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Research Article

IDENTIFICATION OF CONTENT FACTORS AFFECTING THE FORMATION OF INTERDISCIPLINARY RESEARCH-BASED UNIVERSITY IN THE HIGHER EDUCATION SYSTEM OF IRAN

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ABSTRACT
The main objective of this research is to identify the content factors affecting the creation of interdisciplinary research-based university in Iran. This research is applies in terms of objective and descriptive-survey with the mixed type according to the implementation. The statistical population consists of all senior managers and faculty members at state and Islamic Azad Universities of Districts 8 and 12 in Tehran. 525 samples (female and male) are selected according to stratified random sampling during 2014-2015. The research tools are interviews and researcher-made questionnaires. The validity of tools (content and structure) is approved by advisor and supervisor professor and three experts in this field and the reliability of questionnaire equal to 0.87 is confirmed through Cronbach's alpha. The descriptive and inferential statistics are utilized for data analysis, and the exploratory and confirmatory factor analysis by LISREL software is used to find the effective factors. The results indicate that the following systems are effective in content creation of interdisciplinary university: 1- Scientific, education and evaluation system; 2- Research system and development programs; 3- system of international relations and globalization and virtualization of education; 4- Macro interdisciplinary philosophy, culture and orientation.

Keywords: *Content Factor, University, Interdisciplinary Studies*

INTRODUTION
Conducting the interdisciplinary studies requires the changes in the borders and establishing the conditions which conduct the scientific behavior of educational systems in long term. The experts believe that like a connecting bridge, the interdisciplinary studies can provide the appropriate infrastructures for expanding the correlation between the university and population. According to their views, the development and continuation of interdisciplinary activities play a major role in providing and creating the complex capacity for learners. Therefore, understanding the multidimensional approach of interdisciplinary studies is inevitable for the use of this issue. This study seeks to reach the understanding of content dimensions of interdisciplinary studies. The life and work cycles became profoundly based on the knowledge and scientific changes became faster, more dynamic and complex, and then the knowledge generation, transfer and application became a global process (Farasatkhah, 2009). Under such this situation, the environment of universities had gradually been undergoing a major development. Now, a new wave of science is emerging at universities and it is significantly different from the third wave. This wave is along with new ideas relying on the information technology. The idea of releasing the universities from the traditional and managerial constraints of past generation will create the modern scientific space. This new space is the result of integrating the interdisciplinary ideas and approach and is associated with the specific educational benefits which lead to the special and new abilities (Erpku, 2009).
Lattucak (2004) believes that the accountability cannot be expected without interdisciplinary look at future of higher education system. Asmar (2003) argues that the universities change their nature towards emphasizing on the interdisciplinary studies resulted from the change in the nanotechnology, biotechnology and information technology fields. Under such circumstances, the development of

university on the basis of discipline is the movement on very rugged ground, thus it is necessary to integrate the knowledge (Shayan, 2013). In this study, the researcher seeks to achieve the organized knowledge in the field of applying the interdisciplinary in the higher education system and universities, and its content aspects and components.

MATERIALS AND METHODS

This study is applied in terms of objective and it is descriptive-survey with mixed type according to the data collection method. The thematic domain of this study refers to the development of interdisciplinary research-based university model in higher education system of Iran. The time domain of research refers to the academic years of 2013-14 and 2014-15; and the spatial domain of research refers to the state universities affiliated to the Ministry of Science, Research and Technology in Tehran and the comprehensive units of Islamic Azad universities of Districts 8 and 12 (except for the faculties and universities of Medical Sciences). The statistical population of this study consists of senior managers and faculty members at state universities affiliated to the Ministry of Science, Research and Technology in Tehran and the comprehensive units of Islamic Azad universities of Districts 8 and 12 during the academic years of 2013-14 and 2014-15. The stratified sampling (Proportional Allocation sampling method) and then the simple random method are utilized in this study. The sample size of population present is obtained equal to 525 subjects (male and female).

The mixed method is applied for data collection in this study. To answer the research questions, the researcher first collects the information from the websites of top universities about the application of interdisciplinary studies and research components. In the next step, the researcher develops the theoretical principles and research literature and explains the theoretical framework, the research model and questionnaire through the library study (reading books, paper and electronic contents).

Finally, the researcher interviews with the experts and applies their views in this field to develop a final questionnaire. Afterwards, this questionnaire is given to the university managers and faculty members to determine the existing and desired status of interdisciplinary studies in Iran.

The experts' views are utilized to ensure the face and content validity of questionnaire in this study.

The confirmatory factor analysis is utilized after collecting data to determine the validity of questionnaire as well as determining the components. The reliability of questionnaire is obtained through Cronbach's alpha coefficient and SPSS software, and then the results obtained for each variable are separately presented for both existing and desired status.

Table 1: The obtained alpha for each content factor of research

Cronbach's alpha coefficient in existing status	Variable	Cronbach's alpha coefficient in desired status
0.871	Philosophy, culture and macro orientation of interdisciplinary system	0.934
0.823	Research system and development programs	0.915
0.872	Scientific, education and evaluation system	0.802
0.920	System of international relations and globalization and virtualization of education	0.828
0.871	Whole questionnaire	0.869

The descriptive and inferential statistics are utilized for data analysis of this study. In the inferential analysis, the research questions are investigated through relevant statistical tests including the one sample t-test for determining the current status of variables and exploratory factor analysis (principal component

analysis) for determining the components of model through SPSS software version 20 as well as the second-order factor analysis through the structural equation modeling by LISREL software version 8.8 for drawing the model.

RESULTS AND DISCUSSION

Results

Data Analysis for the First Research Question: What are the dimensions, indices and content standards associated with the interdisciplinary studies in the world? To answer this question, the dimensions, indices and standards of interdisciplinary studies are obtained by investigating the research literature and existing theoretical principles and provided as the questionnaires for experts. After data collection, the confirmatory factor analysis (Principal Component Analysis or PCA) is utilized at two stages to determine the validity of questionnaire and the components in order to:

1) Adapt the extracted components and factors to 13 components and 4 main content factors which are obtained through investigating the experimental and theoretical background and the experts' opinions;
2) Determine the existing components of interdisciplinary studies in the country;
3) Confirm the construct validity of questionnaire.

Table 2: Identified principal component analysis by analysis of principal components and variables loaded on them

Content factors	Content component of interdisciplinary research-based university
Factor A: Philosophy, culture and macro orientation of interdisciplinary system	1- Theoretical principles for establishing the interdisciplinary system; 2- The philosophical principles for establishing the interdisciplinary system; 3- The culture reconstruction and capacity-building; the interdisciplinary adoption factor; 4- The use of culture as a strategic approach for development of knowledge creation and interdisciplinary development
Factor B: Scientific, education and evaluation system	5- The policies of human resource employment, promotion and development in the field of education; 6- Implementation of scientific macro policies and programs focused on the design of education programs; 7- Designing the programs for the way of evaluating the accountability
Factor C: Research system and development programs	8- The Research system and development programs and strategies; 9- Development of research and learning capabilities and skills; 10- Development of rethinking and design in the field of research system
Factor D: System of International Relations and globalization and virtualization of education	11- Designing, implementing and applying the strategy of education internationalization and virtualization; 12- Convergence of interdisciplinary and academic programs with national, transnational and global (international) programs; 13- Participation and preparation of infrastructures necessary for design and implementation of international projects and programs (conferences and seminars)

At the second stage, 13 extracted components in the first-order exploratory factor analysis are subjected to the principal component analysis in order to adapt the extracted factors to 4 content factors which are obtained through theoretical and empirical literature review and expert opinions.
According to the exploratory factor analysis on 13 components identified in the first order factor analysis, 4 factors are identified as the content factors and named according to the literature and described in the following table.
Data Analysis for Second Research Question: How is the content status of interdisciplinary studies at universities of Iran?
After identifying the components of interdisciplinary studies from the perspective of experts, the descriptive indices of each factor and the components of questionnaire are presented in both existing and desired in status and then the significance of extracted components obtained from the mean is investigated through one-sample t-test. In this method, the observed mean of each component is compared with expected mean (the average scale score of 3).

Table 3: Descriptive indices in both existing and desired status based on the extracted components of Factor A (Philosophy, culture and macro orientation of interdisciplinary system)

Existing status					Desired status			
Standard deviation	**Mean**	**Sample size**	**Number of items**	**Component**	**Number of items**	**Sample size**	**Mean**	**Standard deviation**
0.53	1.91	525	4	Theoretical principles for establishing the interdisciplinary system	4	525	4.18	0.58
0.51	1.92	525	4	Philosophical principles for establishing the interdisciplinary system	4	525	4.07	0.55
0.46	1.96	525	5	culture reconstruction and capacity-building; the interdisciplinary adoption factor	5	525	14.4	0.61
0.51	1.74	525	5	The use of culture as a strategic approach for development of knowledge creation and interdisciplinary development	5	525	4.08	0.72
0.41	1.88	525	18	Factor A	18	525	4.12	0.54

According to the table above:
The importance of component, "Theoretical principles for establishing the interdisciplinary system", is estimated equal to 1.91±0.53 in existing status and 4.18±0.58 in desired status. The important of this component is less than the average value of 3 in existing status and it is also significantly different from the desired status. The importance of component, "the philosophical principles for establishing the interdisciplinary system", is estimated equal to 1.92±0.51 in existing status and 4.07±0.55 in desired

status. The important of this component is less than the average value of 3 in existing status and it is also significantly different from the desired status. The importance of component, "the culture reconstruction and capacity-building; the interdisciplinary adoption factor", is estimated equal to 1.96±0.46 in existing status and 4.14±0.61 in desired status. The important of this component is less than the average value of 3 in existing status and it is also significantly different from the desired status. The importance of component, "the use of culture as a strategic approach for development of knowledge creation and interdisciplinary development", is estimated equal to 1.74±0.51 in existing status and 4.08±0.72 in desired status. The important of this component is less than the average value of 3 in existing status and it is also significantly different from the desired status. The importance of Factor a, "Philosophy, culture and macro orientation of interdisciplinary system", is estimated equal to 1.88±0.41 in existing status. The important of this component is less than the average value and it is also significantly different from the desired status (4.12).

Table 4: Descriptive indices in the existing and desired status based on the extracted components of Factor B (Scientific, education and evaluation system)

Existing situation					Desired condition			
Standard deviation	Mean	Sample size	Number of items	Component	Number of items	Sample size	Mean	Standard deviation
0.63	2.00	525	5	The policies of human resource employment, promotion and development in the field of education	5	525	4.39	0.61
0.45	1.89	525	4	Implementation of scientific macro policies and programs focused on the design of education programs	4	525	4.56	0.33
0.72	1.82	525	4	Designing the programs for the way of evaluating the accountability	4	525	4.30	0.45
0.52	1.90	525	13	Factor B	13	525	4.42	0.30

According to the table above:
The importance of component, "The policies of human resource employment, promotion and development in the field of education", is estimated equal to 2.00±0.63 in existing status and 4.39±0.61 in desired status. The important of this component is less than the average value of 3 in existing status and it is also significantly different from the desired status. The importance of component, "The implementation of scientific macro policies and programs focused on the design of education programs", is estimated equal to 1.89±0.45 in existing status and 4.56±0.33 in desired status. The important of this component is less than the average value of 3 in existing status and it is also significantly different from the desired status. The importance of component, "Designing the programs for the way of evaluating the accountability", is estimated equal to 1.82±0.72 in existing status and 4.30±0.45 in desired status. The important of this component is less than the average value of 3 in existing status and it is also significantly different from the desired status. The importance of Factor B, "Scientific, education and evaluation system", is estimated equal to 1.90±0.52 in existing status. The important of this component is

less than the average value in existing status and it is also significantly different from the desired status (4.42).

Table 5: Descriptive indices in existing and desired status based on the extracted components of Factor C (Research system and development programs)

Existing status				Component	Desired status			
Standard deviation	**Mean**	**Sample size**	**Number of items**		**Number of items**	**Sample size**	**Mean**	**Standard deviation**
0.53	1.99	525	5	The research and development programs and strategies	5	525	4.52	0.48
0.62	2.05	525	2	Development of research and learning capabilities and skills	2	525	4.44	0.56
0.59	1.70	525	5	Development of rethinking and design in the field of research system	5	525	4.26	0.74
0.47	1.91	525	15	Factor C	15	525	4.41	0.52

According to the table above:

The importance of component, "The research and development programs and strategies", is estimated equal to 1.99±0.53 in existing status and 4.52±0.48 in desired status.

The important of this component is less than the average value of 3 in existing status and it is also significantly different from the desired status.

The importance of component, "Development of research and learning capabilities and skills", is estimated equal to 2.05±0.62 in existing status and 4.44±0.56 in desired status.

The important of this component is less than the average value of 3 in existing status and it is also significantly different from the desired status.

The importance of component, "Development of rethinking and design in the field of research system", is estimated equal to 1.70±0.59 in existing status and 4.26±0.74 in desired status.

The important of this component is less than the average value of 3 in existing status and it is also significantly different from the desired status.

The importance of Factor C, "Research system and development programs", is estimated equal to 1.91±0.47 in existing status.

The important of this component is less than the average value in existing status and it is also significantly different from the desired status (4.41).

Table 6: Descriptive indices in existing and desired status based on the extracted components of Factor D (System of International relations and globalization and virtualization of education)

Existing status					Desired status			
Standard deviation	**Mean**	**Sample size**	**Number of items**	**Component**	**Number of items**	**Sample size**	**Mean**	**Standard deviation**
0.50	1.80	525	5	Designing, implementing and applying the strategy of education internationalization and virtualization	5	525	4.34	0.50
0.55	1.85	525	4	Convergence of interdisciplinary and academic programs with national, transnational and global (international) programs	4	525	4.55	0.32
0.55	1.95	525	4	Participation and preparation of infrastructures necessary for design and implementation of international projects and programs	4	525	4.74	0.29
0.49	1.87	525	13	Factor D	13	525	4.54	0.24

According to the table above:
The importance of component, "Designing, implementing and applying the strategy of education internationalization and virtualization", is estimated equal to 1.80±0.50 in existing status and 4.34±0.50 in desired status. The important of this component is less than the average value of 3 in existing status and it is also significantly different from the desired status. The importance of component, "Convergence of interdisciplinary and academic programs with national, transnational and global (international) programs", is estimated equal to 1.85±0.55 in existing status and 4.55±0.32 in desired status. The important of this component is less than the average value of 3 in existing status and it is also significantly different from the desired status. The importance of component, "Participation and preparation of infrastructures necessary for design and implementation of international projects and programs (conferences and seminars)", is estimated equal to 1.95±0.55 in existing status and 4.74±0.29 in desired status. The important of this component is less than the average value of 3 in existing status and it is also significantly different from the desired status. The importance of Factor D, "System of International relations and globalization and virtualization of education", is estimated equal to 1.87±0.49 in existing status. The important of this component is less than the average value in existing status and it is also significantly different from the desired status (4.54).

Discussion

The aim of interdisciplinary studies is the education process change which leads to the more specialized service in educational systems. Therefore, the educational systems including the higher education system should made the content changes in order to be ready for entry in new areas of science in line with

ensuring a constant source for new ideas. Thus, the universities and higher education institutions need the strategic and operational changes to achieve the interdisciplinary programs. On the other hand, the supporting policies of governments and countries in various aspects ate among the main and influential factors which play roles in promotion of interdisciplinary research programs. The findings of this study prioritize the valuation of content factors for creating and designing the interdisciplinary university as follows:

1- Philosophy, culture and macro orientation of interdisciplinary system
2- Scientific, education and evaluation system
3- Research system and development programs
4- System of International relations and globalization and virtualization of education

- Interdisciplinary research is based on the various management and philosophical theories, the education insights and learning theories.

The Chaos theory is among the management theories. This theory aims at changing the individual subjective models by creating the dynamism in their attitudes in order to establish the teamwork space in the organization (university) by applying the individual collaborative knowledge in the organization (university).

Under this policy, the macro decisions are made with the aim at developing the knowledge capacities in the organization, university and higher education system. This case is like the butterfly effect under which a small movement makes the great changes.

Since, according to the systematic view, the constant and dynamic activities are implementing in the systems, this butterfly effect can be generalized to all sectors of system. The learning theories in interdisciplinary research with systematic approach and consideration of all aspects ultimately seek to guide the individuals towards the critical thinking. According to Etemadizadeh *et al.*, it should be noted that humanizing the desired knowledge is the aim of interdisciplinary programs. Since the major objective of humanities is the interpretation of human conditions, the experts and philosophers' final aims is to find the image of individual in the context of society.

- Creation of a structured system, establishing the department and the goal setting-based knowledge network like what is done at the University of British Columbia in order to achieve the multiple social, economic, human, scientific and technological goals. The policies and procedures of doing affairs are achieved by creating the databases.

This scientific organized system results in the freedom of research, making the cognitive and practical fields of various sciences close to each other, and creating the lifelong learning plans which in fact represent the changed traditional views of knowledge. This issue is presented in the research by Newel (2002). In addition to providing an interactive opportunity for faculty members, students, and teachers, these programs create the infrastructures for their mutual collaboration of capacity and capabilities and build the conditions which provide the professors' personal knowledge and organizational memory for students. This leads to the quiet and planned development of field-centered style to student-centered style and creates the infrastructure for lifelong learning and integrated multiple skills by filling the gaps of existing types of knowledge as well as expanding the learning fields and making them flexible.

- According to the findings of this research, the "research system and development programs" factor is another important and influential factor for creation of interdisciplinary research-based university.

The adoption of research and development program interdisciplinary strategies such as the strategy for reconstruction of fields or linking and creating a new field (in accordance with the research by Beniadenfield) from several different fields has the direct impact on the quality of education program and guarantees the freshness of these programs.

The use of this strategy according to what is done at University of Michigan leads to different prospects for students' cooperation in research fields accompanied by several advisor and supervisor professors for implementing the strategic programs with the aim at students' development. Conducting the participative projects with presence of professors' various views creates the purposeful thinking challenges in students and leads them to strengthening the requirements of integrated learning, acquiring the new learning

opportunities and facilitating the intellectual mobility, developing the problem solving skills and interaction, collaboration and network building for doing the teamwork.

In this regard, considering the interactional interdependence components, the coherent collaboration and teamwork, and collaborative effort, Bronstein (2003 and 2002) considers these components as the competitive advantages for performing the interdisciplinary programs.

- Now, the academic and research activities by scientists and experts are not limited to international borders and have created the appropriate infrastructures for strengthening the cooperation between nations, civilizations and cultures.

To achieve the objectives of system of international relations and globalization and virtualization of education, it is essential to design and implement the strategies in this regard. To do this important issue, the internationalizing the university is significantly important. In addition to the issuance of national culture to other countries and access to international users in cyberspace, this issue indicates the need for providing the high quality international education for global citizens. The strategy of internationalizing the university and education leads to the deconstruction of traditional structures and education programs and courses. The application of interdisciplinary programs in this strategy affects the form of communication and social participation with the approach to diversity and sustainable development.Due to the high capacity of interdisciplinary dialogue, its programs and the ability to respond to the global changing needs, the positive performance of this system can enter the higher education system in the global competition arena.

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