

Knowledge Creation Environment in the Iranian Universities: A Case Study

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Abstract

The main purpose of the present research is to analyze the knowledge creation environment at an Iranian University (Alzahra University) as a typical University in Iran, using a combination of the *i*-System and Ba models. This study is necessary for understanding the determinants of knowledge creation at Alzahra University as a typical University in Iran. To carry out the present research, which is an applied study in terms of purpose, a descriptive survey method was used. In this study, a combination of the *i*-System and Ba models has been used to analyze the knowledge creation environment at Alzahra University. *i*-System consists of 5 constructs including intervention (input), intelligence (process), involvement (process), imagination (process), and integration (output). The Ba environment has three pillars, namely the infrastructure, the agent, and the information. The integration of these two models resulted in 11 constructs which were as follows: intervention (input), infrastructure-intelligence, agent-intelligence, information-intelligence (process); infrastructure-involvement, agent-involvement, information-involvement (process); infrastructure-imagination, agent-imagination, information-imagination (process); and integration (output). These 11 constructs were incorporated into a 52-statement questionnaire and the validity and reliability of the questionnaire were examined and confirmed. The statistical population included the faculty members of Alzahra University (344 people). A total of 181 participants were selected through the stratified random sampling technique. The descriptive statistics, binomial test, regression analysis, and structural equation modeling (SEM) methods were also utilized to analyze the data. The research findings indicated that among the 11 research constructs, the levels of intervention, information-intelligence, infrastructure-involvement, and agent-imagination constructs were average and not acceptable. The levels of infrastructure-intelligence and information-imagination constructs ranged from average to low. The levels of agent-intelligence and information-involvement constructs were also completely average. The level of infrastructure-imagination construct was average to high and thus was considered acceptable. The levels of agent-involvement and integration constructs were above average and were in a highly acceptable condition. Furthermore, the regression analysis results indicated that only two constructs, viz. the information-imagination and agent-involvement constructs, positively and significantly correlate with the integration

construct. The results of the structural equation modeling also revealed that the intervention, intelligence, and involvement constructs are related to the integration construct with the complete mediation of imagination. The present research suggest that knowledge creation at Alzahra University relatively complies with the combination of the *i*-System and Ba models. Unlike this model, the intervention, intelligence, and involvement constructs are not directly related to the integration construct and this seems to have three implications: 1) the information sources are not frequently used to assess and identify the research biases; 2) problem finding is probably of less concern at the end of studies and at the time of assessment and validation; 3) the involvement of others has a smaller role in the summarization, assessment, and validation of the research.

Keywords: *i*-System, Ba Model, Knowledge Creation, Knowledge Creation Environment, Knowledge Management, Alzahra University.

Introduction

Knowledge is considered the most important element of value creation due to the increasing complexity of the competition between the institutes and organizations. Therefore, understanding knowledge creation and its determinants and the process of knowledge management is substantially important. Seemingly, mechanical attention to knowledge management regardless of knowledge creation is not adequate and fails to result in improvement and innovation on its own (Nonaka & Takeuchi, 1995). Improvements in the capacity for the creation of knowledge and innovation in organizations and educational centers can considerably contribute to the improvement in performance and survival of these organizations. Organizational innovation revolves around the targeted design and alteration of the products, services, structures, and organizational processes.

The environment plays a key and significant role in the emergence of knowledge and knowledge creation because human is a context-oriented creature that needs to be in the right environment to carry out every task and activity. His performance is also influenced by the attributes of that environment. For instance, a mechanic can only manifest his knowledge if he is in a repair shop and if he has access to the necessary devices and accessories to show the concrete manifestation of his knowledge. If he is in a chemistry laboratory, he basically cannot show his knowledge. Davenport (1998) stressed the role of organizational culture in knowledge management. Moreover, the repeated emphasis on the incompatible organizational culture (Jennex, 2008: 12), as the most important reason for the failure of the knowledge management programs, in different references confirms the role of the environment on the manifestation and circulation of knowledge in organizations.

Several knowledge creation and knowledge management models have been developed. Some of these models include the models developed by Bukowitz & Williams (1999) and Birkinshaw & Sheehan (2002). Most of these models are based on the knowledge management process rather than knowledge creation. Nonaka and Takeuchi introduced the notion of knowledge creation in Japanese companies for the first time. They argued that knowledge creation is a process revolving around explicit knowledge and tacit knowledge and it results from the conversations and discussions during action or during a discussion over the solution to a problem. In this process, the person's tacit knowledge is shared with a group, is discussed, and is converted into collective tacit knowledge. Then, each person writes his interpretation of the conversations, which results in the formation of the person's explicit knowledge. This

person shares his/her explicit knowledge in the form of plans, instructions, guidelines, and models with a workgroup, where it transforms into collective explicit knowledge. Following discussions and conversations about the collective explicit knowledge, this knowledge transforms into collective tacit knowledge, setting the scene for the reemergence of the person's tacit knowledge and continuation of this cycle. Hence the written interpretations, conversations, and observations (five senses) in the interaction cycles form the basis for knowledge creation as acknowledged by all knowledge management and knowledge creation scholars (Nonaka & Takeuchi, 1995).

Universities are among the most important knowledge creation organizations and they also serve as knowledge enterprises. The creation of knowledge is the most important and satisfactory event in these centers. Therefore, all of the components of these organizations collaborate to create knowledge. Universities need to study the components of the knowledge creation process, reinforce the weaknesses, and protect and preserve the strengths. Despite the numerous scientific products of the universities, cases of knowledge creation in Iran that influence the public welfare and life have been rare. Hence instead of knowledge creation (which refers to the production of articles in practice), the method of knowledge creation has to be studied at universities and thus we carried out this analysis at Alzahra University. Universities use knowledge creation mechanisms either consciously (with official knowledge management plans) or unconsciously (knowledge management based on the staff experience in each department). These mechanisms have become normalized over time and often function imperfectly (Nakamori, 2006). If a university or research center is clearly aware of its knowledge creation components and knows the relationships between these components, their weaknesses and strengths, and the distance from the ideal model, it can more effectively prepare a knowledge creation environment. In the studies by researchers such as Nakamori (2006), a combination of the *i*-System and Ba models is used to study knowledge creation environment at universities. In this study, the *i*-System and Ba models are utilized to analyze the knowledge creation environment at Alzahra University because very few of the available knowledge creation models (such as the models proposed by Bukowitz & Williams in 1999; Nonaka, Reinmüller & Toyama in 2001; Birkinshaw & Sheehan in 2002, Salisbury, 2008) specifically concentrate on the knowledge creation environment. Moreover, very few of these models match the *i*-System model in addressing the knowledge creation environment in details. Nakamori and others (Nakamori, 2006; Tian & Nakamori, 2005; Kikuchi & Nakamori, 2007) integrate this process model into the Ba model (which focuses on the primary elements required for knowledge creation) in some of their studies to develop a hybrid model specific to university environments. He proposed a model with precise details for the analysis of the knowledge creation environment at universities. Due to the higher precision and explicit details of this model as compared to the model proposed by Nonaka & Takeuchi, we used Nakamori's model in this study. Hence it could be concluded that knowledge creation requires an environment, which has to be suitable. The hybrid Ba and *i*-System model, which was designed by Nakamori (2006) and some of his colleagues such as Wierzbicki & Nakamori (2006) for university environments, suits this study. However, the mathematical bases of this model have been explained and proven by Nakamori (2003). The present research attempts to analyze the knowledge creation environment at Alzahra University using a combination of the *i*-System and Ba models. It, in fact, aims to answer the following questions: 1) In what condition are the input, process, and output constructs? 2) Which constructs do have the largest effect on the

knowledge creation at Alzahra University? 3) How much does the research conceptual model match the operational model?

Conceptual Model

In works such as Nakamori (2014) and Wierzbicki and Nakamori (2006) as well as the studies by Nakamori (2006), and Kikuchi, Rong, Wang, Wierzbicki & Nakamori (2007), we find that Nakamori as a leader of these works have combined the constructs of *i*-System model with the ingredients of Ba model and offered a new framework for the evaluation of knowledge creating environments. In this section, we describe elements of this combined model.

Ba model

As Nonaka & Kono (1998) were expressed, Ba is a Japanese concept the best English equivalent of which is the term “place”. This term initially was introduced by the Japanese philosopher, Nishida Kitaro, and was made discursive by Shimizu. The philosophical concept of Ba signifies a place for identification of an individual in a team, and self-identification. Nonaka & Kono (1998) by emphasizing on the German existentialist thinking have stated that Ba is a place in which the meaning is sheltered and by which the meaning is nurtured. Therefore, Ba is a common and public place that makes possible the scientific dialogue and knowledge creation. Nakamori (2006) and Pribadi (2010) stated that Ba have three dimensions: 1. infrastructure (place, material, equipment); 2. Agents (cooperators); and 3. Information (explicit knowledge).

***i*-System model**

This model offers a self-regulating mechanism without the control of an external director (CEO, dean, boss, owners, etc.) for knowledge creation. It is one of the main models of knowledge creation that was inspired by the Nonaka, & Takeuchi’s (1995) model. By using this model, the external data and information are combined by the internal knowledge of agents in order to lead an organization to a new knowledge that have not existed before. Nakamori (2006) stated that this model have 5 dimensions: 1. Intervention (finding problems); 2. Intelligence (explicit knowledge available for problem solving); 3. Involvement (place and equipment for dialogue, oneness and cooperation); 4. Imagination (grasping, digesting and understanding ideas, analyzing them, and imagining new ideas); and 5. Integration (combining and integrating ideas, and assessing and evaluating them).

Mixed model

By combining the *i*-System and Ba models, we offer a mixed model by 11 constructs using Nakamori (2006). It can be said that construct no 1 serves as the input, constructs 2-10 serve as the process and construct 11 serves as the output:

Intervention

This construct serves as input and signifies the process of finding problems and ability of distinct and clear problem statement. By means of this dimension, an organization or a foundation can evaluate the work environment’s potential to activate or motivate agents for finding and defining the problems. Problem finding and problem statement workshops, educating research priority definition methods, awards for best problem statements and so on

can be some of the observed variables of this construct.

Infrastructure-intelligence

This construct assesses the hardware constraints of the knowledge creating environment. This construct aims to assess the limitations of equipment, appliances, place (books, library space, computer hardware, network equipment, etc.) in finding and aggregating the needed information.

Agent- intelligence

This construct is very individualistic and aims to assess the agent's liberty and freedom in investigating any problems they want in their knowledge creating environment. To what extent an agent has freedom to investigate a specific problem? Is there any forbidden problem that no one can study? Why?

Information-intelligence

This construct aims to assess whether data gathering from inside and outside of the knowledge creating environment is possible. Is there any prospected mechanism or process for gathering data from inside or outside the knowledge creating environment?

Infrastructure-involvement

This construct targets the hardware dimensions of cooperation and involvement of the agents. The main question of this construct for assessment of the knowledge creation environment is that whether or not the place, appliances, resources, and other physical equipment have been provided for the cooperation of heterogeneous groups (such as the faculty members and students, outside researchers and students).

Agent-involvement

This construct aims at the assessment of the commitment to the rules of cooperation in the knowledge creation environment. To what extent the agents are committed to rules of cooperation? Are there ever any rules for adherence?

Information-involvement

This construct studies the collaborative problem-solving process in the knowledge creating environment and aims to investigate whether the dialogues target the heart of the problem. Is there concentration on the core of problem and whether marginal and none-relevant factors affect mode of the process?

Infrastructure-imagination

This construct investigates the possibility of direct experience and data collection of phenomena inside the knowledge creation environment, or the existence of the routines, facilities or official recommendations for gathering data from outside of the environment.

Agent-imagination

This construct seeks to identify whether there are any routines or practices for the

absorption of external explicit knowledge (documents, catalogues, standards, reports, etc.) and converting them into the internal and implicit knowledge by means of the focus groups sessions, reading sessions, research review sessions etc.

Information-imagination

The aim of this construct is to find out whether there is any routine, practice, plan or culture for offhand transaction and information sharing among the homogenous or heterogeneous agents in the knowledge creation environment.

Integration

This construct serves as the output and signifies the process of combining, integrating and evaluating new findings or new interpretations or understandings and their validity.

By combining the above-mentioned dimensions of the Ba and *i*-System models, the conceptual model of this research is constructed:

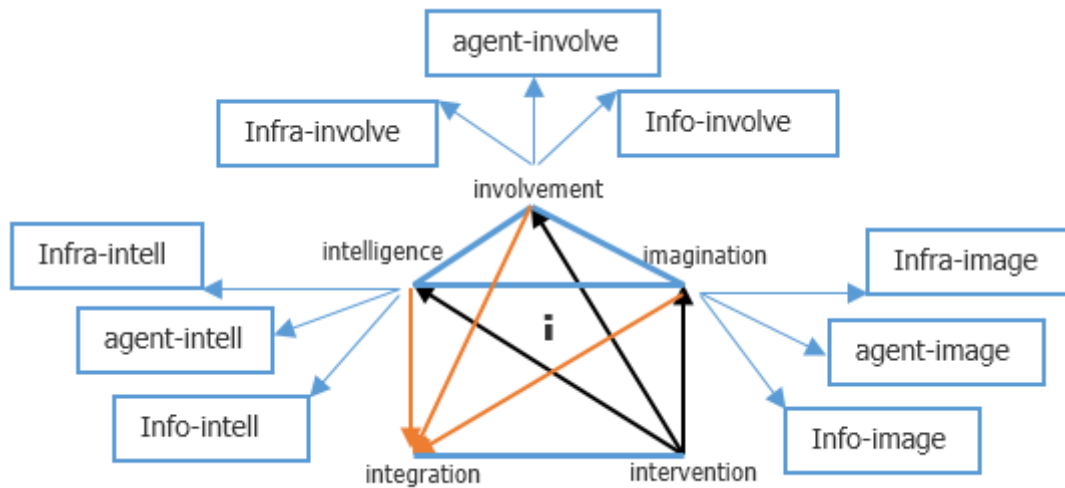


Figure 1. Conceptual model of the research

In the following section, we aim to assess the knowledge creation environment of Alzahra University in Iran as a typical Iranian university by means of the conceptual model represented in a questionnaire with 52 questions.

Research Method

This study is an applied research in terms of purpose and a descriptive-survey study in terms of the data collection and analysis method. A 52-item questionnaire was the main data collection instrument. The questions in this questionnaire were rated based on a six-point scale (fully agree (code 6), agree (code 5), partially agreed (code 4), partially disagree (code 3), disagree (code 2), and fully disagree (code 1) and assessed the 11 research constructs. Nakamori's model (2006) was used to formulate this questionnaire. The research statistical population included all of the faculty members of Alzahra University (344 faculty members) from whom a sample was collected using the stratified random sampling technique. In this study, each department at Alzahra University was considered a stratum and several faculty members were randomly selected from each stratum to form the sample. The sample size was 181 based on the Krejcie and Morgan's table. Finally, 129 completed questionnaires were

received, which accounted for 72.27% of all the distributed questionnaires. This percentage was considered acceptable. The Content Validity Index (CVI) method was used to assess the content validity of the questionnaire, and 10 experts completed the CVI questionnaire. Since the CVI index was higher than 0.79 for all statements, the validity of this questionnaire was confirmed.

The reliability of a research scale refers to the stability and repeatability of its results. In a reliability assessment, the goal is to ensure whether the scale yields relatively stable results or yields contradictory data on the research population each time. There are various reliability assessment methods, but the split-half method was used in this study. To this end, the research questions were split in half. To wit, the odd questions were put in the group 1 and the even questions were put in the group 2. Next, the Pearson correlation coefficient (Pearson's r) was calculated for these two variables, which was 0.702. Then, Pearson's r was put in the $R_n = \frac{2r}{1+r}$ formula and since the calculated R_n (0.824) was more than 0.7, the reliability of the questionnaire was accepted.

We used the SPSS and AMOS statistical software programs for analyzing the data. Furthermore, the descriptive (median, mean, standard deviation, quartiles) and Inferential (t-test, regression analysis, structural Equation Modeling (SEM)) statistics were used for finding patterns.

Findings

At the first stage, the descriptive statistics concerning our sample are presented below. We used the median criteria for computing the research variables in SPSS:

Table 1.

Descriptive statistics of the research constructs

Statistics constructs	Median	Mean	Standard deviation	quartile 1	quartile 2	quartile 3	Interquartile
Intervention	3	2.79	1.18	2	3	4	2
infra-intell	3	3.14	0.81	3	3	4	1
agent-intell	3	3.32	0.89	3	3	4	1
info-intell	3	2.75	0.79	2	3	3	1
infra-involve	3	2.87	0.95	2	3	3	1
agent-involve	4	4.05	0.63	3	4	4	1
info-involve	3	3.11	0.90	2	3	4	2
infra-image	3.5	3.37	0.74	3	3.5	4	1
agent-image	2	2.25	0.83	1	2	3	2
info-image	3	3.06	0.92	3	3	4	1
integration	4	3.79	0.81	3	4	4	1
total	3	3.20	0.62	3	3	4	1

As shown in the table 1, the median value of agency-involvement is 4, the infrastructure-imagination is 3.5, the agent-imagination is 2, and other constructs are 3. Then, commitment to the rules of cooperation and direct experience of phenomenon in the knowledge creation environment is in a good condition but there is a weak condition for the absorption of external explicit knowledge, and other conditions are mediocre. On the basis of mean value, three

constructs, namely intervention (mean=2.79), information-intelligence (mean= 2.75) and infrastructure-involvement (mean=2.87) are under the average utility and only agent-involvement (mean=4.05) is in a good condition and other constructs are of average condition.

For testing the significant difference between the upper and lower bound of the spectrum, we used the nonparametric binomial test because of the ordinal data. Table 2 shows the results:

Table 2
Binomial Test

	Category		N			Observed Prop.			Test Prop.	Exact Sig. (2-tailed)
	Group 1	Group 2	Group 1	Group 2	Total	Group 1	Group 2	Total	Group 1	Group 1
intervention	<= 3	> 3	74	55	129	.57	.43	1.00	.50	.113
infra-intell	<= 3	> 3	63	66	129	.49	.51	1.00	.50	.860
agent-intell	<= 3	> 3	58	71	129	.45	.55	1.00	.50	.291
info-intell	<= 3	> 3	82	47	129	.64	.36	1.00	.50	.003
infra-involve	<= 3	> 3	83	46	129	.64	.36	1.00	.50	.001
agent-involve	<= 3	> 3	9	120	129	.07	.93	1.00	.50	.000
info-involve	<= 3	> 3	61	68	129	.47	.53	1.00	.50	.597
infra-image	<= 3	> 3	52	77	129	.40	.60	1.00	.50	.034
agent-image	<= 3	> 3	108	21	129	.84	.16	1.00	.50	.000
info-image	<= 3	> 3	65	64	129	.50	.50	1.00	.50	1.000
integration	<= 3	> 3	19	110	129	.15	.85	1.00	.50	.000

Table 2 shows the results of the binomial test. Null hypothesis maintains no significant difference between the frequencies of upper and lower bound of the spectrum in each of the constructs of the research and alternative hypothesis maintains a significant difference between the frequencies. As mentioned above, there is a significant difference between the frequencies in five constructs: information-intelligence (lower), agent-involvement (upper), infrastructure-imagination (upper), agent-imagination (lower), and integration (upper). Thus we can more precisely say that gathering data from inside and outside the knowledge creation environment and absorption of external explicit knowledge are not in a good condition at Alzahra University but commitment to the rules of cooperation, direct experience of phenomenon, and combining findings and evaluating them is significantly in a good condition.

In the next step, we examined the effects of independent variables (10 variables) on the dependent variable (integration) by means of the multiple regression with stepwise style. The results are shown below:

Table 3
Variables entered in regression

Model	Variables Entered	Variables Removed	Method
1	information- imagination	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
2	agent-involvement	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

a. Dependent Variable: integration

On the basis of the first output of regression analysis (table 3), only two variables (information-imagination & agent-involvement) had linear relationship with the dependent variable and have remained in the analysis. Therefore the variations of “integration” were only

dependent on the variations of information-imagination and agent-involvement and noother nine variables at Alzahra University.

Table 4

Regression coefficient and Durbin-Watson Statistic for spatial dependency of error terms

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.519a	.270	.263	.69439	
2	.625b	.390	.380	.63704	2.126
a. Predictors: (Constant), info-image, b. Predictors: (Constant), info-image, agent-involve, c. Dependent Variable: integration					

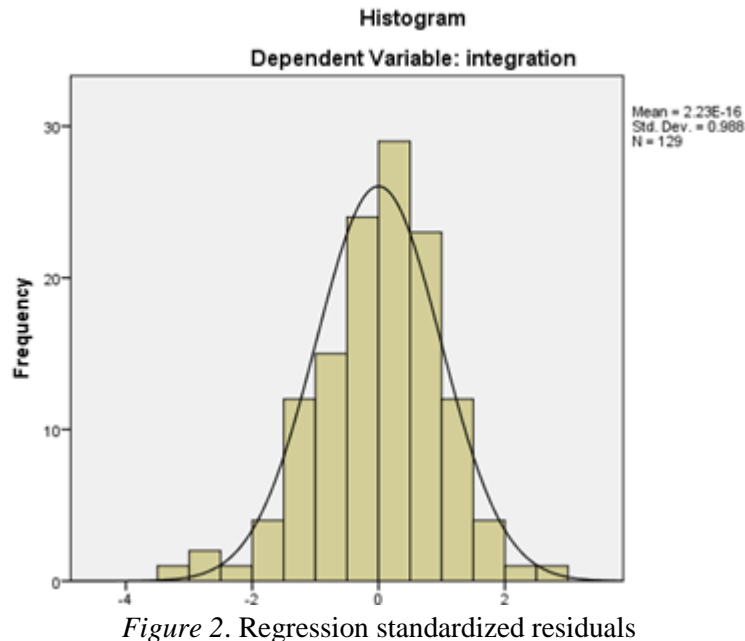
Table 4 shows the next important output of stepwise regression analysis. It consists of R, R square, and Durbin-Watson coefficient. Pearson's R shows the strength of correlation between the independent variables ("information-imagination" and "agent-involvement") and the dependent variable. They have a strong correlation with integration because R is more than 0.5. R square or coefficient of determination shows the dependence of the variations of the dependent variable to the variations of the independent variable. As shown in table above, 27 percent of the variance for "integration" is explainable by "information-imagination" and 39 percent of its variations could be explained by "agent-involvement". The other important output is the Durbin-Watson statistic that shows the spatial dependency or independency of error terms (probable difference between the real values and predicted values by regression analysis). If the said statistics be less than 1.5 or more than 2.5, it indicates a correlation between the error terms and the inconsistent condition for regression analysis. This statistic here is 2.126 and it shows a spatial independency of the error terms and the consistency of conditions for regression analysis.

Table 5

Residual Statistics

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	2.2242	5.0529	3.8008	.50547	129
Std. Predicted Value	-3.119	2.477	.000	1.000	129
Residual	-1.89670	1.55164	.00000	.63180	129
Std. Residual	-2.977	2.436	.000	.992	129
a. Dependent Variable: integration					

Results of the table 5 is another evidence for the correctness of regression analysis in addition to the Durbin-Watson statistic. It shows that the mean value of residual, std. predicted value and std. residual is zero, which means that the distance of every observation from regression line is equal.



In the figure 2, we can see normal distribution of standardized residuals that verifies the outputs of table 5 and shows the equal distribution of error terms over regression line. Thus this condition for regression analysis has been satisfied.

Table 6.
coefficients of regression line equation and beta values

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
(Constant)	2.423	.216		11.240	.000	1.996	2.849
info_imag	.453	.068	.519	6.682	.000	.319	.588
(Constant)	.676	.409		1.653	.101	-.134	1.486
info_imag	.427	.062	.489	6.836	.000	.303	.551
agent_involv	.448	.092	.349	4.875	.000	.266	.630
a. Dependent Variable: integration							

Table 6 is the most important output of regression analysis. Considering that the P value of variables in the model 1 is under 0.05, we chose this model because we recognized it as important for predicting the variations of the dependent variable. Beta value for information-imagination is the biggest value that shows almost 50 percent of variance for the dependent variable regressed on this variable. It reveals that the information-imagination (offhand transaction and information sharing among homogenous or heterogeneous agents) is the most important variable for the integration of knowledge in Alzahra University. But for regression equation, we use unstandardized coefficients; thus:

$$\text{Integration} = 2.423 + \text{info-image} \times 0.453$$

On the basis of the above-mentioned linear equation, we can say that the outputs of the knowledge creation environment in Alzahra University regress on 0.453 of information

imagination (routines, practices or plans for offhand transaction and information sharing among homogenous or heterogeneous agents in the knowledge creation environment.) plus the constant value of 2.423. Thus, information imagination is the main variable for predicting the knowledge creation environment in Alzahra University as a typical university in Iran.

In the final phase of the research, we have used the structural equation modeling method and AMOS software (v. 22) for comparing the *i*-System model of Alzahra University with the basic *i*-System model and assessing the degree and size of deviation from it.

This method was used in order to assess the effects of several independent variables on several dependent ones in a model. In other words, we used structural equation modelling when some endogenous variables are simultaneously exogenous variables (Arbuckle, 2013). In order to evaluate the conceptual model, we should design the targeted model on the basis of the conceptual model. To do this, we should specify the latent variables first. In the model above, the variables “intervention”, “imagination”, “involvement”, “intelligence” and “integration” are the latent variables. Then, the observable variables for “intervention” and “integration” were added. Questions q_1 to q_5 are observable variables for “intervention” and questions q_{48} to q_{52} belong to “integration”. Then, we specified the intermediate variables, namely “infrastructure-imagination”, “agent-intelligence”, “information-intelligence”, “infrastructure-involvement”, “agent-involvement”, “information-involvement”, “infrastructure-imagination”, “agent-imagination” and “information-imagination”, and their observable variables, namely the questions q_6 to q_{47} . To run the model, we used bootstrapping as a non-parametric method.

As shown in the figure 3, factor loading (correlation coefficient) of “intervention” to “integration” is -0.15, intervention to imagination equates with 0.12, intervention to involvement, 0.18, intervention to intelligence, 0.29, imagination to integration, 1.00, intelligence to integration, 0.00, involvement to integration, -0.04, intelligence to imagination, 0.16, intelligence to involvement, 0.48, and involvement to imagination is 0.55. Table 7 presents all correlation coefficients among the latent variables and intermediate variables:

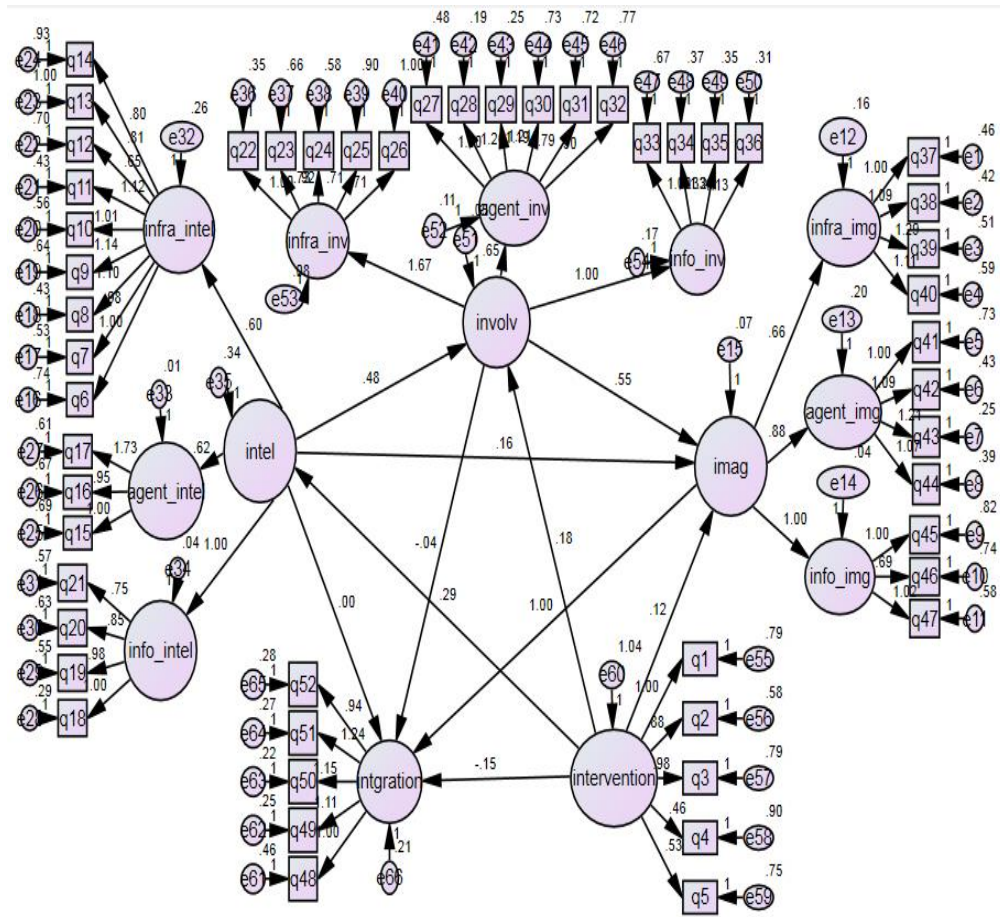


Figure 3. Model of the research: the main, intermediate and observable variables with significant or insignificant relations

Table 7
Correlation coefficients among the variables

Paths		factor loading	standard error of mean	confidence level	
		Estimate	S.E.	P	
Intelligence	<---	Intervention	0.295	.075	***
Involvement	<---	Intervention	0.187	.056	0.001
Involvement	<---	Intelligence	0.476	.116	***
Imagination	<---	Intervention	0.116	.103	0.090
Imagination	<---	Involvement	0.553	.331	0.048
Imagination	<---	Intelligence	0.164	.191	0.392
agent-imagination	<---	Imagination	0.877	.228	***
infra-imagination	<---	Imagination	0.664	.178	***
info-imagination	<---	Imagination	1.000		
infra-intelligence	<---	Intelligence	0.601	.133	***
info-intelligence	<---	Intelligence	1.000		
agent-intelligence	<---	Intelligence	0.623	.161	***
info-involvement	<---	Involvement	1.000		
infra-involvement	<---	Involvement	0.670	.325	***
agent-involvement	<---	Involvement	0.647	.165	***

Paths			factor loading	standard error of mean	confidence level
			Estimate	S.E.	P
integration	<---	Intervention	-0.148	.108	0.168
integration	<---	Involvement	-0.041	.423	0.922
integration	<---	Imagination	1.000		
integration	<---	Intelligence	0.004	0.248	0.986

As shown in the table 7, the paths between intervention and imagination, intelligence and imagination, intervention and integration, involvement and integration, and intelligence and integration are not significant in the 0.95 confidence level (p-values are less than 0.05). However, the direct effects of intervention to intelligence (0.295), intervention to involvement (0.187), intelligence to involvement (0.476), imagination to integration (1.00) and involvement to imagination (0.553) are significant. For studying the indirect effects, we got complete and partial mediation data from the outputs of AMOS. Table 8 shows the data for indirect effects:

Table 8.

Indirect effects of the variables

Variables	Intervention	Intelligence	Involvement	imagination	integration
Intelligence	0	0	0	0	0
Involvement	0.141	0	0	0	0
Imagination	0.224	0.263	0	0	0
Integration	0.328	0.407	0.553	0	0

If the direct path between two variables would not be significant but there would be significant indirect effect with intermediation of another variable, the mediation is complete. If the direct path between two variables would be significant and also there would be significant indirect effect with intermediation of another variable, the mediation is partial.

Table 9

Types of mediation

path of indirect effects			type of mediation
intervention	imagination →	integration →	complete mediation
Intervention	involvement →	imagination →	partial mediation
Intelligence	imagination →	integration →	complete mediation
Intelligence	involvement →	imagination →	complete mediation
Involvement	imagination →	integration →	complete mediation

As seen in the table 8, intervention has indirect effect on integration (0.328) and this effect occurred with the mediation of “imagination” because only the path of imagination to integration is statistically significant, and mediation of “imagination” is a complete mediation because the direct effect of intervention to integration is statistically insignificant. Moreover, intervention has an indirect effect on imagination (0.224) and this indirect effect appeared with the mediation of “involvement” because only the path of involvement to imagination is statistically significant, and mediation of “involvement” is a partial mediation because the direct effect of intervention to imagination is statistically significant. Also, intelligence has indirect

effect on integration (0.407) with complete mediation of “imagination” and it has indirect effect on “imagination” (0.263) with complete mediation of “involvement”. Eventually, “involvement” has the biggest indirect effect on integration (0.553) with the complete mediation of “imagination”. We can conclude that “imagination” is the most influential mediator for the indirect effects of other variables and plays a key role in the knowledge creation of Alzahra University as a typical university in Iran.

Studying the model fit indices is the final phase of this research. It was probable that model fit indices would not be suitable to saturate standards. Thus we acted on the suggestions of AMOS, namely the modification indices. Modification indices in AMOS are some suggestions for drawing covariance lines between variables or error terms for the improvement of model fit. Arbuckle (2013) suggests that if we can improve indices like “Root Mean Square Error of Approximation” (RMSEA), “chi-square divided by degree of freedom” (χ^2/df), “Comparative Fit Index” (CFI) and “Normed Fit Index” (NFI) to a suitable level, it would be sufficient. We performed the modification indices and this enabled us to improve the indices to a suitable level. The respective results are presented in the table 10:

Table 10

Model fit indices

model fit indices	RMSEA	CFI	NFI	χ^2/df
criteria	>0.1	>0.8	>0.9	1-5
Values	0.107	0.927	0.940	1.023

As shown in the table 10, after performing the modification indices suggested by AMOS, the model fit indices improved to a satisfactory level that can be accepted with some tolerance.

Conclusion

Considering the results of the regression analysis and structural equation modelling, It is comprehensible that two variables, namely, “agent-involvement” and “information-imagination”, are key factors for knowledge creation in Alzahra University and probably all other universities in Iran, because their regulations, bylaws, rules and administrative norms are almost the same. The key point is that these two factors are cooperative factors. “Commitment to the rules of interaction” and “offhand transaction and information sharing” are crucial to a successful knowledge creation in an Iranian university. On the other hand, the average value of “intervention” and “infrastructure-involvement” was less than mean value (mean=3). Considering the insignificant effect of intervention on integration and its low average value, more attention to the skills of finding resonant problems and clear explanation of them is needed. Furthermore, gathering data from inside and outside the knowledge creation environment (information-intelligence) and absorption of external explicit knowledge (agent-imagination) are not in a good condition and new regulations on them are needed. According to the findings, the knowledge creation model of a typical university in Iran is depicted below:

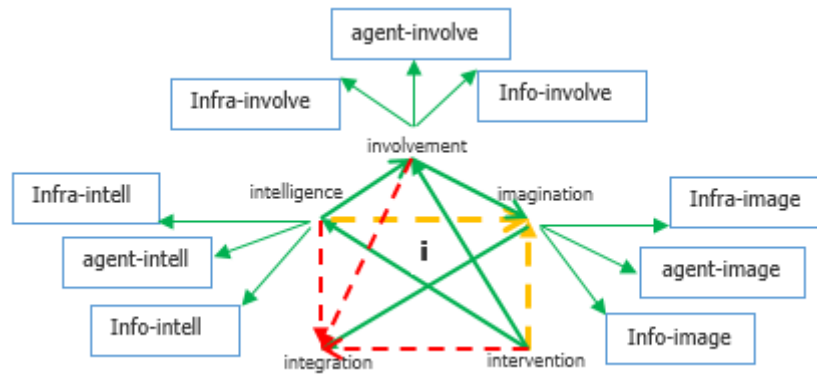


Figure 4. Knowledge creation model of a typical university in Iran

The red dashed lines represent the statistically insignificant paths, the orange dashed lines represent the indirect effects, and the green dashed lines represent the statistically significant paths. As shown in the figure 4, effects of all other variables on “integration” as the dependent variable take place with complete mediation of “imagination” and they don’t have direct effect on integration. This finding shows the individualistic mode of knowledge creation vs. the cooperative mode in Iran. It can be an alert for knowledge creation, as a collective subject matter, in Iran and it may have economic, social or ethical implications.

As Shown in fig. 4, direction of all constructs (except “imagination”) toward integration is not significant thus it shows that knowledge creation in the Iranian University occurs actually by means of personal abilities of one researcher without meaningful awareness about real problems of universities, institutions, corporations and organizations. Also, it takes place with minor perception of scientific participation and available true data and information (in libraries, information centers, organizations and corporations) for handling research projects. This may lead researchers to monographs that superficially have more than three or more co-authors. Moreover, this may lead to gathering fake data because of insignificant relationship between intelligence and integration in the studied knowledge creation environment.

The findings of this research are correspondent with some aspects of the work by Tian, Nakamori & Wierbichi (2009). Their research shows that in the Japan Advanced Institute of Science and Technology, there are: 1. weakness in technical backup and IT skills; 2. lack of precise understanding about importance of IT in knowledge management; 3. lack of enough emphasis on cooperation and 4. deficiency in scientific discussions. This research correspondingly showed that weaknesses in the scientific discussions aiming to comprehend and internalize knowledge as well as offhand cooperation and information sharing are important factors for the knowledge creation environment at Alzahra University as a typical university in Iran. Findings of this research are partially correspondent with the findings of Ren, Tian, Nakamori & Wierzbichi (2007). They have shown that four factors were important for the electronic backup for knowledge creation in the Japan Advanced Institute of Science and Technology: 1. creative group communication environment; 2. electronic environment for experiment support; 3. adaptive hermeneutic agents; and 4. planning and road-mapping systems. In the present research, the “creative group communication environment” was emphasized by introducing “agent-imagination” as a key variable for predicting knowledge creation in a typical Iranian university.

The results also are partially different from the findings of Kikuchi & Nakamori (2007).

They have shown that “stability” as a personal characteristic has a significant relationship with the process variables of the mixed model (infrastructure-intelligence, agent-intelligence, information intelligence, infrastructure-involvement, agent-involvement, information-involvement, infrastructure-imagination, agent-imagination, and information-imagination). Furthermore, they have shown that “information-involvement” and “infrastructure-imagination” had a significant relationship with all personal characteristics of researchers. Thus, in their research, leading dialogues toward the heart of problems, and regulations for gathering data from inside and outside the knowledge creation environment were important. But, in this research, offhand cooperation and commitment to the rules of cooperation are important variables to pay attention.

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