

# Examination and Evaluation of the Construct-Building Components Affective in Food Security in the Agricultural Sector

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## Abstract

Food and nutrition security is of the main pillars of national development, showing new attitudes, needs and priorities at the level of policy and implementation in recent years. Thus, it calls for proper and comprehensive management. The present study examined the construct building components affecting food security (FS) in the agricultural sector. The data related to evaluation of the requirements for setting up a management information system in the agricultural sector of Khuzestan were collected by visiting the agricultural service centers and using a questionnaire and interview. The questionnaire needed was researcher-made, designed based on the basic research questions. The results of the study regarding the rejection or confirmation of sub-hypotheses indicated that technical requirements, economic requirements, hardware requirements, software requirements, scheduling requirements, and socio-cultural requirements all with a probability of 99%, and management requirements and legal requirements with a probability of 95% were confirmed. Economic requirements had the greatest effect on FS, followed by, respectively, technical, hardware, operational, software, socio-cultural, scheduling, legal, human resource and managerial requirements in the next priorities of the effect on FS. Thusly, management requirements had the least effect on FS, yet all requirements of the hypotheses were confirmed at the same time.

**Keywords:** Food security, management information system, structural components, agricultural sector

## INTRODUCTION

Food and nutrition security is of the main pillars of national development, showing new attitudes, needs and priorities at the level of policy and implementation in recent years. Thus, it calls for proper and comprehensive management.

The agricultural sector is of the most critical and largest economic sectors in Iran followed by service sector, accounting for about 2% of Gross Domestic Product (GDP) and a major part of non-oil exports. It also creates a large part of Iran's employment; therefore, sustainable development of this sector guarantees the economic growth of the country [1].

Examination of the trend of economic transformation in various countries indicates the position and significance of the agricultural sector in the sustainable development of these countries. Determining the value of agriculture for a country seems almost impossible, as on the one hand, it provides the necessary food for human strength and in most countries, it still has the largest share in employment on the other [2]. Climate and demographic developments in Iran, besides the prevailing economic conditions, have led to the creation of FS in development programs and the 20-year vision document [3].

A management information system is an organized set of interrelated phenomena whose content consists of data, processes, storage and outputs [4]. Rama Krishna and Asef (2002) calculated the overall household FS index in northern Ethiopia [5]. Their results showed that FS in these areas is at a high level (more than 38%). They have considered the production to be effective on FS using Logit model. Zhai (2013) examines FS in China in terms of structure, system and resources [6]. Using the system theory method, he has shown that the realization of FS in China should be based on specific national conditions, optimal allocation of resources and structural optimization. Costa et al. (2013) studied

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agricultural productivity and food insecurity in Brazil <sup>[7]</sup>. They concluded a significant relationship between the level of education of the head of the household, the presence of people under the age of eighteen in the family, farmers' productivity and food insecurity.

Falco and Chavas (2009) studied the effect of crop genetic diversity and production risk on FS in the Ethiopian highlands <sup>[8]</sup>. Using the torque-based approach and stochastic production function, they concluded that product diversity reduces production risk and improves nutritional status in the region. In their study entitled "The factors affecting the FS of rural households in Punjab," Bashir *et al.* (2012) have concluded that their level of national FS is equal to the level of FS at the international level, yet 13% of households do not have proper FS at the household level <sup>[9]</sup>. Monthly income, livestock assets and household size have had a positive effect on rural FS.

In their result in of the study entitled "Information technology for rural development program in Thailand," Duroung *et al.* (2003) have shown that the lack of technical experience to transfer science and lack of knowledge and expertise to use local programs are of the most important barriers to information technology development. According to Chowdhury (2001), information and communication technology (ICT) can play a role in FS by easing access to up-date market-related policies and information, improving market profitability, helping farmers make decisions, increasing diversity in the rural economy, and saving life costs <sup>[10-12]</sup>.

The findings of Gerster and Zimmermann (2003) have to do with the project of financial radio program, decision improvement and increasing food production <sup>[13]</sup>. The findings of the Uganda Rural Agricultural Knowledge and Information System project improve the ability of individuals to acquire information and focus on the needs of the audience. The result of Pcard (2003) on agricultural information and technology services in the Philippines has been about the marketing of agricultural products and increasing crop production. Bakhshizadeh *et al.* (2013) argue that ICT is one of the facilitators of rural development with a great potential to help poor villagers, improve food quality and security, increase communication and information flow to support livelihood strategies. Story (2006) considers the effects of the development of ICT in rural areas in reducing dissatisfaction, improving social welfare and FS indicators, and increasing rural knowledge and skills. Rostami *et al.* (2014) studied the factors affecting the FS of rural households (a case study of Karnachi village in Kermanshah). The results showed a positive and significant relationship between socio-economic statuses of the household with FS of the studied households, so that a significant relationship was found between household FS with monthly household income, father's job position, and livelihood status, mother's level of education and dimension of family. Dorosti *et al.* (2) conducted a study entitled "The prevalence of food insecurity and related

factors." The purpose of the study was to examine the prevalence of food insecurity and some related factors in Dezful in 2008. Father's age, mother's age, parents' education level, parents' occupation, family size, having a child under 8 years old in the family, body mass index (BMI) and ethnicity all affected food insecurity.

Lashgarara and Borzoui (2009) conducted a study entitled "The role of ICT in improving life quality in rural areas."<sup>[14]</sup> The results showed that the focus on ICT is very important in improving life quality and this technology plays an important role. Thus, the information variables about helping to market agricultural products, expanding the tourism industry, eliminating intermediaries, creating economic opportunities, generating income for the villagers, increasing productivity, training and agricultural use and health education of the villagers all affect life quality.

Given the significance of implementing the agricultural information system in Iran, the present study can show the possibility of implementing this system in investing in sub-sectors of the agricultural sector, lead to integrated information management, and relieve the problems related to non-decision making because of the lack of information or incomplete or non-update information. It will help managers in lower ranks such as farmers, middle and senior managers of the country and will cause the sustainable development of agriculture and the country by extending it to the whole country and implementing it.

## METHODS

Field and survey methods were used in the study. The population was wheat farmers in Khuzestan, who are 8500 people (N = 8500) according to the latest statistics of Ministry of Agriculture Jihad. The sample size was determined using Morgan table. Accordingly, given the population of 8500 people, the sample size was determined as 367 people. The study used both library and field methods. The data needed in the theoretical foundations and background were collected using a review of texts and library methods. The data related to evaluation of the requirements for setting up a management information system in the agricultural sector of Khuzestan were collected by visiting the agricultural service centers and using a questionnaire and interview. The questionnaire needed was researcher-made, designed based on the basic research questions. The questions of this questionnaire had two sections of demographics and questions based on the five-point Likert scale.

Composite Reliability (CR) coefficient was used to evaluate the reliability of the questionnaire, whose value for all the components was greater than 0.70, showing that the evaluation tool has the necessary reliability.

SPSS and LISREL were used to analyze the data of this study. First, SPSS was used to provide descriptive data. In the descriptive section, first, the structures and their constituent components were described using relative distribution tables,

graphs and statistical indices (mean and standard deviation) and then the normality of data distribution was examined. Then the research models were implemented using LISREL to report the validity and reliability of the measurement tool, and finally, the main hypothesis and sub-hypotheses were tested using this software.

## RESULTS

In this part, modeling of LISREL axis covariance structural equations were used to test the hypotheses, but first the normality of the data of the variables was examined using skewness coefficient and kurtosis as using this software depends on establishing a quantitative scale of variables and normal distribution of data. The results showed that the absolute value of the skewness and kurtosis coefficient for all the variables was less than 0.50, thus, one can state that the data distribution of all the variables is normal. It has to be noted that in the inferential findings section, the measurement models of “Food Management and Security Information System” were implemented using the second-order confirmatory factor analysis to report the validity of the measurement tool. It is noteworthy that in the present study, construct validity was examined using confirmatory factor analysis. Factor loadings and fit indices were reported in this regard. If the factor loadings value is greater than 0.40 and significant and the desired value of fit indices is established on the other hand, one can state said that the measurement tool has construct validity.

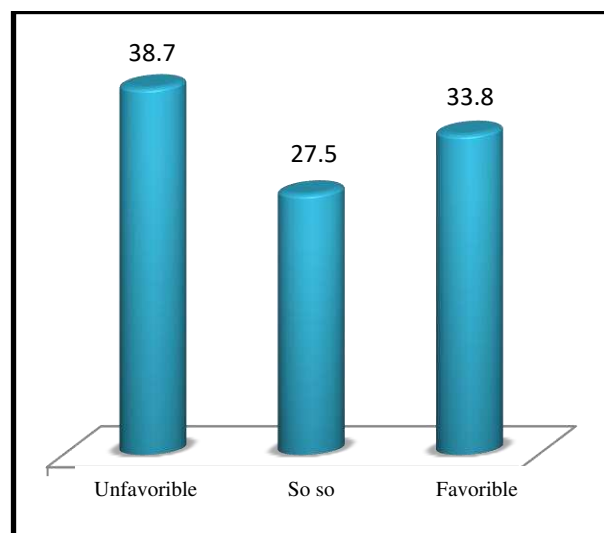
The extracted mean variance index was used to evaluate the convergent validity. If the value of this index is greater than 0.50, it can be stated that convergent validity is established. Maximum Shared Squared Variance was used to measure divergent validity. If its value for each measurement model is less than the extracted average variance index, one can state that divergent validity is established. Then diagnostic validity is assessed with the help of criterion of Fornell-Larcker. It is worth noting that CR was used to evaluate the reliability of the measurement tool. If its value is greater than 0.70 for all research concepts, it can be accepted that the measurement tool has the necessary reliability.

### Evaluating the construct of FS:

Four components “food existence, access to food, food supply stability and food safety” and sixteen items were used to measure the construct of FS. The average total score of sixteen questions related to this concept were calculated by considering the positive and negative directions of the measures to construct the scale. The results of the table show that 38.7% of the respondents assessed the FS in Khuzestan as undesirable and 33.8% as desirable. Among them, 27.5% had an intermediate evaluation. Based on the results obtained in the table below, the result obtained from the mean in the range (1-5) is 2.91, showing that overall; the desirability of FS in Khuzestan is moderate to the respondents.

**Table 1:** Relative distribution of respondents' views on FS

SD	Mean (1-5)	Percent	Cases
0.53	2.91	38.7	Undesirable
		27.5	So so
		33.8	Desirable
		100	Total



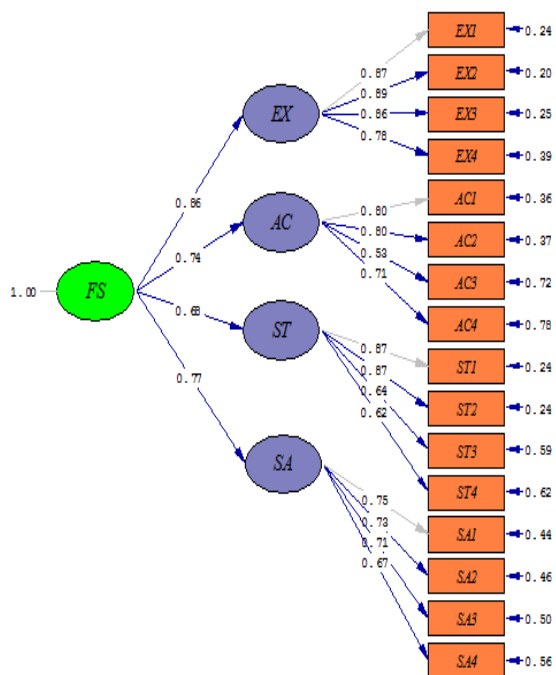
**Figure 1:** FS

### Evaluation of validity and reliability of components and items of FS

Four dimensions and sixteen items were considered to measure FS construct. In this section, the variables related to the measurement of this construct are first introduced, then the model is implemented, and the results are reported;

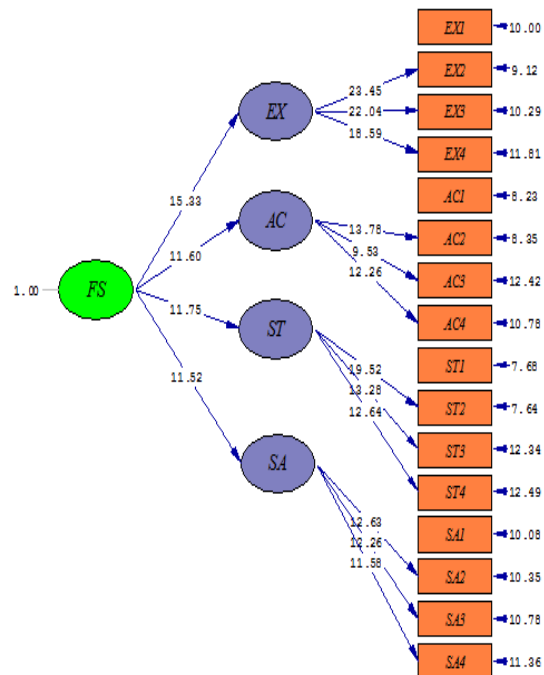
**Table 2:** Introduction of variables

Variable	Aspects	Items
Food security (FS)	Existence of food (EX)	EX1 to EX4
	Access to food (AC)	AC1 to AC4
	Food supply stability (ST)	ST1 to ST4
	Food safety (SA)	SA1 to SA4



Chi-Square=251.33, df=100, P-value=0.00000, RMSEA=0.068

**Figure 2:** Second-order factor model of FS construct (in standard mode)



Chi-Square=251.33, df=100, P-value=0.00000, RMSEA=0.068

**Figure 3:** Second-order factor model of FS construct (in a significant mode)

The results of the FS evaluation model are as follows:

Table 3: The results of FS evaluation model						
Components	FL	Items	FL	AVE	MSV	CR
Existence of food (EX)	0.86	The food has good variety in this province.	0.87	0.724	0.596	0.785
		The food needed by the household is available in this province.	0.89			
		The province is at a good level in terms of food production.	0.86			
Access to food (AC)	0.74	Food not grown in the province is prepared and marketed by governmental and non-governmental organizations.	0.78	0.516	0.445	0.829
		Due to the inability to prepare food, other family members consume food that they do not like.	0.80			
		Households consume limited food because of lack of financial resources.	0.80			
Food supply stability (ST)	0.68	It is possible to have access to any kind of food for family members.	0.53	0.577	0.487	0.844
		Dietary diversity is observed in the household food basket.	0.71			
		The food needed by the household is supplied stably to the market.	0.87			
Food safety (SA)	0.77	Some foods become scarce and expensive at uncertain and unpredictable times.	0.87	0.512	0.455	0.781
		In case of food shortage, the necessary measures are taken immediately to eliminate the shortage in the market.	0.64			
		Appropriate mechanisms are adopted and implemented to maintain stability in the food market.	0.62			
		The food on the market is at a good level in terms of health and safety.	0.75			
		The relevant institutions regularly and carefully monitor the health and safety of food.	0.73			
		The natural conditions of food use are not associated with an unacceptable risk to human health.	0.71			

The mechanism of reviewing and approving the safety of consumption of the province's products has been predicted and provided. 0.67

**Examination of the construct validity**

As is seen in the table above, the factor loadings of all dimensions and components of the food-safety measurement

model are greater than 0.40 and significant. Thus, one can state that all factor loadings are desirable. The results of FS model fit indices are as follows;

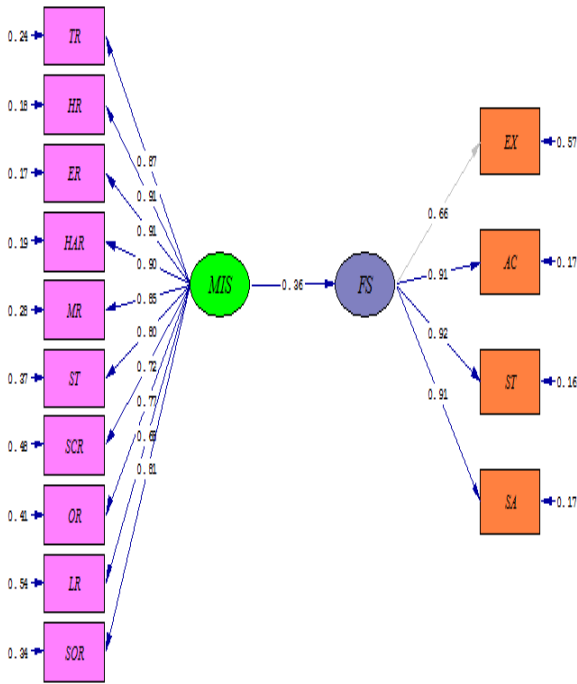
**Table 4: Fit indicators of FS evaluation model**

Row	Model fit criteria	Abbreviation	Value	Desired limit	Interpretation
1	Chi-square to the degree of freedom ratio	$\chi^2/df$	2.513	3>	Desirable
2	Normalized fit index	<i>NFI</i>	0.95	0.90 <	Desirable
3	Comparative fit index	<i>CFI</i>	0.97	0.90 <	Desirable
4	The root mean square error of approximation	<i>RMSEA</i>	0.068	0.08>	Desirable

As the values of all fit indices of Table (3) are desirable, one can state that the dimensions and items selected to measure FS have the necessary construct validity and can well measure the concept.

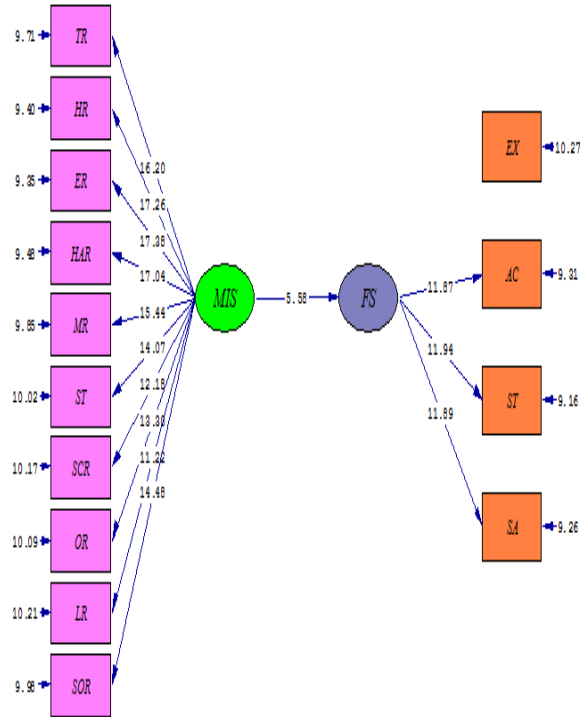
**The main hypothesis**

The effect of establishing a management information system on improving FS in the agricultural sector of Khuzestan



Chi-Square=161.31, df=76, P-value=0.00000, RMSEA=0.056

**Figure 4:** Structural equation model of the effect of management information system deployment on FS (in Standard Mode)



Chi-Square=161.31, df=76, P-value=0.00000, RMSEA=0.056

**Figure 5:** Structural equation model of the effect of management information system deployment on FS (in significant mode)

**Table 5:** The results of implementation of the structural equation model

Hypothesis	Independent latent variable ( $\zeta$ )	Dependent latent variable ( $\eta$ )/variable	Standard coefficient ( $\beta$ )	Sig. (t-value)
	MIS	FS	0.58	
	FS	EX	0.27	
	FS	AC	0.21	
	FS	ST	0.16	
	FS	SA	0.26	

Main	Management information system	FS	0.36	5.58
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According to the results obtained and significance coefficients 5.58, which is not in the range -1.96 - 1.96, one can state that the main hypothesis - the effect of the establishment of

management information system on improving FS in the agricultural sector of Khuzestan - is confirmed. Moreover, as is seen, the establishment of management information system with a coefficient of 0.36 has an effect on improving FS. In other words, the effect of establishing a management information system on improving direct FS is significant and moderate. The results of the model fit indices are as follows:

**Table 6:** Model fit indices

Row	Model fit criteria	Abbreviation	Value	Desired limit	Interpretation
1	Chi-square to the degree of freedom ratio	$\chi^2/df$	2.122	3>	Desirable
2	Normalized fit index	<i>NFI</i>	0.94	0.90 <	Desirable
3	Comparative fit index	<i>CFI</i>	0.95	0.90 <	Desirable
4	The root mean square error of approximation	<i>RMSEA</i>	0.056	0.08>	Desirable

As the values of all the fit indices of the above table are desirable, given the fit indices, one can state that the collected data support the model of the effect of establishing management information system on improving FS in the agricultural sector of Khuzestan.

### Sub-hypotheses

The results of testing the sub-hypotheses are briefly presented in the following table showing the standard coefficient and significance in order of priority.

**Table 7:** Summary of the results of testing the sub-hypotheses

Row	Independent latent variable ( $\zeta$ )	Dependent latent ( $\eta$ )/variable	Standard ( $\beta$ ) coefficient	Sig. (t-value)	Priority
First	Economic requirements	FS	0.80	9.33	1
Second	Operational requirements		0.66	8.01	2
Third	Management requirements		0.48	6.74	3
Fourth	Hardware requirements		0.42	6.35	4
Fifth	Technical requirements		0.31	4.65	5
Sixth	Socio-cultural requirements		0.29	4.31	6
Seventh	Software requirements		0.25	3.96	7
Eighth	Legal requirements		0.21	3.58	8
ninth	Human requirements		0.19	3.11	9
Tenth	Scheduling requirements		0.17	2.99	10

## DISCUSSION AND CONCLUSION

The purpose of the study is to evaluate the feasibility of establishing an information system to enhance FS in the agricultural sector of Khuzestan and the creation of such a system will need financial and time costs and using human resources and equipment. Thus, it is necessary to conduct feasibility studies before the implementation of the operational plan and to make the necessary decision regarding the implementation or non-implementation of the operational plan according to the feasibility results. In feasibility studies, it is tried to identify and analyze various technical, operational, economic, financial, socio-cultural, human resources, hardware, software equipment, scheduling,

legal, and managerial, and security options to select the most appropriate plan to meet the needs (Eslami, Bitá).

Economic requirements had the highest effects on FS, followed by operational, managerial, hardware, technical, socio-cultural, software, legal, human, and scheduling requirements. Thus, scheduling requirements had the least effect on FS, but all the requirements of the research hypotheses were confirmed at the same time.

The results obtained concerning the effect of economic factors as the most effective factor in other related studies has been confirmed as well. The economic factor was the most effective one on FS. Seyed Hamzeh and Damari (2017) considered the economic factor of the household as the first

priority of FS in the community, in line with the results of this study [15]. Moreover, Shakouri (2004) stated that wealth and household income are the main factors and are the first priority of FS in society; thus, economic requirements are among the first priority of FS in communities in many studies [16].

According to the study, the second factor in the effect on FS is operational factors and requirements. Several studies have been done in the past concerning the second effective factor in the study, which is operational factors and requirements. Scott (1986) argued that the ability of managers to report activities and actions is one of the most effective factors in determining the correct use of management information system. Additionally, Davis and Olson (2005) claimed that the easy and appropriate availability of data processing results for users to use is one of the factors affecting the activity of management information system.

According to the results of the study, the third factor affecting FS is the factors and strict management requirements mentioned in previous studies in this field. According to the similar results of Rezaian (2006), the support of senior managers of the organization has been stated as one of the factors with a significant effect, among the set of factors, on the performance of the management information system.

According to the results of our study, the fourth factor affecting FS is the factors and hardware requirements stated in previous studies in this field. For instance, Rezaian (2006) stated that hardware tools and facilities to implement management information system are of the most effective factors on optimal performance.

According to the present study, the fifth factor concerning the effect on FS is technical factors and requirements. Regarding this, Rezaian (2006) states the type and degree of applicability of the management information system as well as covering all the needed applications so that the user can use the system easily and with high productivity are of the factors affecting enhancing FS.

The socio-cultural requirements were identified as a factor with a significant effect and the sixth priority on FS based on the results in this study. Lauden and Lauden (2005) obtained similar results, based on which attention to the socio-cultural contexts of the users is of the factors affecting the application of management information system. Moreover, in a study on the relationship between agricultural productivity and food insecurity, Costa et al. (2013) found a significant relationship between education level and social class of the head of the household with food insecurity.

Based on the results of the study, legal requirements are the eighth factor affecting FS. In a similar study in this regard, Lauden and Lauden (2005) stated that government laws and regulations, along with the rules and social requirements

governing each community, have a significant effect on the implementation of management information system.

The results of the study proved the significant relationship between human resource requirements and FS as the ninth factor in terms of level of significance. Concerning this, there are other studies like Rezaian (2006) that consider the specialized, qualified and efficient human resources as the most influential factors in the performance of management information system.

As the last requirement examined in the present study, scheduling requirements have had a significant effect on FS. Concerning this, Davis and Olson (2005) claimed that the availability of information in timely manner and the availability of information and system results are among the significant factors in the management information system.

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