Designing and Validating a Model for Databases in Open and Distance Universities

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ABSTRACT

Background: Humans have always needed to store and retrieve information. In the last decades, one of the most important phenomena in the information industry was the emergence and popularity of machine reader databases, especially online databases. The main purpose of this study was to design and validate a model for databases in open and distance universities.

Methods: This research is a descriptive study conducted by survey method. The statistical population of the present study consists of all specialists in the field of studying databases and open and distance educational universities. In a small part, sampling was done by a census method and in a purposeful manner. The responses were analyzed using descriptive and inferential statistics and by SPSS and Lisrel software. For the purpose of examining the parametric deflections, the Kolmogorov–Smirnov test was used to check the normality of the data. The Levene's test was used to examine the default of variances and obtain the inferential part of factor analysis. The current research was carried out in 2 qualitative and quantitative phases. In the qualitative phase, some of the distance education scholars and database experts were selected as a purposive sample to analyze the basic parameters obtained in the first phase. In the quantitative phase, sampling was done through census and purposive manner from professors' at the University of Isfahan (N=211). 22 questionnaires were excluded due to reasons such as non-functional responses, and statisctical analysis was carried out for 189 participants. To measure content validity index (CVI), Waltz and Bausell index was utilized and the instrument under investigation was presented to 8 experts who were engaged in the content validity stage.

Results: The results of the research showed that databases in open and distance universities in Iran have high quality and quantity regarding the search and search features and the technical aspects.

Conclusion: Based on this research a major issue of concern is to find a framework and model which can be used by executives and managers from distant backgrounds to evaluate the quality of their existing databases.

Keywords: Distance learning, Open education, Databases, Evaluation

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Introduction

Nowadays, information is the most valuable and strategic source of social and economic development and helps with the growth of science and technology in each country. Today humanity experiences a technology-based information and communication society and, using modern information systems has provided an incredible opportunity for communication among all people and facilitated the global exchange of information (1).

The rapid and unrestrained growth of world-wide data has made the coordination between scientists and experts in the information centers impossible, unless they use a powerful and fast means to deal with this phenomenon known as the explosion of information (2). Simultaneously, with the explosion of information, humanity has witnessed the rapid progress of electronic and computer science technology, and its use in economic, social, military and cultural activities. As information grows, the importance of registration, processing and implementation of information in Research and Development becomes more evident (3).

The growth of a developed country seems impossible without the use of information and its applications. In principle, development and communication cannot be two separate categories. The basis of the post-industrial or informational society is the widespread use of information-communication technologies. In fact, information and communication technologies are combined and provide services that revolutionize the collection, accumulation, call, or processing, retrieval and distribution of information. It has expedited the generation of information and is focused on all computer developments (4).

From the very beginning of civilization, mankind has always needed to store and retrieve information. Undoubtedly, one of the most important phenomena of the past few decades in the information and communication industry was the emergence and popularity of machine reader databases, especially online databases. In fact, online

databases created the information industry in such a way as noted before (5). Data are considered to be the most important capital of large operational environments. For this reason, the strategic issue of selecting databases in operational environments is very important. New ways of storing, processing and retrieving data are introduced by software and hardware industries. Electronic databases and sophisticated search systems have improved the availability of information, data search and data retrieval. A database of raw datasets that are organized in the form of regular information can be accessed at any time (6). Databases of data type refer to source databases that ultimately refer to the final information source, containing the main bibliographic details (book, article, etc.) and the source, which has all the divided information (7).

In the light of the industrial revolution, human societies developed a tendency toward becoming more professional, which, on the one hand, increased the need for education and information, and, on the other hand, presented a community with the opportunity to learn in a traditional way**.** This tendency leads to formal and informal learning, distinction between learners and uneducated, establishment of communication and transmitting educational messages on the technology of sound, image, information and printing, and the formation of different versions of distance education, in accordance with the ever faster growth of technology. Distance learning is a type of designed learning that usually takes place in a different location from teaching and requires specific teaching and instructional techniques and specific communication and electronic tools, along with special organizational and management props (8).

Nowadays, modern educational systems are considered as a necessity in view of the need for education, creation of opportunities for studying in different climatic conditions, and different educational conditions for learners with respect to their gender and culture. Distance education, as a modern educational method, is considered as a

necessity for eliminating climatic barriers, the geography of educational spaces, and age and gender constraints for learners (9). Databases can also be used in educational environments in a variety of ways. They can play a major role in educational programs. The storage and management of user profiles, exam questions, and registration and retrieval of exam results are not possible without using databases (5).

Given the importance of quality, it is important to consider other aspects of distance learning in addition to development. Factors such as meeting the needs of stakeholders, fulfilling educational goals and objectives, reducing costs and increasing access to distance education graduates are crucial. Implementation of e-learning programs and the need to meet the required standards are other important factors for the dynamics of distance education centers in the country (10).

Background studies show that distance education in the higher education systems face some challenges such as increasing costs without increasing credits, declining educational quality, uncertainty about the suitability of educational programs and courses, the economic and social imbalance between supply and demand of educated people, lack of employment opportunities, etc. Obviously, solving these problems and improving the quality of education requires making strategic changes through the design of strategic plans. The design of these programs involves the acquisition of information and taking measures that will lead to more awareness. Since the goal of each database is to provide users with appropriate information at the right time, it is necessary to know the appropriate design methods for the database in any educational system, to provide the appropriate crediting design in addition to saving the cost of construction, design, and purchasing the information required by the learners (11).

Also, in accordance with Iran's 1404 plan and the objectives of this vision, including a country with advanced knowledge, capable of producing science and technology, based on the superior contribution of human resources and social capital in national production, higher education needs a kind of transformation based on metamorphosis, professional competence, customer orientation, strategic ability, Teaching human resources . So, universities in Iran, as one of the country's scientific centers, play a key role in providing opportunities for young forces, refocusing the prospects of professional life, and educating the human resources and scientists. Therefore, such factors as sustainability, survival, dynamism and preservation of the competitive power of this educational system have been considered as the key variables in addition to quality improvement at universities (12).

Along with the development of technology and computer capabilities in the storage and retrieval of information, the number of databases have increased. In other words, day by day we face a variety of database information that has been designed and presented in a variety of topics (13). Today, improving, upgrading and quality assurance are the requirements of academic systems all over the world. Application, evaluation and validation are required to create awareness about the current situation and identify the needs and problems of the higher education system. Determining the extent of achieving its goals is an effective step in planning to improve the quality of the higher education system. Obviously, if the quality of the existing databases in higher education is not optimal, the country's scientific and technical future will not be reassuring. As the number and variety of databases and information resources has increased considerably in distance education over the past few decades, the need to focus on their quality and credibility is felt more than ever. Due to the sensitivity of using databases, and the high costs of database development, the present study intends to "design and validate a model for databases in open and distance universities" (14).

The role of information and communication technology in expanding distance education

was investigated in this research. The researcher examined the variety of available techniques and their role in distance education. The findings showed that technology has a positive role in providing distance education (15). Also, viewpoints of learners about the role of social networks and applications in the management of distance education systems was studied. Findings of the research indicate that learners have a positive view of social networks and existing applications in the educational environment, which have improved the relationships between faculty members and students (16). The researchers also examined the viewpoints of learners on how to engage in traditional education and distance education. A variety of distance-learning models in Australian virtual universities were explored. It also did not address the learner's perspective on online presentations in the educational environment. The findings of the research showed that the messages presented in the learning environment have a positive role in students' prospects and students have positive views about it (17). The factors influencing the selection of online resources among learners at the virtual universities in Africa have been investigated. Research findings showed that factors such as ease of access and the design of a web structure were the most important reasons (18).

A research entitled "Increasing the speed of video transmission in distance education systems" has been conducted. It attempts to present a compression codec based on the nature of remote video tutorials in the field of low-mobility images in order to compress these images at a higher rate and to help improve the translation for the Web. It can be argued that compressing video tutorials from distance is much better than compressing these images with other compression formats that are also used for vibrant videos. The main purpose of this study is to provide a unique method for educational low mobility images. It claims to have a higher compression ratio for such video images, and this compression will not change the pixels of the image's

importance (19).

The main objective of this research is designing and validating a model for databases in open and distance universities.

Methods

A sequential research method was used for this research because the present study involves the collection of qualitative information and profound analysis of the views of scientists and experts, quantitative data collection and statistical analysis. This sequential method is used in the mixed approach in which one of the two types of quantitative or qualitative data was initially collected and analyzed and based on the information extracted from the data, it was subsequently dealt with. The statistical population of the present study consists of all specialists in the field of studying databases and universities of open and distance education. Since the present study was a compilation type, it was carried out in two qualitative and quantitative stages. At this stage, the most important factors that are most effective in operating a database are selected. In the qualitative section, they included: 1-General features 2-Search features 3-Input of search 4-Output of search 5-Options 6-Retrieval Options 7-Special Features 8-Domain 9-Precision 10-Technical Aspects 11-Guidelines 12-Management Considerations. They were first selected from a number of opinion polls by distance education professors and database experts to classify the categories. The basic element is explored in the first stage to formulate the model (20). The number of individual samples in the qualitative sampling is based on the data saturation. This means that as long as the sampling continues, new components and ideas will still be presented by sample members. In a small part, sampling was done by census and in a targeted manner.

The present work was a mixed method design which was carried out in 2 qualitative and quantitative phases. In the first phase, distance education scholars and database experts were selected purposefully to analyze the obtained parameters. Sample

size in qualitative sampling was based on the theoretical data consensus. In the quantitative sampling, it was done based on purposeful and census manner (N=211). Following the exclusion of 22 participants, 189 participants were finalized.

Topic: This study is a kind of curriculum development study.

Location: This study is related to databases of distance education and open universities.

Time: This study is was conducted in the years 2018-2019.

Instruments
Questionnaire:
content validity and alpha Cronbach were

considered in this stage. Exploratory Factor Analysis and Theoretical consensus were used in qualitative phase.
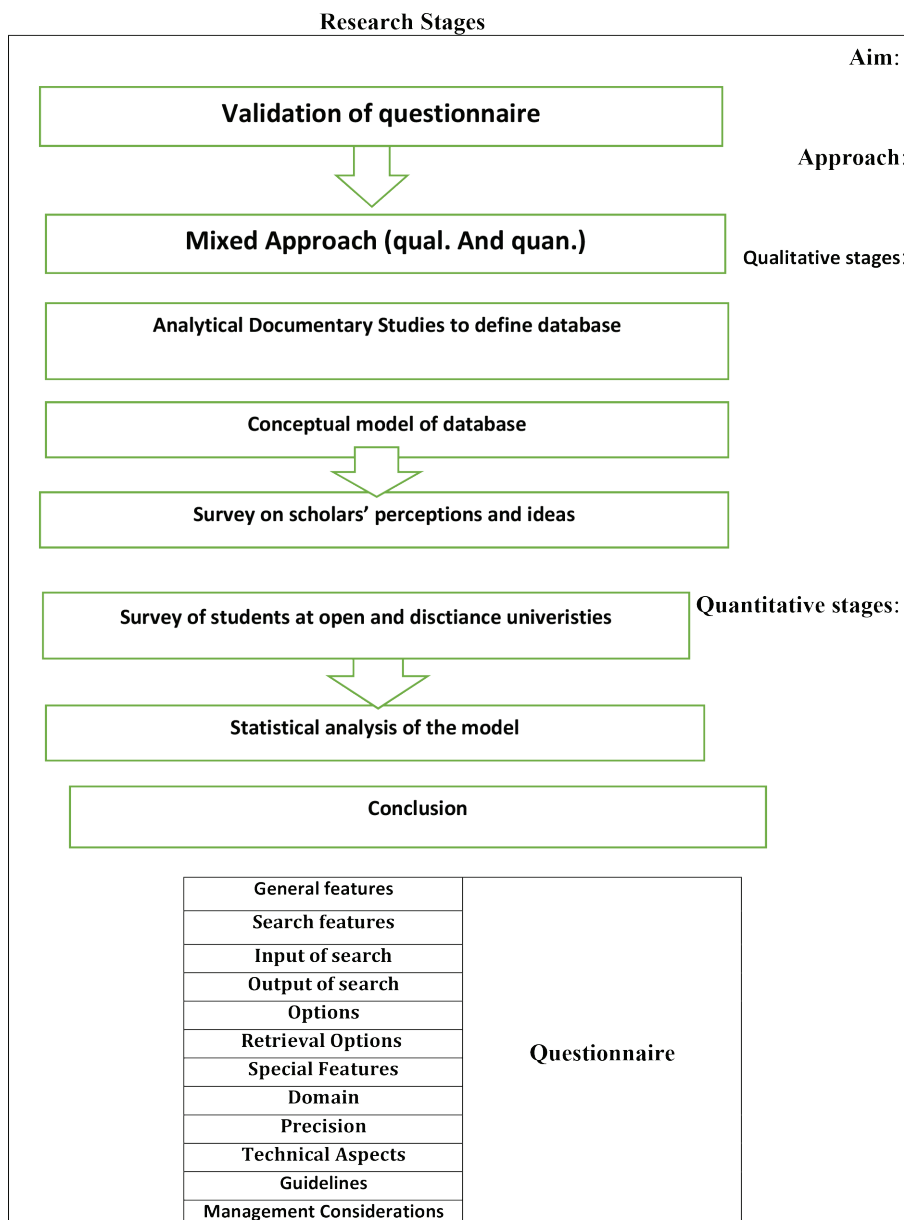
Designing Instrument
This stage was done with careful review of published works. The first version was designed in 2 weeks. This questionnaire consisted of 123 items.

Data Collection
a) Analytical Documentary Studies
b) Field Research

CVR
The experts were asked to specify a

Research Stages

mark (1= useful, but not necessary, and 0= not necessary). The answers were analysed through formula below:

$$CVR = \frac{n - N/2}{N/2}$$

The numerical value of the content validity ratio was determined by using the minimum value table provided by Lavouche. As the answer range was 0 to 2 and the number of evaluators was 8, so the range for each phrase ranged from 0 to 16. According to the table for number 16, those expressions whose numerical CVR was greater than 0.49 were significant and retained.

It should be noted that the total CVR was 0.95.

The most important tool used in this research is a questionnaire. In this research, a researcher-made questionnaire related to the subject of research was taken from the proposed model. In the next stage, the cognitive framework which validated from theoretical and analytical foundations used for the target sample (including a team of open minded and remote universities and think tanks).

The Cronbach alpha was calculated for each domain and for the whole instrument. The total Cronbach alpha was calculated 0.913.

$$\alpha = \frac{\frac{k}{k-1}\left[\sum S_i^2 - S^2 t\right]}{S^2 t}$$

k : Total questions of Questionnaire

$S^2 t$: Total variance

$\sum S_i^2$: Total variance of each question in questionnaire

Cronbach's alpha was used to measure the reliability of the questionnaires. Using the SPSS software, the Cronbach's alpha coefficient variables were calculated in Table 1.

The Cronbach's alpha coefficient varies from zero to one and number 1 indicates that the equations of a scale are greater and the most valuable. The alpha value is generally determined by the two criteria of the number of units of a scale and the mean of correlations between the terms.

Results

The proposed evaluation framework, in the form of a questionnaire with emphasis on the main factor affecting the credibility of the databases, was provided by professors and topic specialists. It included 12 criteria and 123 measurement factors. Also, during a survey, the importance and impact of each agent has been questioned by scientists and experts. The data obtained from validation

Table 1: Cronbach's alpha coefficient for each dimension of the questionnaire

Components	Number of questions	Cronbach's alpha coefficients
General information	12	0.803
Search features	17	0.827
Search input	7	0.701
Search output	14	0.752
Display options	6	0.729
Recovery options	6	0.712
Special features	7	0.713
Domain	2	0.703
Accuracy	9	0.751
Technical aspects	23	0.844
Guidance	5	0.726
Management Considerations	15	0.827
Whole questionnaire	123	0.913

and the survey form are analyzed by content analysis method and the result is presented as a template for the evaluation of the databases. The basis of this questionnaire is validation of the proposed framework, evaluates the quality of databases from the experts' point of view in five point Likert scale.

In order to validate the proposed framework and determine the degree and rank of the factors affecting the evaluation of databases, the quantitative study was carried out. The proposed model is presented in Table 2.

Therefore, 12 factors affecting the evaluation of databases are provided to subject experts in order to rank the factors in terms of importance and compare them to each rating in the column. Then, according to this ranking, the share of each factor is

determined in percentage terms in such a way that the total share of each factor is equal to one hundred. After collecting the information obtained from the survey form, the proposed model for evaluating the databases is established. This template is presented in Table 3.

By analyzing the results obtained from the implementation of the proposed model in the sample, the guidance agent with the mean of 9.65 out of the total number of factors affecting database credentials has earned the highest score. The technical aspects are ranked second with average of 63.11. Domain agent, management considerations and search features are ranked 6.61, 52.93, 51.51 and 43.51, respectively. In this way, the guidance agent with an average of 9.65 is

Table 2: Suggested model of evaluation of open and distance training databases

Factor	Number of effective factors
General information	12
Search features	17
Input search	7
Search Results	14
Display options	6
Recovery options	6
Specific features	7
Domain	2
Precision	9
Technical aspects	23
Guidance	5
Management Considerations	15

Table 3: The proposed model for the evaluation of distance education databases

No.	Components	Number of factors	Average	S.D.
1	Guidance	5	9.65	1.66
2	Technical aspects	23	63.11	6.77
3	Domain Agent	2	6.61	1.94
4	Management Considerations	15	52.93	11.67
5	Search features	17	51.51	5.18
6	Search Results	14	43.51	4.52
7	General information	12	33.75	3.66
8	Precision	9	29.56	3.96
9	Specific features	7	23.03	2.51
10	Input search	7	50.59	2.77
11	Recovery options	6	18.94	2.29
12	Display options	6	16.75	2.57

rated in the acceptable position. The factors of the technical aspect, scope and management considerations are within acceptable and weak boundaries. Other factors are also valued as weak.

Adaptive fit indices of the developed model represent the acceptance of the model. According to all the indicators, the search component model has a suitable fit. Factor loads represent the effect of the observed variables on the explanation and measurement of their hidden variables. To confirm the factor load, a significant level is considered. If the level of significance is smaller than 0.05, then the effect of the burden is a significant factor. In Table 4, the factor loads, the standard error rate, the significant level and the value of t-value indicate the items related to the output component of the search.

The designed model for the search output component is measured using 14 rows. As shown in Figures 1 and 2, the search output component is measured and explained by 14 items including q37 to q50.

Due to the smaller significance level, the factor loads are 0.05, and all observed variables significantly differentiate their hidden variables. The closer the standard estimate is to one, the greater the relevance and the stronger the relationship. The results of the confirmatory factor analysis for the output component of the search with 14

questions indicate that the questions were considered to be in appropriate level in relation to this component and can measure this component properly. In questions 41 and 39 (search results are based on specific fields such as release date, author's name, etc.) the results are presented in a comprehensible manner and have the most relevance to the output component, and the question 30 (the search with keywords, title, subject, phrase, etc.) has the least relevance to the search result component.

In view of the general criteria for assessing databases (access, content, and updating,
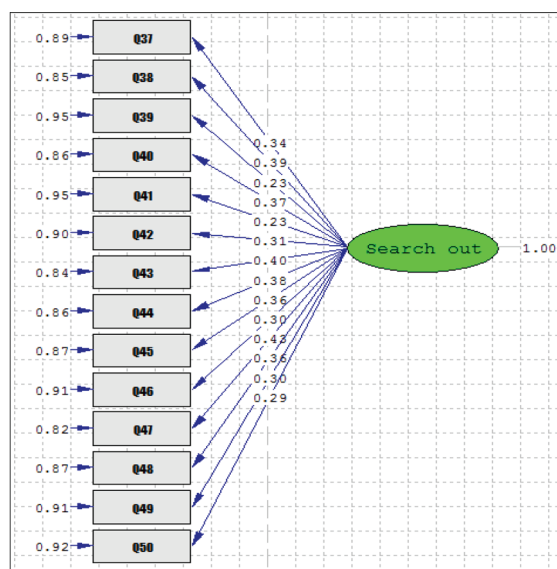

Figure 1: Confirmatory factor analysis of search output component with standard coefficient

Table 4: Factor loads of the output model of the search component

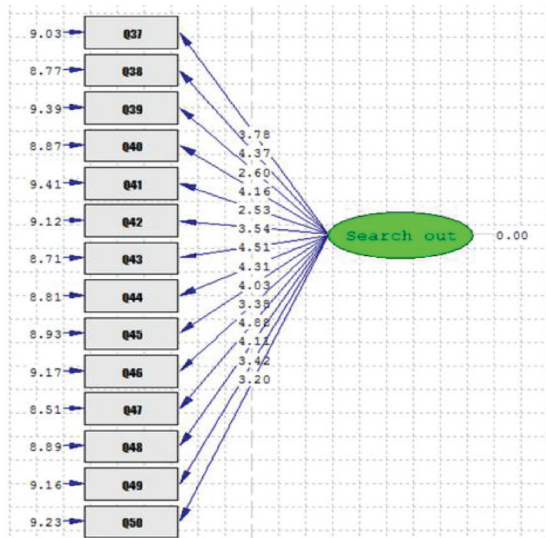| Route			Standard Estimates	t value	Significance level	Result
Q37	<--	Search output	0.34	3.78	**	Confirmed
Q38	<--	Search output	0.39	4.37	**	Confirmed
Q39	<--	Search output	0.23	2.60	**	Confirmed
Q40	<--	Search output	0.37	4.16	**	Confirmed
Q41	<--	Search output	0.23	2.53	**	Confirmed
Q42	<--	Search output	0.31	3.54	**	Confirmed
Q43	<--	Search output	0.40	4.51	**	Confirmed
Q44	<--	Search output	0.38	4.31	**	Confirmed
Q45	<--	Search output	0.36	4.03	**	Confirmed
Q46	<--	Search output	0.30	3.38	**	Confirmed
Q47	<--	Search output	0.43	4.88	**	Confirmed
Q48	<--	Search output	0.36	4.11	**	Confirmed
Q49	<--	Search output	0.30	3.42	**	Confirmed
Q50	<--	Search output	0.29	3.20	**	Confirmed

**P<0.01; *P<0.05

Figure 2: Significance level confirmatory factor analysis output components Search

search, support) and validation criteria in the United States, England, Canada, Saudi Arabia, and South Africa, the general criteria for assessing the databases of open and remote universities in Iran can be achieved (Figure 3).

Discussion

Meeting the challenges of higher education in the third millennium and achieving the goals of the twenty-first century document of 1404, and the goals of this vision, including

a country with advanced knowledge, capable of producing science and technology, should rely on the superior contribution of human resources and social capital to national production. Higher education requires a kind of transformation based on metamorphosis, professional competence, customer orientation, strategic ability, monitoring role and retention of values. In this regard, Iran's open and distance universities as one of the country's main scientific hubs have a key role to provide opportunities for young forces, refocusing the prospects of professional life, and educating human resources. Obviously, the survival, dynamism and preservation of the competitive ability of this educational system in key variables require improving the quality of educational resources and databases in universities and educational institutions.

Today, with the rapid growth of databases in universities, we need to enhance our awareness of the current status of databases in distance education, and take the appropriate measures for improving the efficiency of these databases in order to meet the growing demands of the country. Therefore, the existence of a model and framework for evaluation and validation is essential in the
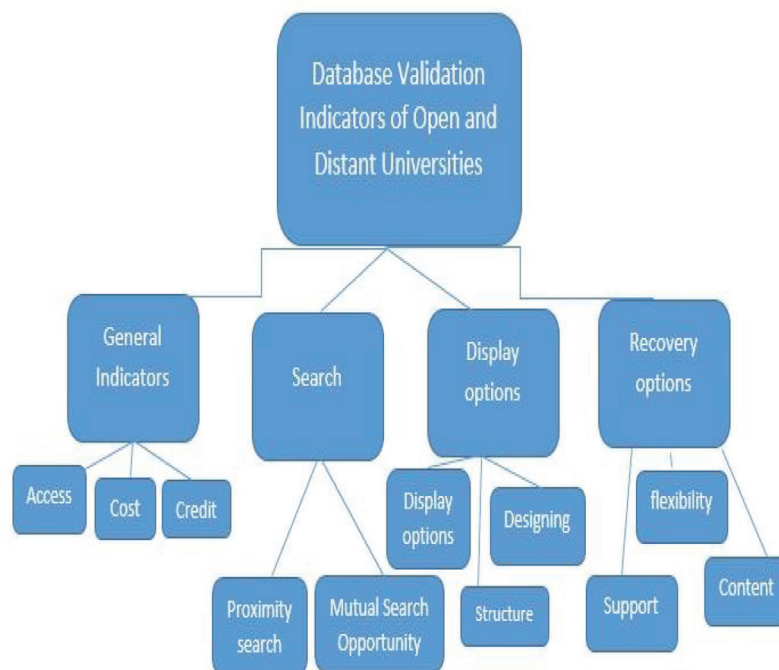

Figure 3: Conceptual model of research

context of improving the search quality. What has been discussed and studied in this research as a major concern is finding a framework and model which can be used by distance-education administrators as a benchmark for evaluating the quality of their existing databases. Application, evaluation and validation are required to create awareness about the current situation and identify the needs and problems of the higher education system. Determining the extent of achieving its goals is an effective step in planning to improve the quality of the higher education system. Obviously, if the quality of the existing databases in higher education is not optimal, the country's scientific and technological future will not be reassuring. Since the number and variety of databases and information resources in distance education has increased considerably over the past few decades, the need to focus on their quality and credibility is also more necessary than ever.

One of the most important challenges in the quality of the database is the multiplicity of effective and influential factors and variables that are in this field and the diversity of the categories that have been studied from different perspectives. For example, in an equality assessment model that was implemented by the Swedish International Development Cooperation Agency in 2008, the legal, cultural, economic, and political factors did not include Helm's cultural factor and also the factor of international cooperation. In addition, the importance of each agent is not specified in these studies. However, in this research, the effort was to determine the essential variables that affect the evaluation of databases and importance of each factor in the evaluation process. By studying the model and frameworks provided in the field of database evaluation, a quality assessment model was created for factors and indicators that affect the quality of databases. The proposed model was used and validated by experts and then implemented in the sample. The obtained datawas determined after analyzing the status and the quality

of databases in distance education. What distinguishes the present model from the evaluation models of the databases in other countries is:

In different sources, scholars have introduced factors influencing the evaluation of existing databases in distance learning in different categories. In this research, we have tried to extract all the factors in various sources, and after eliminating the similar ones, A more complete and stratified classification was obtained in the 12 main nodes and 123 subgroups in the proposed pattern.

In the proposed model, the factors influencing the quality and evaluation of the existing databases in the country's distance education are not identical and not in the same rank. Each factor is ranked based on its importance and impact on the evaluation of databases.

- A benchmark table is set up to evaluate the quality of databases and to provide an indicator for determining the quality of databases in distance education and higher education.

- The markers introduced in the proposed template are a good guide for finding the points of weakness and strength. The positive points of the databases that can provide a good guide for improving the quality of the databases.

- Defined markers for each agent provide an adequate tool for managers and organizers of distance education to address the weaknesses of the databases with regard to each agent, and to fix or improve their quality.

- Based on the proposed model and ranking of the factors affecting the quality of the databases and the results obtained from the implementation, one can prioritize the starting point of examining the educational points according to the importance of each factor.

In each research, the limitation is an integral part of it. In spite of efforts to minimize the limitations of some cases, it can restrict the explanation of the research results, which include:

1) Limited statistical population to all

specialists in the field of studying databases and open and distance education universities that limit the generalizability of the results.

2) Other limitations of this research were not to consider the role of economic, social and cultural status of the research sample.

3) Among other limitations of this research, the measurement tool for dependent variables has been used only from the questionnaire.

Availability of Data and Materials

The data that support the findings of this study are available from the corresponding author on request.

Conflict of Interest

The authors declare that they have no conflict of interests.

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