06	0.90	0.93	0.92	0.001	2.45

Note, RMSEA: Root mean square error of approximation; NFI: Normed fix index; CFI: Comparative fit index; GFI: Goodness of fit index; P: P-value; df: Degrees of freedom

3. Results

The results (Table 3) demonstrated that most respondents (around 40%) were 31-40, while 20-30 year-old respondents had the least frequency in the sample.

Table 3 The frequency distribution of the respondents' ages

Age Group (Years Old)	Frequency	Percentage
20-30	43	11.75
30-40	147	40.16
41-50	125	34.15
51 >	51	13.93
Total	**366**	**100**

The obtained data further revealed that 79% of the participants were males, while the remaining 21% were females (Table 4).

Table 4 The frequency distribution of the respondents' gender

Gender	Frequency	Percentage
Male	290	79.23
Female	76	20.77
Total	**366**	**100**

Based on the findings (Table 5), the work experience of most participants was 11-20 years (around 39% of the respondents). Moreover, almost 28% of the participants had 1-10 years of experience in their jobs, which was the least frequent in this regard.

Table 5 The respondents' working experience

Work Experience (Years)	Percentage	Frequency
1-10	28.14	103
11-20	39.34	144
21-30	32.51	119
Total	**100**	**366**

The results (Table 6) represented that most participants (59.29%) had bachelor's degrees, while the least frequent participants (5.74%) were the ones with doctoral degrees.

Table 6 The respondents' distribution according to their education

Education	Percentage	Frequency
Bachelor's degrees	59.29	217
Master's degrees	34.97	128
Ph.D.'s degrees	5.74	21
Total	**100**	**366**

Extensive interviews, observations, and group discussions were used for collecting the required data. To collect information by GT, the researcher interviewed experts through group discussions until "reaching saturation". Data analysis was based on Strauss and Corbin's method, which relies on open, axial, and selective procedures. Through open coding, the transcribed interviews were studied and data were broken down into discrete parts. Next, the main categories and sub-categories were related to each other during the axial coding process, followed by extracting the core category.

Figure 1 displays concepts that were extracted from interviews. After concept extraction, a code was given to each concept. A total of thirty-six revealed concepts, five subcategories, and twenty-six categories were extracted, and after selective coding, categories were integrated and combined to provide a conceptual framework.

The following section deals with evaluating the relationships between the implicit and explicit variables of the study. The goal is to determine the construct validity of the model. In general, validity investigates whether the implicit indicators or variables measure what is intended by researchers or not. Thus, before evaluating any research model, the accuracy of explicit variables in assessing the implicit ones should be taken into account. This should be performed before performing the main analyses of the study for each explicit variable. In the following section, the strength and significance of the paths between implicit variables are examined using their relevant indicator to determine the validity of the model.

As AMOS is considered a powerful tool to evaluate the construct validity of measurement models, it was implemented to determine the construct validity concerning the concept of skill development. The models are mentioned to have adequate construct validity if they have a convenient fit with the data and their standardized factor loadings are significant and above 0.3. Thus, the first step was to determine the fitness and investigate the fitness indicators of the models.

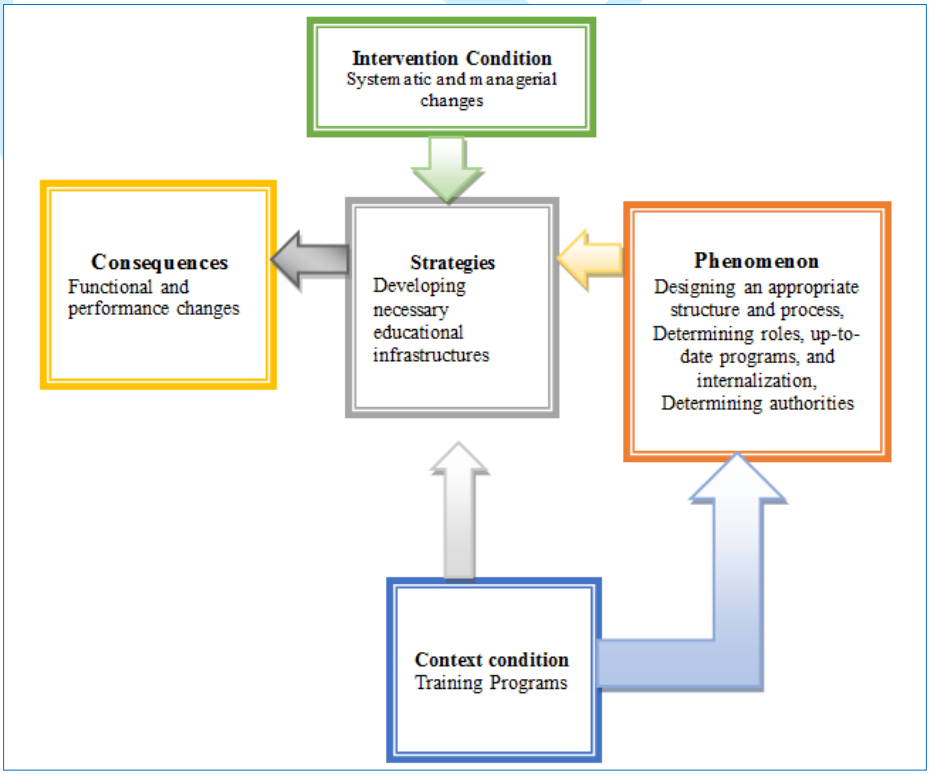

Fig. 1 The conceptual model

The results of performing the confirmatory factor analysis on the model of measuring skill development are presented in Table 7. The obtained values demonstrated that the standardized factor loadings of all items were above 0.3 and significant at $p \leq 0.05$. Moreover, Cronbach's alpha coefficients of all variables showed their internal consistency. The reliability of the implemented sub-scales for the measurement of skill

development was calculated using the composite reliability (CR) technique and the squared multiple correlation coefficients (R^2) for the factors and observed variables, respectively. The higher CR values of a factor (CR>0.6) indicated the reliability of the scale to measure an intended factor. In addition, the R^2 values (always in the range of 0-1) represented the portion of the changes and variances observed in the case of each variable that was explained by the relevant factor. Hence, the higher values obtained for R^2 showed the higher reliability of that variable in measuring the intended factor.

The presence of a relationship between the observed and latent variables highlights the validity of the model. To assess the fitness of the model, the researcher assumes a specific theoretical model, collects the data, and then fits the data with the test model.

The concept of the performance of extension agents consists of five sub-scales, including communicative skills, creativity and problem-solving, commitment and responsibility, acquisition of knowledge, and technical skills.

Table 7 The results of the confirmatory factor analysis

Construct	Items	Factor Loading	R^2	Cronbach's Alpha
Communicative skills	CTS1	0.72	0.138	0.79
	CTS2	0.65	0.263	
	CTS3	0.73	0.118	
	CTS4	0.72	0.269	
	CTS5	0.73	0.240	
	CTS6	0.73	0.515	
	CTS7	0.87	0.646	
Creativity in problem-solving	CPS1	0.90	0.852	0.78
	CPS2	0.73	0.527	
	CPS3	0.80	0.653	
	CPS4	0.34	0.576	
	CPS5	0.45	0.677	
	CPS6	0.40	0.537	
Commitment and responsibility	CSR1	0.39	0.566	0.72
	CSR2	0.35	0.411	
	CSR3	0.52	0515	
	CSR4	0.56	0.279	
	CSR5	0.52	0.222	
	CSR6	0.49	0.175	
Knowledge acquisition	SIK1	0.70	0.210	0.74
	SIK2	0.60	0.174	
	SIK3	0.53	0.210	
	SIK4	0.53	0.078	
	SIK5	0.67	0.124	
Technical skills	PW1	0.37	0.099	0.75
	PW2	0.79	0.139	
	PW3	0.73	0.677	
	PW4	0.54	0.120	
	PW5	0.44	0.232	

Table 6 provides the analysis results of the communicative skills, and seven examined substantial indicators. The results indicated that the variable of participation in solving problems (0.87) was a stronger determining

factor in skill development, while the variable interested in transferring knowledge and information with a factor loading of 0.65 had the weakest factor.

Based on the results of the study, five indicators were measured to determine the level of creativity in solving problems among respondents. The highest factor loading belonged to providing new and effective recommendations (0.90), while assessing various aspects of problems had the lowest factorial loading (0.34). Concerning the commitment and responsibility factor, six variables were analyzed, and factorial loading for doing the job based on the rule, regulations, and values of the organization had a significant impact (0.56). Further, the variable of no supervision in doing the job had a small impact on the performance of extension agents (0.35).

Among the five indicators of knowledge acquisition, knowledge and information about the job had the highest factorial loading (0.70), whereas being familiar with stakeholders and information about the quality and standard of work indicators had the least effect on the performance of agents (0.53).

The results of a study about the impact of technical skills revealed that having knowledge and ability about the standards related to job skills with a factorial loading of 0.79 had the strongest impact, while being able to utilize the equipment and tools related to the job had the weakest effect on the performance of the extension agents (0.37).

Among all factors related to performance, communicative skills had the highest effect, while commitment and responsibility had the weakest impact on performance.

Fig. 2 illustrates the structural model of the research with unstandardized coefficients, indicating the casual quantifiable relationship between variables in SEM. Based on the results of the study about the causal relationships between five factors, the strongest causal relationship was between communicative skills (0.89) with creativity in problem-solving, whereas the weakest causal relationship was observed between communicative skills and commitment (0.53).

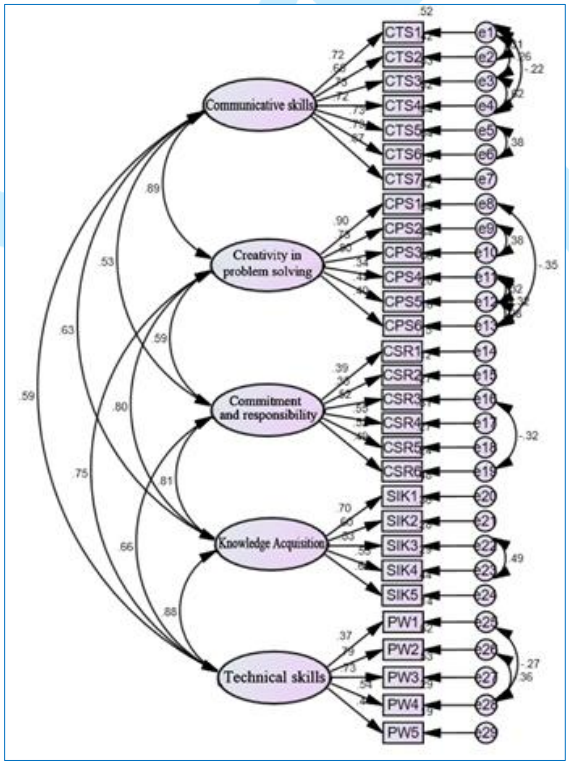

Fig. 2 Structural model of the research

4. Discussion

As mentioned earlier, the current study sought to assess the role of skill development in the performance of agricultural extension agents in Iran. Based on the results, five factors were identified that described the components of performance for extension agents.

GT was used to explore the contribution of skill development to improving the performance of extension agents in Iran. According to some researchers, GT is a middle-range theory to uncover the structures of meaning and to increase transparency by the individual to explain the purposes and process (e.g., Kim et al., 2009; Wanger et al., 2010).

The core strategy that emerged from GT confirms the importance of designing and developing educational infrastructure for training extension agents. The study findings showed that training programs as a contextual factor could play a significant role in developing skills and eventually improving the performance of agents. On the other hand, systematic and managerial changes in extension organizations as the most intervening condition highlight the importance of changes in skill development programs to provide better access to training programs.

Based on the findings, skill development could play a significant role in enhancing the communicative skills of extension agents, which is consistent with the findings of Biyranto et al. (2018), representing that communication skills proved to have a positive and significant impact on the job performance of state civil workers. They found that employees who have the skills to use communication media and information technology will have a positive and significant impact on the achievement of their work. According to Akshara et al. (2021), developing communication skills also contribute to the self-esteem of employees.

On the other hand, the results of this study confirmed the importance of creativity in the problem-solving of extension agents in Iran. Based on the report by Petrone (2018) from LinkedIn, creativity is considered the second most important skill in the world. He referred to the definition by Mumwa who defined creativity as a way to solve problems with novelty and relevancy. Arnold and Place (2010) indicated that critical and creative thinking and problem-solving affect the ability of agents to fulfill their duties.

Commitment and responsibility have a relationship with the skill development of extension agents, and Naong (2016) found that there was a relationship between commitment and skill development among college students in South Africa. Accordingly, extension organizations in Iran must implement effective human resources and skill development practices to internalize and strengthen commitment toward the organization.

The results of our study demonstrated that the development of skills could play a role in the acquisition of specialized knowledge, and thus the performance of extension agents. In their study about career influences of agricultural extension agents, Arnold and Place (2010) concluded that personal characteristics, skills, and knowledge bases were described by participants as essential components for performing the job.

The development of skills contributes to improving the technical skills of extension agents, and in this regard, the inclusion of training programs as a part of skill development practices improves the technical skills of extension agents. Kaynacki and Boz (2019), in a study on the roles and responsibilities of extension agents in Turkey, reported that extension agents should be proficient to perform their duties and provide them with training to enhance their capabilities and skills.

This study aimed at looking at a holistic view of the skill development of extension agents in Iran. It was found that there is a need for a more practical approach toward skill development and performance of extension agents in Iran.

The results of this study revealed that trained and skillful extension agents can overcome the obstacles facing extension organizations in Iran. The relationship between skill development training programs with the performance of extension agents would increase the efficiency and effectiveness of extension organizations. The general conclusion of this study represents that the skill development of extension agents is an effective factor, and long-term investment plays a key role in achieving sustainable development in rural areas.

On the other hand, barriers such as lack of knowledge and skills by extension agents require more emphasis on ensuring the local advisory programs and facilitating the process of the capacity building of

agents. It is also important to assess the capacity of extension agents in supporting the rural population and to offer recommended strategies to combat the weaknesses of the extension system in Iran.

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Declaration of Conflict

The authors declare that they have not known competing financial or personal relationship that could have appeared to influence the work reported in this paper.

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