ORIGINAL ARTICLE

Developing a Model of Proper Governance for Removing Interaction Barriers between Universities of Medical Sciences Andindustries

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Abstract

Background: The interaction between university and industry, due to its highly constructive and positive effects on technical, economic and social changes, was traditionally at the center of policy makers' and planners' attention. The aim of the present study was to explain barriers and challenges existing in the interaction between medical sciences universities and industry.

Methods: This present descriptive-correlational study used measuring method fto investigate the interaction among Medical Sciences University (School of Public Health). 1468 individuals participated in this study. Using Morgan scale, 321 people were selected as the sample. Two questionnaires were prepared by the researcher. The proper governance questionnaire contains political, economic, social, legal and cultural dimensions composed of 69 questions. The barriers between university and industry questionnaire covering 3 dimensions of individual interaction barriers, organizational interaction barriers and environmental interaction barriers is composed of 40 questions. Data analysis was done using SPSS, version 21.

Results: Based on factor analysis of the data, the main dimension of proper governance respectively was cultural factors and among various factors of barriers between university and industry, environmental interaction dimension was considered as the most important one. Moreover, the results showed that there was a direct and meaningful relationship between dimensions of proper governance and interaction between university and industry variable.

Conclusion: Based on the results of the present study, considering culture and cultural differences can help improve the interaction between university and industry.

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Introduction

To achieve higher economy in today's competitive world, cooperation of the organizations and industries with universities and research centers under the government auspices is the best approach.[1] Industry and university are the two effective institutions running major parts of economic and industrial developments of a country.[2] The effects of the two institutions on economic status of the society is so obvious that economic power of a country as well as gaining scientific and industrial achievements is highly dependent on the positive interaction of the

two institutions. One of the challenges our country, Iran, is dealing with is poor interaction between the two institutions of industry and university.[3]

The need to interaction between university and industry, due to its highly constructive and positive effects on technical, economic and social changes, was traditionally at the center of the policy makers' and planners' attention and they tried hardly to make efficient connection between the two institutions. If universities, where industrial barriers and problems could be dissolved through scientific methods, really focus on training professional human resources, and if industry with its various operational roles also focuses on industrial plans of the country, whether in production or provision of services, the urgent need to make interaction between industry and university is clearly obvious.[4]

The literature shows that, first, the relationship and interaction between the two institutions was not fundamentally established and, secondly, the content and form of this interaction was not properly oriented and targeted.[5] Therefore, interests and needs of the two institutions were fulfilled exogenously and separately and thus there was no motivation for interaction between the two institutions.[6]

The instances of the interaction barriers between the two institutions of university and industry in the present study, according to model of Esmaeil Panah and colleagues include individual interaction barriers, organizational interaction barriers, and environmental interaction barriers.

1- Individual interaction barriers: contains attitude interaction, skills interaction, demographic interaction, and psychology interaction

2- Organizational interaction barriers: contains cultural interaction, managerial interaction, financial interaction, and structural interaction.

3- Environmental interaction barriers: contains legal interaction, infrastructural interaction, particular features of industry, surveillance issues, and inter-cultural interactions.[7]

Generally, the interaction between university and industry carries the goal of achieving both scientific power of the university and experiences of industry and the interactions is conducted through making official and unofficial contracts between the two institutions.[8] Examples of research cooperation between the two institutions reveal dissensions in terms of nature, goal, value, criterion and interest which has led to emanate conflicts and knots that are difficult to unravel.[9]

Every industry and business is increasingly affiliated to human resources in economic construct.[10] That is, businesses highly need relying on universities

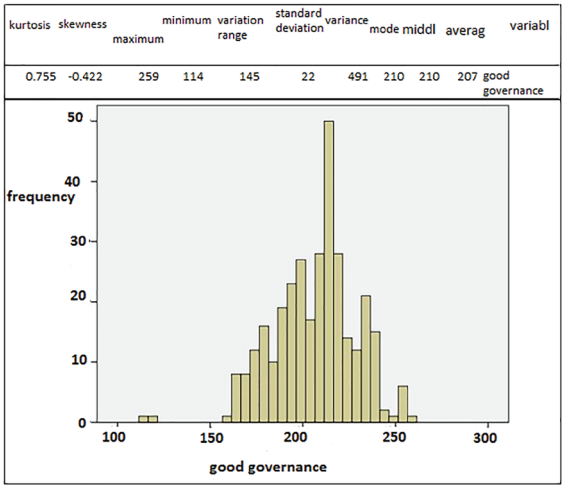

Figure 1: Descriptive statistics of good governance variable

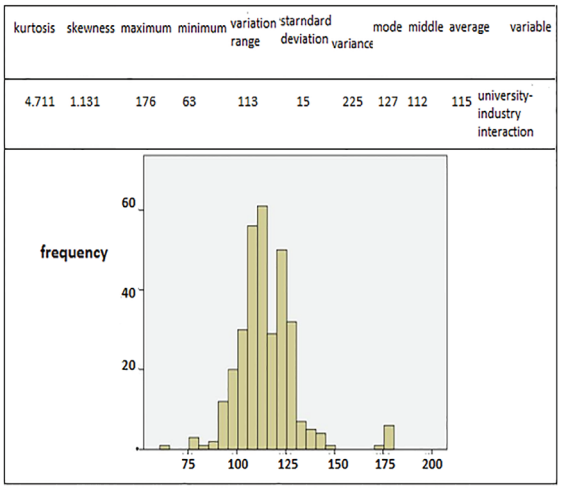

Figure 2: Descriptive statistics of university-industry interaction variable

as human resource trainers. Thus, it is obvious that industry and university require sustainable and uninterrupted interaction.[11]

Today, science is considered as the main criterion for setting added value in modern economies by which competitive potentials of countries would be strengthened in international markets.[12] Extensive application of science in modern economy has made a shift in attitudes and paradigms as avoiding resource-dependent economy towards adopting science-based economy.[13]

Insular encountering of various institutions of the society, specially industry and university in developing countries such as Iran, is related to the nature of the institutions, their independence in providing resources and interests, and lack of a mediator in order to set up an interaction between institutions.[14,15]

Lack of conformity between university learnings and real needs of the industry, many other problems have arisen, such as spending extra costs for training graduates after starting the job, time-consuming

trainings related to job, suspending the job planning and projects due to the graduates' insufficient skills, increasing damages and decreasing security of working force due to using inexperienced people whose academic knowledge is insufficient at workplace.[16]

Provision of opportunities for effective performance of interactions between the two institutions (industry and university) in the society is not merely the responsibility of the government while it requires cooperation of both government and society.[17] The concept of proper governance is built on the government-society cooperation.[18]

A powerful and proper governance system, in addition to its integrated performance, is considered as the basis of development of the society besides that quality of governance in various countries also highly affects the interactions between the institutions of a society.[19] A good governance system is achieved due to attaining sustainable development, political stability, citizenship rights, participation of various public groups in the society, social welfare, and moving towards globalization.[20]

Based on aforementioned comments, the present study has identified dimensions and components of good governance system through exploratory studies and then presented a model which is explained as follows:

Good governance contains 5 dimensions, each bearing several components as:

- Political dimension: including components of political stability, removing violence and government efficiency.[21,22]

- Economic dimensions: including components of considering public welfare and life and economic stability.[23,24]

- Social dimensions: including components of public participation and respecting their right to comment and remark, government accountability towards public questions, and observing civil rights.[25,26]

- Cultural dimensions: including components of attention to cultural differences and applying Islamic Patterns in the culture.[27]

- Legal dimensions: including components of rules and regulatory efficiency, ruling of law, campaign against corruption, and confirming the competency of policy makers.[28]

1- Regulatory efficient: this indicates capability and potentials of the government for making authentic and accurate policies with operation guarantee for efficiently management of affairs.[29]

2- Rule of law: people and authorities' true and actual respect for institutions established for making and enforcing laws as well as solving disparities.[30]

3- Campaign against corruption: corruptions in this context refer to misuse of public/general resources and power in favor of a special person or group that deleteriously affects development of the society.[29]

4- Confirming competency of policy makers: this refers to related empirical experience of policy makers as well as their acceptance in competency tests and benchmarks (scientifically and practically) in order to be confirmed for doing the job.[30]

Methods

The present study is a descriptive-correlational research carried out using measuring method in Medical Sciences Universities (Healthcare department) and related industries of Kerman and Fars provinces. The statistical population of the study was 1915 people composed of 1468 people of top managers; managers; education, research and industry development expe;rts as well as 447 people including university presidents, professors and teachers, managers, education experts and experts of interactions between university and industry. Using Morgan scale, 321 people of all aforementioned population were selected as the sample for answering two questionnaires of "good governance" and "interaction barriers between university and industry" which were made by the researcher. Notably, the industries included in the study were selected according to their relationship to "university-industry interaction offices".

Both questionnaires confirmed the reliability and validity of the present research. "Good governance" questionnaire is composed of 5 dimensions as political dimension (political stability, lack of violence, government effectiveness), economic dimension (considering public welfare, economic stability), social dimension (public participation and right to comment/ democracy, government accountability toward public, respect civil laws), cultural dimension (considering culture and cultural differences, using Islamic patterns), and legal dimension (regulatory efficient, rule of law, campaign against corruptions, confirming the competency of policy makers) plus 69 multiple choice questions each with 5 choices starting from "completely agree" ending to "completely disagree".

The questionnaire of "interaction barriers between university and industry" is composed of 3 dimensions as individual interaction barriers (attitude, skill, demographic and psychology interaction), organizational interaction barriers (cultural, managerial, financial and structural interaction) and environmental interaction barriers (legal and infrastructural interactions, special features of industry, surveillance matters and inter-cultural interactions), plus 40 multiple choice questions each

with 5 choices starting from "completely agree" ending to "completely disagree".

The present study used content validity in order to determine the validity of the researches; the validity of "good governance" questionnaire was 0.85 and that of "interaction barriers between university and industry" was 0.89. The reliability coefficients of both questionnaires were calculated using Cronbach's alpha coefficient; the reliability of "good governance" questionnaire was 94% and that of "interaction barriers between university and industry" questionnaire was also 93%.

$$CVI = \frac{30}{30} = 1$$

$$CVR = \frac{n_E - \frac{n}{2}}{\frac{n}{2}} = \frac{n_E - \frac{30}{2}}{\frac{30}{2}} = \frac{27 - 15}{15} = 0.8 > 0.33$$

As CVR value was higher than 0.42 (aforementioned validity), so content validity of the item was confirmed. If CVI was higher than 0.79, content validity of scale was confirmed.

The easiest method of checking reliability of a test is doing retest. In this way, the test is taken from one group for two times and the results are compared such that correlation coefficient between the two results is considered as reliability coefficient of the test. This type of reliability is called retest reliability.

$$r_s = 1 - \frac{4\sum_{i=1}^{n} D_i^2}{n(n^2 - 1)} = 0.87 > 0.8$$

D_i: difference between ranks of the corresponding members of the two groups

n: number of participants in each group

The reliability values higher than 0.8 are accepted in retest method.

Inclusion and exclusion criteria: The statistical population of the study refers to one that meets at least one common criterion. In other words, studying people must show some properties called entrance (inclusion) criteria. Hence, the lower criteria (filters) for including the samples to the study, the more number of samples and the more heterogeneous they are and vice versa. In the present study, the criterion for including the subjects in the study was the individuals' participation in university-industry activities (at the same time) with at least master degree and higher, at least two years job experience in target organization, with tendency to participate in the study and those professors/teachers directly interacting between university-industry offices.

Also, it is possible that samples withdraw from the study due to specific reasons. It happens when the samples don't answer more than 20% of the questions in the questionnaire, lack enough tendency to participate in the study, have terminated cooperation with their workplace (due to death, etc.), and don't fill out the questionnaires in the due time.

For data collection, 321 questionnaires were distributed among top managers, managers and experts, and then collected.

Data analysis was done in two steps as:

A- Descriptive statistics: data were described using mean, median, mode, frequency table, frequency percentage and bar chart (Figures 1, 2).

B- Inferential statistics: in this step, first, treatment of data were observed to determine if the sample group belongs to the target statistical population, as well as determining specifications of the statistical population using inferential statistics tests, and then the result was inferred.[31] In the present study, correlation test plus variance diagram were used for determining the correlation between variables. Moreover, the whole statistical analysis of the study was done, using SPSS software, version 21.

Results

The present study used scatter plot and correlation testing for determining the relationship between variables of good governance and university-industry interaction. Factor analysis of variables and hypotheses testing and finally designing a model from structural equations (the most appropriate way for analyzing in behavioral sciences studies) were also carried out.

To study the hypotheses, correlation testing was applied and for determining its type, first normality of variable of university-industry interaction was measured using Kolmogorov-Smirnov test. Based on the results of the test, as normality value of 9.294 and –p was lower than 0.001, the university-industry interaction variable was of normal distribution. Finally, Spearman and Kendal correlation coefficient test were used in the study.

Based on the results obtained from analyzing 321 samples and considering –P<0.001 for the relationship between dimensions of good governance and solving interactions barriers between related industries and medical sciences university, it was possible to reject null hypothesis at level of 0.05. Therefore, there was a direct relationship between the two variables of dimensions of good governance and solving interaction barriers between industry and medical sciences university (Table 1).

Furthermore, for the relationship between "political dimension of good governance" and "solving interaction barriers between university and

Table 1: Correlation test of dimensions of good governance based on suggested criteria of Muslim theorists and university-industry interaction

Spearman correlation coefficient	0.326
Kendal correlation coefficient	0.232
Number	321
P value	Lower than 0.001 *

Meaningful at level 0.05*

industry", the –P value was obtained 0.005. Thus, the null hypothesis was rejected at the level of 0.05. Therefore, there was a direct relationship between the two variables of "political dimension of good governance" and "solving interaction barriers between university and industry" (Table 2).

Table 2: Correlation test of political dimension from good governance dimensions based on suggested criteria of Muslim theorists and university-industry interaction

Spearman correlation coefficient	0.156
Kendal correlation coefficient	0.112
Number	321
P value	0.005 *

Meaningful at level 0.05*

For the relationship between "economic dimensions of good governance" and "solving interaction barriers between university and industry", -p value was obtained 0.006. Thus, the null hypothesis was rejected at the level of 0.05. Therefore, there was a direct relationship between the two variables of "economic dimensions of good governance" and "solving interaction barriers between university and industry" (Table 3).

Table 3: Correlation test of economic dimension from good governance dimensions based on suggested criteria of Muslim theorists and university-industry interaction

Spearman correlation coefficient	0.154
Kendal correlation coefficient	0.105
Number	321
P value	0.006 *

Meaningful at level 0.05*

For the relationship between "social dimension of good governance" and "solving interaction barriers between university and industry", -p value was obtained for 0.001. Thus, our null hypothesis was rejected at the level of 0.05. Therefore, there was a direct relationship between the two variables of "social dimension of good governance" and "solving interaction barriers between university and industry" (Table 4).

Table 4: Correlation test of social dimension from good governance dimensions based on suggested criteria of Muslim theorists and university-industry interaction

Spearman correlation coefficient	0.178
Kendal correlation coefficient	0.122
Number	321
P value	0.001 *

Meaningful at level 0.05*

For the relationship between "cultural dimension of good governance" and "solving interaction barriers between university and industry", -P value was obtained <0.001. Thus, the null hypothesis was rejected at the level of0.05. Therefore, there was a direct relationship between the two variables of "cultural dimension of good governance" and "solving interaction barriers between university and industry" (Table 5).

Table 5: Correlation test of cultural dimension from good governance dimensions based on suggested criteria of Muslim theorists and university-industry interaction

Spearman correlation coefficient	0.238
Kendal correlation coefficient	0.172
Number	321
P value	Lower than 0.001 *

Meaningful at level 0.05*

As to the relationship between "legal dimension of good governance" and "solving interaction barriers between university and industry", -p value was obtained <0.001. Thus, again the null hypothesis was rejected at the level of 0.05. Therefore, there was a direct relationship between the two variables of "legal dimension of good governance" and "solving interaction barriers between university and industry" (Table 6).

Table 6: Correlation test of legal dimension from good governance dimensions based on suggested criteria of Muslim theorists and university-industry interaction

Spearman correlation coefficient	0.342
Kendal correlation coefficient	0.249
Number	321
P value	Lower than 0.001 *

Meaningful at level 0.05*

The final model of the study contained factor load values of "dimensions of good governance" variable for 321 people in the order of importance as:

Based on this result, cultural dimension of good governance was considered as the most important factor among others that must be considered in major planning and policy making.(Table 7)

What are Dimensions of University-Industry Interaction Variable?

To answer this question, factor analysis of the participants' responses was done. In this method,

Table 7: Factor load of the dimensions of good governance

Dimensions of good governance	Factor load	Rank
Political dimension	0.460	2
Economic dimension	0.418	4
Social dimension	0.307	5
Cultural dimension	0.478	1
Legal dimension	0.441	3

dimensions of university-industry interaction variable are rated based on the level of importance. Table 8 shows values of factor load of each dimension separately that is based on 321 participants' responses. According to the Table, environmental interaction is the most important dimension that should be involved in planning and macro-policy makings (Table 8).

Table 8: Values of factor load and dimensions of university-industry interaction variable

Dimensions of university-industry interaction variable	Facto load value
Individual interaction	0.184
Organizational interaction	0.422
Environmental interaction	0.557

Investigating the Research Hypotheses

One of the most appropriate methods of analysis in behavioural studies is multivariable analysis because of multivariable nature of the subject. Thus it is not possible to use two-variable analysis method in which a single independent variable is selected with one dependent variable each time.[32] Thus, we applied structural equation modelling usingAmos software version 21 for confirming/rejecting hypotheses. To ascertain meaningful hypotheses, the two scales of "critical value" and "meaningful level" were used. Critical value is achieved from the result of regression value (regression weight) divided by standard error. According to meaningful level of 0.05, critical value must be higher than 1.96 or lower than -1.96 unless the model does not consider it as important. Also, for the meaningful level, values lower than 0.05 are considered as meaningful difference for regression values of zero with 99% reliability level. (Table 9)

One of the limitations of the study was time consuming process of distributing and collecting questionnaires due to great number of the samples and wide extent and variety of statistical population. Also, some managers refused to participate and help the researcher due to the industries' lack of need to participate in universities plans. Then, the researchers had to convince the managers and other authorities in terms of preserving confidential data; this made some problems for processing the study.

Finally, it is suggested that agencies working on the relationship between industry and university should make an attempt to build trust between the two institutions through holding continuous convincing meetings with managers of industries in order to ensure them about good outcomes and consequences of cooperation between universities and industries. These agencies can also provide opportunity for students to take part in practical courses in industry in order to be trained effectively and get trust from industry managers.

Discussion

The results of the present study showed that there was a direct relationship between main variables of good governance and solving interaction barriers between university and industry. It means that the variable of good governance can affect the interaction between university and industry and also provide opportunities for more interaction of the two institutions. Furthermore, there was a direct relationship between political dimension of good governance and solving interaction barriers between university and industry. Thus, it is concluded that political stability, as a factor of determining possibility of a governing system's destruction, can facilitate the interaction among various institutions of the society, and it has the strongest correlation with the variable of criterion.

Also, there was a direct relationship between economic dimension of good governance and solving interaction barriers between university and industry.

Table 9: Effect analysis

Hypothesis	Regression coefficients	P	Result	Impact
	Direct impact			
Political dimension	0.90	<0.01	Confirmed	Direct
Economic dimension	0.46	<0.01	Confirmed	Direct
Social dimension	0.07	0.50	Confirmed	-
Cultural dimension	0.39	<0.01	Confirmed	Direct
Legal dimension	0.26	0.025	Confirmed	Direct

Based on this result, it is concluded that improving people's welfare and economic stability leads to enhancing the interactions between university and industry. This issue must be considered in major policy makings.

The results also showed that there was a direct relationship between social dimension of good governance and solving interaction barriers between university and industry. Thus, it can be concluded that government's accountability and responsibility toward public questions (through creating databases related to industries and universities activities) has the strongest correlation with the variable of criterion.

Based on the results, there was a direct relationship between cultural dimension of good governance and solving interaction barriers between university and industry. Thus, it is concluded that considering culture and cultural differences as well as promoting Islamic patterns and interests in the society will result in enriching the culture of development plus progressing cultural development, and consequently enhancing the interaction between university and industry; besides,the present study adequately and equally focused on both notions.

Moreover, the results indicated that there was a direct relationship between legal dimension of good governance and solving interaction barriers between university and industry. Then, it is concluded that t more efficient rules and regulations that highlight the government capacity and strength in codifying accurate and proper policies besides efficient application of the policies lead to improvement in the interactions between university and industry.

Participants' experience revealed the more basic and important role of agencies working on university-industry relations rather than teachers' role.[33] Similarly, past researches confirmed the importance of building trust between industries and universities as well as changing prevalent craftsmen attitude toward university as they believe that universities aim to merely collect financial resources through interacting with industry without commitment to meet the industries' demands.[34] Other studies referred to failure in making dynamic interaction between industries and universities through only formal correspondence.[35] Government job, as leader and organizer of the society, is to accelerate good governance and provide appropriate economic, political and cultural opportunities in order to trigger a dynamic efficient interaction between various institutions, specifically between industries and universities.[36]

Totally, the results of the present study showed that there were some challenges and barriers in interaction between university and industry. It is not fair if we only criticize universities for this deficit and expect just universities to make an efficient interaction withindustries. On the other side, craftsmen also refuse to cooperate and interact with universities significantly. However, any gap in interaction between the two institutions will disturb the processes of national development. Additionally, good governance aims to effectively improve the interaction between social institutions, achieve sustainable human development, and try to boost responsibility and participation capacity of various the society members.[37]

Kamsa and Embach studied the institutions' role in development process of African countries and found that weak ruling of law, corruptions, poor management, weak civil society and political interventions are among the most important deterrent factors of development in African countries.[38]

Also, Adamz and Mansfild showed the determinant key role of research and studying in development of industry.[39] Moreover, Meulemesster and Rochar studied 76 companies working in 7 European industries and showed that only 11% of the products and 9% of new products were produced without academic-scientific studies.[40] In this regard, Brown and Rochar focused on the interaction between universities and industries in Germany and found that technology development and economic achievement of the country was to a high extent dependent on academic-scientific researches.[41]

Plewa in his studies as "evolution of university-industry interaction and effective factors", carried out in Australia, concluded that policy makers' planning is necessary for facilitating the interaction and finally their achieving success.[42]

Industry without making use of up-to-date science is doomed to fail and also science without its application in industry is not considered a valuable science. At global level, industrial backwardness of the countries is due to their poor science-based economy. The recent global crisis, such as water management crisis, unemployment, cultural and identity crisis, was more serious in countries where interaction between institutions is poor in long time rather than those with effective interaction between institutions (specially industry and universities).[43]

Comparative analysis of governance components in Iran shows that the country is of potentials for achieving general and sustainable development due to its opportunities and advantages of human resources, natural resources and its geographic situation. Reports related to economic and human development in the country shows that Iran has failed to properly make use of these advantages. A solution for this can be improvement of the interaction between universities and industries. Moving toward science-based

economy and expanding human development indexes can strongly affect universities-industry interaction.[44] Interaction between industries related to the country defense and universities is a notable sample in Iran.[45]

Comparison of the present study and other researches in the area reveals that there is no conflict between good governance, from researchers' point of view, for solving university-industry interaction barriers. Here, good governance is of dimensions beyond what have been introduced by other researchers, such as focusing on culture in a higher range in the area.

Hence, the present study is drastically different from other studies in the area in terms of content and structure. The differences can be:

- Categorizing and classifying the variables factors

- Prioritizing the variables of good governance

- Having a variety of statistical population compared to other studies that present much more reliable results

Presenting a local model of factors of effective and good governance for solving university-industry interaction barriers

In a good governance system, human development as well as industrial development is the result of university-industry interaction. In the present study, according to importance and priority of cultural factors, it is recommended that macro-policies should be made at the same time with applying local models along with focusing on cultural factors and differences between institutions in a society.[46]

The results obtained from testing hypotheses of the study were compared to those from other studies and researches and explained as follows:

- The results of the present study showed that there was a significant relationship between good governance, from Muslim theorists' point of view, and university-industry interaction. This result is in the same line with those of Seyed Noorani and colleagues, Jalaei and colleagues, and Eskandari.

Seyed Noorani and colleagues in their studies concluded that good governance was one of the effective factors of university-industry interaction.[47]

Jalaei and colleagues also found that improving scales of good governance positively affects the interaction of institutions in a society.[43]

Eskandari showed that improving scales of good governance can contribute to the interaction between universities and industries.[48]

Briefly speaking, in the present study, there was no conflict between good governance and solving interaction barriers between university and industry from the researchers' viewpoint.

Limitations of the study

The limitations in various stages of the study can be referred to as:

- Nature of the questionnaires as a tool for evaluating qualitative and quantitative factors of variables

- The participants' high workload and consequently their lack of enough time to fill out the questionnaires

- The participants' tendency and interference with their private issues when filling out the questionnaires

- Identical questions for both industry and university participants while the two institutions are of different special features and requirements

- Difficulty in distribution and collecting the questionnaires because of wide geographical areas of the statistical population and their high number.

- Industry managers' poor cooperation when collecting data (their concern about inappropriate reflect of comments)

- Heterogeneous statistical population in both university and industry and consequently researchers' need to make proper interaction with the two institution

- Convincing the participants about the privacy of their information and comments about organization

Conclusion

The results of the present study highlight the interaction barriers between university and industry. Hence, it does not mean that all barriers have been identified or there will not be other types of barriers in future, but the results are specifically determined for the current time and situation. Based on the final model of the study, applying good management and governance in the following activities can facilitate the interaction between university and industry as follows:

- Providing intermediary agents for administering the relations between the two institutions

- Reconsidering education plans of the universities

- Emphasizing the privatization in exclusive industries and public universities (governmental universities)

- Setting data bases and informing centers related to industries (including production activities, products variety, services variety and so on)

- Providing consultation services to industries by universities and mutual use of experts in the projects

- Focusing practical studies in the universities

- Eliminating administrative bureaucracy

- Appropriating sufficient financial resources to research and development studies by the government

- Localizing technology

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