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Designing the Accreditation Model of Applied Science Higher Education Institutions in Tehran

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Abstract

INTRODUCTION: The quality of education and accreditation of universities, institutions, and educational centers have always been of great concern to many groups, including managers, officials, students, parents, and employers, in the past hundred years. The purpose of current research is to design the accreditation model of applied science higher education institutions.

METHODS: This qualitative research was conducted by using qualitative content analysis. The statistical population includes articles, documents, and all the key informants of applied science higher education institutions in Tehran city. A total of 21 key informants were selected and studied using the purposive and snowball sampling method and maximum diversity technique. The data were collected by semi-structured interview, observation, review of documents and scientific texts and analyzed using MAXQDA-2022 and weighting of factors, criteria, and indicators with the Shannon entropy method and prioritization with RANK function in Excel.

FINDINGS: The results demonstrated that after weighting and prioritizing, the final research model included 33 factors, 101 criteria, and 704 indicators. There are 27 input factors, 4 process factors, 1 output factor and 1 outcome factor.

CONCLUSION: The current accreditation model was prepared in accordance with the conditions of applied science higher education institutions using domestic and international experiences with a systemic approach (input, process, output, and outcome) in the form of factors, criteria, and indicators and can be used by the University of Applied Science & Technology.

Keywords: Accreditation; Applied science higher education institutions; Quality of education; University of Applied Science & Technology

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Introduction

Today, no nation can exceed the quality of its higher education (1). At the global level, the quality of higher education has become one of the most important issues related to educational policies, and the necessary structure for quality assessment has been created at the level of higher education institutions and the higher education system (2). Furthermore, the marked increase in the demand for higher education around the world has caused mounting concern about the quality of education in higher education institutions (3).

The review of literature demonstrated that until now, no research has been conducted in Iran on designing the accreditation model of applied science higher education institutions. The studies have been carried out at the level of higher education and theoretical universities. According to the statistics published by the custodian institutions, such as the Statistical Center of Iran and the Ministry of Science, Research, and Technology, the number of higher education, research, and technology institutions exceeds 3000, the number of students is more than 4.8 million, and the number of faculty members is about 70 thousand people.

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The challenges presented to universities and higher education institutions include cultural problems in universities, excessive expansion of training courses, low quality of education and teaching, lack of up-to-dateness and decrease in the quality level of faculty members, the mismatch between curricula and the daily needs of society, reduction of the prestige of universities and academics, lack of coordination between universities and society, low level of knowledge, insight and ability of graduates, increase in the rate of unemployed graduates and job seekers, lack of goal setting based on the need, and lack of equal opportunities (4).

Training provided by applied science higher education institutions also faces two daunting challenges. A) Problems arising from the development approaches of Applied Science University, B) Ten-year work results and outcomes of Applied Science University (5). In this context, the pathology of the training courses at Applied Science University in Ahvaz demonstrated that such factors as the decrease in the number of students, non-acceptance of these trainings, and the prevalence of credentialism instead of skill orientation are considered a threat to this training (6).

Mohammadi (7) pinpointed in his research that studying in applied science higher education institutions does not increase students' skills. Students need training to work in production and industrial centers before starting work. In the same context, the results of the study by Izadi, Salehi Omran, and Ghorbani (8) indicated no significant relationship between employers' expectations and the skill level of graduates of Applied Science University. Surveys also illustrate that despite the expansion of such education in quantitative dimensions and the increasing variety of majors in applied science centers, the performance of applied science higher education institutions has not been evaluated (9).

The internal evaluation process in the Iranian applied science education system is not continuous. It is necessary to determine a specific time cycle to repeat the accreditation process and use the results obtained from the aforementioned process. Therefore, considering the great number of applied science higher education centers and the variety of disciplines and activities in these centers, as well as validating the education provided, it seems necessary to create a suitable mechanism for evaluating and guaranteeing the quality of these centers (10).

Eaton, in the Chronicle of Higher Education in 2008, reported that higher education institutions spend approximately $375 billion annually, employ approximately 3.37 million full-time and part-time faculty and staff, and provide services to more than 17.7 million students. Considering the wide range of higher education institutions in the United States, it is noteworthy that there are only 80 recognized organizational and program accreditation organizations, and about 740 part-time staff are employed in these organizations. Moreover, the number of employees is increasing, and approximately 18,000 volunteers cooperate with accreditation organizations (11).

According to the aforementioned issues, it is necessary to validate the quality of education in applied science higher education institutions. Accreditation means quality assessment, and quality assessment and accreditation are corrective and supplementary measures to improve education. (12). On the other hand, institutional accreditation is the evaluation of the entire higher education institution and the accreditation of all its components based on the standards related to the university's quality, improvement, and accountability. This type of accreditation focuses on the entire quality of the institution instead of the program of the university (13). The Future of Medical Education in Canada (FMEC) recognizes accreditation as a "powerful lever" (14).

Accreditation is a mechanism that determines the internal and external dimensions of high-quality education through self-evaluation and peer review (15). Accreditation is associated with the key issues of higher education, including responsibility, quality assurance, and quality management (16). In the United States of America, accreditation is synonymous with the process of checking and measuring quality (17). In this country, accreditation is a self-regulating process of recognizing an institution's capability, which is carried out through NGOs. (18).

In England, the external audit of programs is given importance during the self-evaluation of institutions (19). In Germany, accreditation is a process to obtain minimum standards (20). In the Netherlands, accreditation is defined in the law as the granting of a quality mark, which shows that some standards have been met (21). Due to the

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wide range of audiences and the need to pay attention to the continuous improvement of the quality of educational services, and considering that no research has been performed on designing a local model for the accreditation of Applied Science University in Iran, this question is raised, what are the factors, criteria, and indicators of the accreditation model of applied science higher education institutions according to their importance and weight? What accreditation model is suitable for the structure of these institutions to evaluate the quality of applied science higher education institutions?

Methods

The current study was qualitative based on the type of research problem, the nature of the data, and the research questions using the naturalistic paradigm. This research used the qualitative content analysis strategy for data analysis. The statistical society included articles, documents (higher-level documents), and all key informants (principals, assistants, teachers, department managers, managers of education and research, managers of cultural affairs, and educational experts) of applied science higher educational institutions in Tehran. A total of 21 key informants were selected using the purposive and snowball sampling method and maximum diversity technique. Data collection tools were interviews, observation, and review of scientific documents and texts. The data were collected by semi-structured in-depth interview methods and integrated with higher-level documents (3 documents) and literature review (60 articles) in order to enrich the data. Qualitative content analysis of data was performed in MAXQDA 2022 software using open, axial, and selective coding methods.

Weighting and prioritization of factors, criteria, and indicators: Shannon's entropy method was used to weight factors, criteria, and indicators in the data analysis section. Adel Azar has written an article entitled "Development of Shannon's entropy method for data processing in content analysis" (22). Shannon's entropy technique is one of the methods used to determine the weight of elements. Shannon entropy stages are as follows:

1) At the beginning, the decision matrix is prepared then the message is counted according to the frequency of each respondent.

$$X=\begin{bmatrix} x_{11} & x_{12} & x_{1n} \\ x_{21} & x_{22} & x_{2n} \\ . & . & . \\ . & . & . \\ . & . & . \\ x_{m1} & x_{m2} & x_{mn} \end{bmatrix}$$

2) Linear normalization of Data: in this method, it is enough to divide each number in a set by the total elements of that set. In this case, sum of all elements after normalization will be one. For example, in a decision matrix where m options are evaluated based on n criteria, the weight of the criteria can be determined using the concept of entropy. If we denote the decision matrix by X and each of its elements by xij, the decision matrix must be initially normalized. The normal matrix is denoted by N, and each element is denoted by nij.

$$n_{ij} = \frac{x_{ij}}{\sum x_{ij}}$$

Data normalization is a method used to make the range of values related to different research variables uniform and is also known as data de-scaling. If the measurement unit of the studied variables is diverse, the data can be de-scaled using normalization methods. It enables the comparison of data with different measurement criteria.

3) After normalization, the information load (entropy) of each category or indicator is prepared

$$E_j = -k \sum [n_{ij} LN(n_{ij})]$$

In this regard, the value of k is obtained from the following equation:

$$k = \frac{1}{Ln(M)}; \text{M} = \text{Number of options}$$

In the current research, the M=84 consists of 60 background documents, 3 higher-level documents, and 21 interview documents.

4) Calculating the degree of deviation is the fourth step. The value (dj) of the degree of deviation is calculated, which indicates how much useful information the relevant index (dj) provides to the decision-maker. As the measured values of an index are close to each other, it means that the competing options do not differ much from each other in terms of that index.

$$D_j = 1 - E_j$$

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5) Using the information load of the categories, we calculate the importance coefficient (weight) of each of the categories.

$$WJ = \frac{EJ}{\sum_{J=1}^{n} EJ}$$

Thereafter, the following equation will be used to calculate the normal weight:

$$W_j = \frac{D_j}{\sum D_j}$$

In the last step, factors, criteria and indicators were prioritized using the RANK function in Excel.

Validity of qualitative research: from Seale's perspective, quality in qualitative research is something we recognize when we see it (23). Since there is diversity in qualitative research methods and techniques, there is no universally accepted standard for assessing validity in qualitative studies. Its usefulness is also questioned (24) since the unique feature of qualitative research is its openness and flexibility (25). In this research, the strategies used by the researchers to increase the internal validity (credibility) and external validity (transferability) of research are as follows: Pluralism in data, pluralism in theory, use of triangulation (investigator, methods, and data), use of the technique of obtaining accurate parallel information, use of massive and rich description to express the findings, allocating longer time in the study place, Researcher's self-monitoring during the process of data collection and analysis, member control method, coding method, use of qualitative data analysis software (MAXQDA 2022), the technique of low-inference descriptors, presenting the final report to the participants, negotiating with the supervisor and research consultants to increase the accuracy of the research report, using a referee as an auditor (evaluator) to review the entire research.

Reliability of qualitative research

1) *Inter-coder reliability method (repeatability index):* In this research, the text of an interview was provided to a researcher who was familiar with the subject of accreditation and MAXQDA-2022 software to perform the coding. After coding the sixth interview by two independent coders and entering the information into the MAXQDA-2022 software, the Researcher calculated Cohen's kappa coefficient in order to determine the degree of overlap in the coded sections. This index is used to calculate the reliability of qualitative research. Jacob Cohen (1960) introduced the Kappa index. This index can be used to evaluate the agreement of two measurements (by two people or two instruments or at two time points). The results of calculating the Kappa coefficient using the method (Brennan & Prediger, 1981) are illustrated in (Tables 1 & 2).

Table 1. Information of two independent coders

Row	Title of the interview	Number of codes of the first coder	Number of codes of the second encoder	Total number of codes	Number of agreements	Number of disagreements
1	The sixth interview	93	83	176	128	48

Table 2. Calculation of inter-coder reliability (Cohen's kappa agreement coefficient)

		Coder 1			
		1	0		
Coder 2	1	a = 128	b = 29	157	P (chance) = Pc =Number of codes/ (Number of codes + 1) 2 = 0.01
	0	c = 19	0	19	Kappa = (Po - Pc) / (1 - Pc) = 0.72
		147	29	176	

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2) *Test-retest reliability*: this index can be calculated when a coder has coded the text at two different times (26). For this purpose, several interviews were selected as samples, each coded twice in a short and specific time interval (15 days). Thereafter, the specified codes were compared in two time intervals for each interview.

$$PA = \frac{2M}{N1 + M2} * 100$$

In this formula, M is the number of agreements in the second stage of coding, N1 is the number of units coded in the first stage, and N2 is the number of units coded in the second stage. PA0 will also be a number between zero (no agreement) and one (complete agreement).

$$PA = \frac{2 * 48}{69 + 61} * 100 = \%80$$

The test-retest reliability of the interviews conducted in this research was calculated as 83% using the mentioned formula. Considering that this reliability is higher than 60% (Kvale, 1996), the reliability of coding is verified.

Data analysis methods: In this research, the Researcher used qualitative (inductive) content analysis. Therefore, after conducting the interviews, the researchers reviewed and converted the audio to text and re-examined the field notes. All the interviews were examined carefully and line by line, and data coding was performed in order to dig in the data mine (27) using the tool used in qualitative data analysis, the MAXQDA-2022. The unit of analysis is also at the word and sentence level.

Coding has an exploratory mode and it consists of organizing the content in a systematic format and converting concepts into categories (28). It is worth noting that there are different methods for coding qualitative data (1). Nonetheless, considering the validity of the coding method in the Grounded Theory method, the interview texts were coded by following this method in this research. The analysis of qualitative data is performed based on a bottom-up and reverse approach, which includes three types of coding: 1) Open coding: that is, identification of concepts; 2) Axial coding: it shows the relationships between two concepts (23); 3) Selective coding means how the main categories are related to each other and form a whole (29).

Findings

First question: What factors make up the accreditation model of applied science higher education institutions?

In order to answer this question, after combining the data obtained from the literature and interviews and qualitative data analysis, three stages of open, central, and selective coding and weighting using the entropy method, the critical factors in the accreditation of applied science higher education institutions were extracted as described in Table 4.

According to the results obtained from Shannon's entropy method, among the factors affecting the educational quality of applied science higher education institutions, institutional management and leadership ranked first with the coefficient of importance (0.080) and information load (0.058). Therefore, it can be concluded that the factor of "institutional management and leadership" is an essential factor that has more weight in the educational quality of applied science higher education institutions. As a result, institutions should pay more attention to this factor. The second priority is related to human resource management with an importance coefficient (0.066) and information load (0.047). The third priority is given to the education infrastructures with the importance coefficient (0.063) and information load (0.045).

Table 3. Results of test-retest reliability of interviews

Title of the interview	Total number of codes in two stages	Codes of the first stage	Codes of the second stage	Number of agreement codes	Number of disagreement codes	Test-retest reliability (percentage)
4th interview	120	69	61	48	82	80%
10th interview	111	57	54	46	65	82%
15th interview	99	44	55	44	55	88%
Total	330	170	170	138	202	83%

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Table 4. Factors of higher education institutions along with importance coefficient (weight) and rank

Row	Factor	f	Nij	Ej	Wj	RANK
		Frequency	Normalization	Information load	Importance coefficient	
1	Management and leadership of the institution	323	0.122	0.058	0.080	1
2	Human resources management	228	0.086	0.047	0.066	2
3	Education infrastructure	212	0.080	0.045	0.063	3
4	Teachers' affairs	198	0.075	0.044	0.061	4
5	Educational services	139	0.052	0.035	0.048	5
6	Cultural and student affairs	133	0.050	0.034	0.047	6
7	Research and technology affairs	109	0.041	0.029	0.041	7
8	Admitted people	103	0.039	0.028	0.040	8
9	Applied science centers	94	0.035	0.027	0.037	9
10	Teaching-learning process	89	0.034	0.026	0.036	10
11	Learning resources	87	0.033	0.025	0.035	11
12	Curriculum management	85	0.032	0.025	0.035	12
13	Structure of the institution	78	0.029	0.023	0.033	13
14	Supervision and evaluation affairs	73	0.027	0.022	0.031	14
15	Administrative, financial & support affairs	73	0.027	0.022	0.031	15
16	Graduates	60	0.023	0.019	0.027	16
17	Applied science educational courses	60	0.023	0.019	0.027	17
18	Higher-level documents	57	0.021	0.019	0.026	18
19	Education management	46	0.017	0.016	0.022	19
20	Goals of the institution	44	0.017	0.015	0.021	20
21	Board of trustees	42	0.016	0.015	0.021	21
22	Faculty members	41	0.015	0.014	0.020	22
23	Virtual education	40	0.015	0.014	0.020	23
24	Institution council	35	0.013	0.013	0.018	24
25	Stable income	35	0.013	0.013	0.018	25
26	University student	35	0.013	0.013	0.018	26
27	Managers of educational departments	33	0.012	0.012	0.017	27
28	Philosophy, mission & core values	30	0.011	0.011	0.016	28
29	Quality management	24	0.009	0.010	0.013	29
30	Internationalization	14	0.005	0.006	0.009	30
31	Employer	12	0.005	0.005	0.008	31
32	Public relations	11	0.004	0.005	0.007	32
33	Industry-university relationship	10	0.004	0.005	0.007	33
	Total	2653	1	0.716	1	

Second question: What are the criteria of each factor making up the accreditation model of applied science higher education institutions?

Third question: What are the indicators of each criterion making up the accreditation model of applied science higher education institutions?

Fourth question: What is the importance and weight of each factor, criteria, and indicator of the accreditation model of applied science higher education institutions?

Fifth question: What accreditation model can be presented for applied science universities?

To answer questions 2, 3, 4, and 5, literature data were integrated with interview data to enrich the research results. We weighted the factors, criteria, and indicators using the Shannon entropy method. Thereafter, the most important factors, criteria, and indicators were selected. For this purpose, after determining the most important criteria, those criteria that had the least importance were removed along with their indicators. In other words, three criteria with the highest weight were selected, and three criteria with the lowest weight were excluded. Thereafter, the weight of the indicators of the priority criteria was determined. Finally, we introduce the accreditation model of applied science higher education institutions with 33 factors, 101 criteria and 706 indicators according to Table 5.

According to Table 5, the accreditation model of applied science higher education institutions was identified based on the understanding and interpretation of key informants with a systemic approach (theory of open social systems, Hoy and Miskel) in the form of 33 factors, including 27 input factors, 4 process factors, 1 output factor, and 1 outcome factor. These factors are expressed in the form of a systemic approach: 1) Input factors: the board of trustees, the institution's council, higher-level documents, the institutional philosophy and mission, the institutional goals, the institutional management and leadership, the directors of educational departments, the institutional structure, monitoring and evaluation affairs, Education infrastructure, education management, admitted people, students, faculty of the institution, applied science educational courses, curriculum management, teachers' affairs,

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cultural and social affairs, research and technology affairs, learning resources, administrative, financial and support affairs, employer, humane resource management, quality management, sustainable income, applied science centers, public relations.

2) Process factors: learning-teaching process, virtual education, educational services, industry-university relationship; 3) Output factor: graduates; and 4) Outcome factors, including internationalization; diagrammatic view (non-systematic) of the accreditation model of applied science higher education institutions, as illustrated in Figure (1).

Table 5. Weighted factors, criteria, and indicators in the accreditation model of applied scientific higher education institutions

Factors	Criteria	Frequency	Normalization	Information load	Importance coefficient	Rank	Indicator
Board of Trustees	Duties of the Institute's Board of Trustees	16	0.381	0.083	0.235	1	37
	The strategy of the board of trustees	8	0.190	0.071	0.202	2	
	Authority of the Board of Trustees	8	0.190	0.071	0.202	2	
	The composition of the institution's board of trustees	6	0.143	0.063	0.177	3	
Institute Council	Characteristics of the members of the institute's council	7	0.200	0.072	0.389	1	30
	Duties and authorities of the Institute Council	24	0.686	0.058	0.312	2	
	The composition of the Institute Council	4	0.114	0.056	0.299	3	
Higher-level documents	Specialized higher-level documents	25	0.439	0.081	0/178	1	15
	Law of the Fourth Development Plan	7	0.123	0.058	0/127	2	
	Iranian higher education system	4	0.070	0.042	0/092	3	
	Common higher-level documents in all domains	4	0.070	0.042	0/092	3	
Philosophy, mission and core values	Mission of research	13	0.433	0.082	0.260	1	9
	Institutional integrity	8	0.267	0.079	0.253	2	
	Educational mission	4	0.133	0.060	0.193	3	
Goals of the institution	Research and technology goals	11	0.250	0.078	0.284	1	14
	Educational goals	24	0.545	0.074	0.271	2	
	Administrative and financial goals	4	0.091	0.049	0.179	3	
Management and leadership of the institution	Management duties of the head of the institution	166	0.514	0.077	0.196	1	22
	Personality characteristics of the head of the institution	30	0.093	0.050	0.126	2	
	Financial resources and management	30	0.093	0.050	0.126	2	
	Technical skills of the head of the institute	26	0.080	0.046	0.116	3	
Relationship between the institution and the industry	Interaction with the industrial, professional and social environment	10	1	0	0.001	1	7
Internationalization	International communication of the institute	4	0.286	0.081	0.598	1	7
	Levels of internationalization	10	0.714	0.054	0.402	2	
Managers of educational departments	Specific characteristics of the department manager	10	0.303	0.081	0.202	1	15
	Evaluation and monitoring duties of the department manager	7	0.212	0.074	0.184	2	
	Duties of department manager regarding teachers' affairs	5	0.152	0.064	0.160	3	
Structure of the institution	Strategic Plan	19	0.244	0.077	0.179	1	14
	Structural features of the institute	16	0.205	0.073	0.169	2	
	Educational rules and regulations	13	0.167	0.067	0.156	3	
Monitoring and evaluation affairs	Duties of monitoring and evaluation unit	28	0.384	0.083	0.317	1	32
	Evaluation of the quality of education	32	0.438	0.081	0.312	2	
	Stakeholder views	7	0.096	0.051	0.194	3	
Education infrastructures	physical space	56	0.264	0.079	0.184	1	11
	Educational facilities and equipment	50	0.236	0.077	0.178	2	
	Educational environment	48	0.226	0.076	0.176	3	
Education management	Education Courses	15	0.326	0.082	0.223	1	1
	Educational Planning	13	0.283	0.080	0.218	2	
	Improved accessibility	6	0.130	0.060	0.162	3	
Teaching and learning process	teaching method	35	0.393	0.083	0.251	1	14
	Evaluation of student learning	29	0.326	0.082	0.249	2	
	Psychological environment in the classroom	9	0.101	0.052	0.158	3	

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Accepted students	Specific conditions for student recruitment	38	0.369	0.083	0.205	1	25
	Admission screening system	20	0.194	0.072	0.177	2	
	Admission practices and policies	18	0.175	0.069	0.170	3	
University Student	Motivation to enroll students	15	0.429	0.082	0.250	1	15
	Student characteristics	8	0.229	0.076	0.232	2	
	Students' research activity	6	0.171	0.068	0.208	3	
Faculty of the institute	Faculty members characteristics	11	0.268	0.079	0.186	1	21
	Faculty members' research records	8	0.195	0.072	0.168	2	
	Faculty members	7	0.171	0.068	0.159	3	
Applied science courses	Designing training courses	13	0.217	0.075	0.288	1	22
	Educational fields	33	0.550	0.074	0.285	2	
	Outcomes of Applied science education	9	0.150	0.064	0.247	3	
Curriculum management	Curriculum design	14	0.165	0.067	0.124	1	26
	Educational content	12	0.141	0.062	0.115	2	
	Student learning activities	12	0.141	0.062	0.115	2	
	Curriculum & educational resources	9	0.106	0.054	0.099	3	
	Educational topics	9	0.106	0.054	0.099	3	
Educational services	Educational affairs	31	0.209	0.074	0.148	1	46
	Graduate Affairs	28	0.189	0.071	0.142	2	
	Student support services	23	0.155	0.065	0.131	3	
Teacher affairs	Applied science lecturer	101	0.510	0.077	0.226	1	29
	Duties of teachers' affairs	32	0.162	0.066	0.194	2	
	Composition and distribution of lecturers	16	0.081	0.046	0.134	3	
	Evaluation of lecturers	16	0.081	0.046	0.134	3	
Virtual education	Virtual education infrastructure	19	0.475	0.080	0.226	1	18
	Virtual education method	7	0.175	0.069	0.195	2	
	Evaluation of virtual education	4	0.100	0.052	0.147	3	
Cultural and student affairs	Welfare services	27	0.203	0.073	0.139	1	32
	Cultural and social activities	26	0.195	0.072	0.137	2	
	Student counseling center	12	0.090	0.049	0.093	3	
Research and technology affairs	Research management	17	0.156	0.065	0.120	1	42
	Innovation and acceleration center	17	0.156	0.065	0.120	1	
	Scientific research & technology development	15	0.138	0.061	0.113	2	
	Initiatives, innovations, and inventions	11	0.101	0.052	0.096	3	
Learning resources	Other sources of information	27	0.310	0.082	0.300	1	21
	Library	39	0.448	0.081	0.297	2	
	Database	15	0.172	0.068	0.250	3	
Administrative, financial, and support affairs	Financial management	45	0.616	0.067	0.275	1	35
	Computer affairs	11	0.151	0.064	0.263	2	
	Employee welfare services	9	0.123	0.058	0.238	3	
Employer	Recruitment of graduates	6	0.500	0.078	0.5	1	9
	Labor market links	6	0.500	0.078	0.5	1	
Human resources management	human resources	50	0.219	0.075	0.131	1	35
	Staff characteristics	24	0.105	0.053	0.093	2	
	Planning and expansion of education	22	0.096	0.051	0.089	3	
Quality management	Continuous improvement of quality	7	0.292	0.081	0.294	1	18
	Development and quality assurance	11	0.458	0.080	0.292	2	
	Accreditation process	4	0.167	0.067	0.244	3	
Graduates	Employment of graduates	22	0.367	0.083	0.235	1	19
	Graduates' characteristics	16	0.267	0.079	0.225	2	
	Quality of graduates	9	0.150	0.064	0.182	3	
Stable income	Increased income from free training courses	13	0.371	0.083	0.259	1	20
	Increasing income from research	11	0.314	0.082	0.256	2	
	Self-management of institutions	5	0.143	0.063	0.196	3	
Applied science centers	Education department expert	30	0.319	0.082	0.208	1	20
	Head of applied science center	28	0.298	0.081	0.205	2	
	Entrepreneurship	12	0.128	0.059	0.150	3	
Public relations	Advertising and notification of programs	4	0.364	0.083	0.561	1	10
	Advertisements to attract students	7	0.636	0.065	0.439	2	
33 factor	**101 Criteria**						**704 Indicator**

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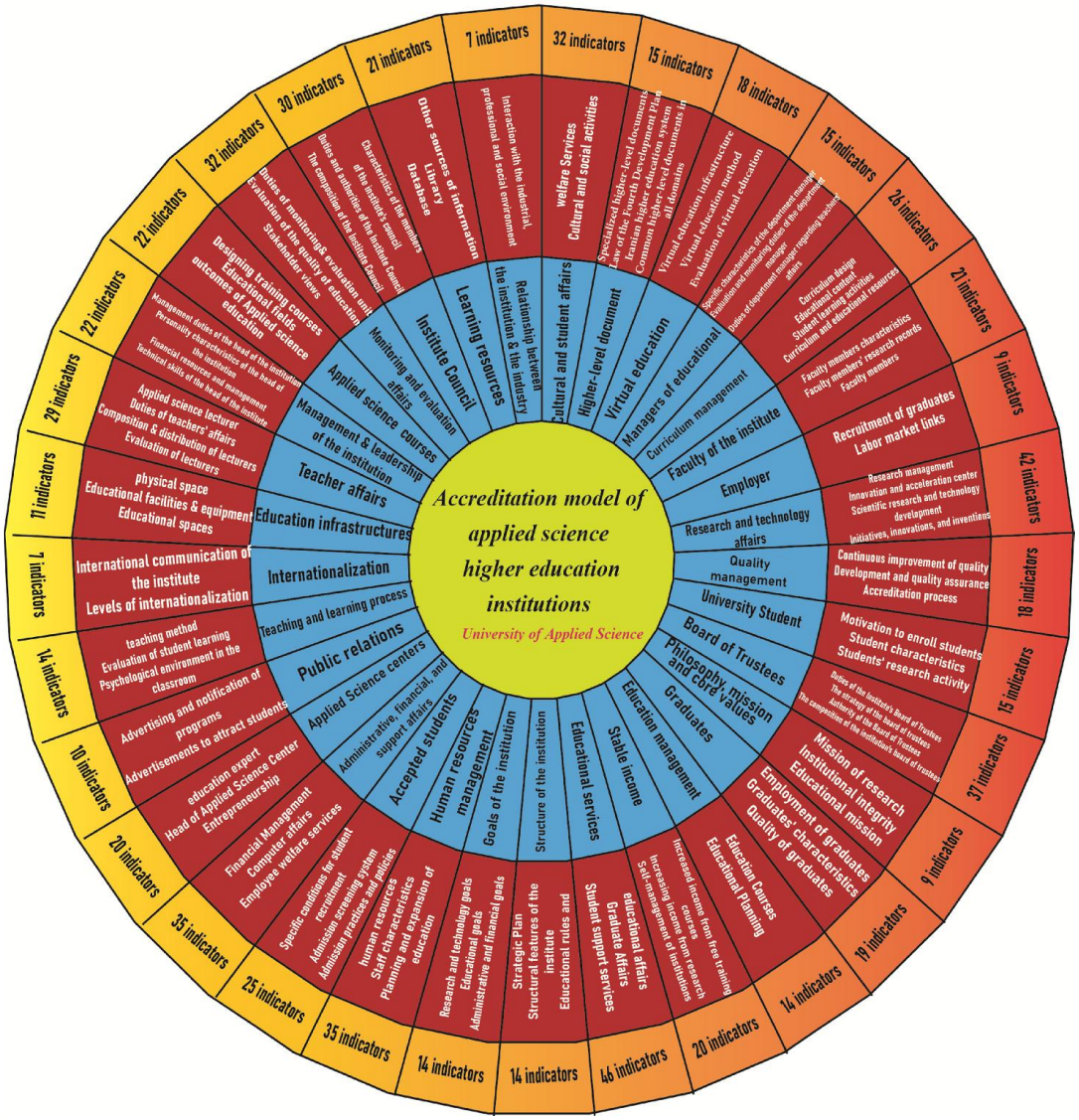

Figure 1. Accreditation model of applied science higher education institutions

Question 6: What is the credibility of the model designed for applied science higher education institutions?

In order to validate the research results and the model designed from the perspective (consensus or triangulation), checking and controlling the members, and evaluating the accreditation model of applied science higher education institutions, 10 credibility criteria of Strauss and Corbin were used: 1) Fit; 2) Applicability or usefulness of the findings; 3) Concepts; 4) Context of concepts; 5) Logic; 6) Depth; 7) Variability or deviation; 8) Innovation (creativity); 9) Sensitivity; 10) Reference to notes (30).

Credibility means to what extent the findings of the research reflect the experiences of participants, researchers, and readers about the studied phenomenon.

Discussion and Conclusion

Higher education has always been closely related to the life and development of human societies. Quality of education and accreditation of academic institutions and centers have always been of great concern to many groups, including managers and officials, students, parents, and employers, for various reasons. The question of quality has been one of the most central challenges presented to higher education in the country in recent years. Since higher education is

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known as a service industry today, universities have to pay attention to the expectations and needs of their customers in order to gain a superior position and maintain a competitive advantage. As universities and higher education become more in demand, the sensitivity towards accreditation, ensuring social accountability, and guaranteeing its quality also increases. Therefore, accreditation is necessary for any institution that is looking for a good reputation, recognition, and funding from the government. Therefore, the current research aims to design the accreditation model of applied science higher education institutions.

The first distinguishing feature of the designed model, with other studies conducted in the field of accreditation, is that this model while being comprehensive and considering the systemic approach conforms to the specific conditions and requirements of applied science higher education institutions, which focus on skill training. Secondly, factors, criteria, and indicators have been weighted and prioritized in the final discovered model; nonetheless, in other studies, it has only been performed at the level of identification of factors, criteria, and indicators. Thirdly, the accreditation model of applied science higher education institutions has been designed with a systemic and holistic approach of factors, criteria, and indicators in the input, process, output, and outcome format. The accreditation model of applied science higher education institutions includes 33 factors, 101 criteria, and 704 indicators. The factors, criteria, and indicators identified in the framework of the systemic approach are as follows:

1) The factor of the board of trustees with four criteria (duties of the board of trustees of the institution, the strategy of the board of trustees, the competencies of the board of trustees, the composition of the board of trustees of the institution) and 37 indicators is consistent with the result of the research by Lewis, 2016. (32)

2) Institutional council has three criteria (characteristics of institutional council members, duties and authorities of institutional council, composition of institutional council) and 30 indicators; however, in the review of literature yielded no findings consistent with this factor.

3) Higher-level documents with four criteria (specialized Higher-level documents, Iranian higher education system, and common Higher-level documents in all areas) overlap with the result of the study by Baniasadi et al, 2016. (33)

4) The factor of philosophy, mission, and core values with three criteria (research mission, institutional integrity, and educational goal) and nine indicators overlaps by the researches such as Lopez et al, 2016; ABHE, 2017; Lagrosen, 2017; Tertiary Education Services Office, 2018; Taleb et al. 2019; NAAC, 2019; Ramezani et al., 2018; Rouhbakhsh & Zeinabadi, 2018; and Aliyari Shourehdeli, 2019. (34-42)

5) The factor of institutional goals with three criteria (research and technology goals, educational goals, administrative and financial goals) and 14 indicators overlap with the results of researchers such as NAAC, 2019; Lopez et al, 2016; ABHE, 2017; Lagrosen, 2017; Tertiary Education Services Office, 2018; Taleb et al., 2019; Ramezani et al., 2018; Rouhbakhsh & Zeinabadi, 2018; and Aliyari Shourehdeli, 2019. (34-42)

6) Institutional management and leadership with four criteria (management duties of the head of the institution, personality traits of the head of the institution, financial resources and financial management, technical skills of the head of the institution) and 22 indicators is in line with the results of the studies by the following researchers: Morosini et al., 2016; ABHE, 2017; Lagrosen, 2017; Taheryar, 2017 Nguyena & Hien Ta, 2017; Islam et al. 2017; Yusoff et al., 2018; Rouhbakhsh & Zeinabadi, 2019, Ramezani et al., 2019; AlTobi & Duqe, 2018; Tertiary Education Services Office, 2018; Imanian et al., 2018, Mehdizadeh, 2016, Bazyar &Mohammadi, 2016; and Mohammadi et al., 2018. (35-51)

7) Industry-university relationship with one criterion (interaction with the industrial, professional, and social environment) and seven indicators overlap with the results of the studies by AlTobi & Duqe, 2018; Gambhir et al. 2016; Taleb et al., 2019; Musa, 2019; Ansari Samani, 2021, Bahardoust et al., 2021; and Kiakojouri, 2019. (38, 48, 52-56)

8) Internationalization includes two criteria (international relations of the institution and levels of internationalization) and seven indicators which are in accordance with the result of the study by Lagrosen, 2017. (36)

9) The manager of educational departments has three criteria (special conditions of the department manager, evaluation and supervision duties of the department manager, and duties of the department manager regarding teacher affairs)

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and 15 indicators.

10) Institutional structure with three criteria (strategic plan, characteristics of institutional structure, educational rules and regulations) and 14 indicators is in line with the results of the following studies such as Basari et al., 2016 and McCowan, 2017. (57&58)

11) Supervision and evaluation with three criteria (the duties of the supervision and evaluation unit, evaluation of the quality of education, stakeholders' views) and 32 indicators is consistent with the results of the studies by CIHE, 2016; Morze et al., 2016; Gambhir et al., 2016; and NAAC, 2019. (39, 52, 59, 60)

12) The education infrastructure factor with three criteria (physical space, educational facilities and equipment, and educational spaces) and 11 indicators align with the results of the studies by McCowan, 2017; Islam et al. 2017; Nguyena & Hien Ta, 2017; Bazyar & Mohammadi, 2016; Zeinabadi & Rouhbakhsh, 2019; Ramezani et al. 2018; and Sadriya, 2018. (40, 42, 45, 46, 51, 58, 61)

13) Education management with three criteria (educational courses, educational planning, and improving access) and 14 indicators are consistent with the result of the study by ABHE, 2017. (35)

14) The teaching-learning process with three criteria (teaching method, evaluation of student learning, psychological environment in the classroom) and 14 indicators is consistent with the results of the following studies: Nguyena & Hien Ta, 2017; McCowan, 2017; Yusoff et al., 2018; Ulker & Bakioglu, 2018; Quality Assessment Center, University of Tehran, 2019; Sadriya, 2018. (3, 45, 47, 58, 61, 62)

15) The factor of admitted people has three criteria (specific conditions of student recruitment, admission screening system, methods and policies of admission) and 25 indicators.

16) The factor of student with three criteria (motivation to enroll students, characteristics of students, research activity of students) and 15 indicators is in accordance with the results of the studies by Chinta et al., 2016; Islam et al. 2017; Nguyena & Hien Ta, 2017; and Ramezani et al., 2018. (42, 45, 46, 63)

17) Faculty members with three criteria (characteristics of faculty members, research records of faculty members, members of the faculty) and 21 indicators are consistent with the results of the studies by Nguyena & Hien Ta, 2017 and Bezpalko & Klishevych, 2017. (45&64)

18) Applied science educational courses with three criteria (design of educational courses, educational fields, and outcome of applied science education training) and 22 indicators overlap with the results of the following studies: Imanian et al., 2018; Mojtabazadeh, 2015; Bazyar & Mohammadi, 2015. (49, 51, 65)

19) Curriculum management with five criteria (educational content, student learning activities, curricular and educational resources, and educational topics) and 26 indicators overlap with the results of the studies by McCowan, 2017; Islam et al. 2017; Nguyena & Hien Ta, 2017; and Sadriya, 2018. (45, 46, 58, 61)

20) Educational services with three criteria (educational affairs, graduate affairs, student support services) and 46 indicators are in agreement with the results of the following studies: Rezaei, 2016; Golzari et al., 2019; Rouhbakhsh & Zeinabadi, 2018; and Ramezani et al., 2018. (40, 42 66, 67)

21) Teachers' affairs have four criteria (applied science teacher, duties of teachers' affairs, composition and distribution of teachers, evaluation of teachers) and 29 indicators.

22) Virtual education has three criteria (virtual education infrastructure, virtual education method, virtual education evaluation) and 18 indicators.

23) Cultural and student affairs with three criteria (welfare services, cultural and social activities, student counseling center) and 32 indicators overlap with the results of the studies by Rouhbakhsh & Zeinabadi, 2018; McCowan, 2017; Rezaei, 2016, and Golzari et al., 2019. (40, 58, 66, 67)

24) Research and technology affairs with four criteria (research management, innovation and acceleration center, scientific research and technology development, initiatives, innovation and inventions) and 42 indicators is in accordance with the results of the studies by Nguyena & Hien Ta, 2017; Yusoff et al., 2018; and Ramezani et al., 2018. (42, 45, 47)

25) Learning resources with three criteria (other information resources, library, and database) and 21 indicators overlap with the results of the studies by Morze et al. 2016 and Taleb et al., 2019. (38, 60)

26) Administrative, financial, and support affairs with three criteria (financial management, computer affairs, employee welfare services) is consistent with the results of the studies by Gambhir el al, 2016; Taheryar, 2017; Tertiary

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Education Services Office, 2018; Nguyena & Hien Ta, 2017; Matos et al., 2017; ABHE, 2017; and Taleb et al., 2019. (35, 37, 38, 44, 45, 52, 68)

27) The employer factor with two criteria (attracting graduates, labor market links) and nine indicators are in line with the results of the studies by EQAC, 2019; and National Assessment & Accreditation Council, 2019. (38&69)

28) Human resources management with three criteria (human resources, employee characteristics, planning and expansion of training) and 35 indicators is consistent with the results of the studies by Gambhir et al., 2016; Islam et al. 2017 Nguyena & Hien Ta, 2017; Taheryar, 2017; and Tertiary Education Services Office, 2018. (37, 44, 45, 46, 52)

29) Quality management with three criteria (continuous quality improvement, development and quality assurance, accreditation process) and 18 indicators overlap with the results of the studies by Morze et al. 2016; Islam et al. 2017; Lagrosen, 2017; Tertiary Education Services Office, 2018; Nassereddine, 2018; Taleb et al., 2019; and Al Ghawiel, 2020. (36-38, 46, 60, 70, 71)

30) Graduates with three criteria (employment of graduates, characteristics of graduates, quality of graduates) and 19 indicators are consistent with the result of the study by Nassereddine, 2018. (70)

31) Sustainable income factor with three criteria (increasing income from free educational courses, increasing income from research, self-management of institutions) and 20 indicators is consistent with the result of the research by Mussawy & Rossman, 2018. (31)

32) The factor of applied science centers with three criteria (education expert, head of applied science center, and entrepreneurship) and 20 indicators is consistent with the result of the research by Rouhbakhsh and Zeinabadi, 2018. (40)

33) Public relations with two criteria (entrepreneurship and advertising programs) and 10 indicators is in line with the results of the studies by Taheryar, 2017 and Morze et al. 2016. (44&60)

The implementation of the accreditation model of applied science higher education institutions present these centers with new challenges and opportunities since in order to receive a quality certificate or maintain a competitive advantage, it is necessary to comply with accreditation factors, criteria, and indicators. Therefore, we are witnessing a marked increase in pressure put on applied science higher education institutions from financiers (government, organizations, and families) and higher education customers (students, teachers, graduates, employees, and the labor market). Consequently, accreditation has become a valuable activity of educational institutions in order to guarantee the quality of services.

The strengths of the current accreditation model that can lead to the improvement of skill training are:

1. Reassuring the University of Applied Sciences, students, and parents about the quality of the education provided;
2. Improving the quality of the skill training system through the implementation of the current model;
3. Helping the institution to identify its strengths, weaknesses, opportunities, and threats through an informed review;
4. Graduates have access to a high level of education in order to succeed in the labor market
5. Employers have access to standard information for recruitment;
6. Encouraging educational institutions for continuous improvement by validating the quality of skill training;
7. Systematic and holistic approach in the accreditation of scientific-applied higher education institutions;
8. Providing reliable information about the quality of skill training provided;
9. Reducing education costs by modifying educational structures and processes
10. Creating the ability to hire teachers and attract quality students;
11. Promotion of internal and external interaction in the institution;
12. The possibility of using accreditation as a lever for negotiation to attract resources (human, financial, equipment, and information).

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Conflict of Interests

The authors declare that there were no conflicts of interest in this study.

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