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Forecasting of Future Academic Libraries with Cross Impact Analysis Approach

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Abstract

This study uses forecasting approach based on key driving forces and their interactions in order to identify important driving forces affecting the future of academic libraries in Iran. The study is a combination of literature review, experts' opinions and cross impact analysis. In order to analyze the data, SPSS and MicMac applications were used. This is an applied study and the study population consisted of a group of stakeholders with dynamic roles in the future of academic libraries or those with clear pictures regarding the current trends in academic libraries worldwide. Experts were selected using purposeful sampling and included faculty members and researchers in the field of information science and scientometrics, as well as managers and librarians of academic libraries. After literature review, 70 driving forces were identified and categorized in 9 categories. The interaction between these driving forces was evaluated by experts selected from the study population. After evaluating direct and indirect interactions between these forces using MicMac software, 13 key driving forces were identified. The findings of this study indicated that driving forces of "systemic and creative thinking of library management", "consistency between library managers expertise with information and scientometrics fields", "development of strategic plans for libraries", "welcoming of changes by the employees", "place as one of the bases of educational system", "electronic publishing", "preparation of curriculum books", " online citation resources", "nature of information and access methods", "development of information and communication technologies", "knowledge management in library planning", "electronic content creation", and "documents management", had the largest effects on future of academic libraries. Also the findings of this study indicated that driving forces of "systemic and creative thinking of library management" and "consistency between library managers' expertise with information and scientometrics fields" had the highest frequency related to being in a suitable situation with average of 1.92 and total of 25 positive scores. Key driving forces of "Development of strategic plans for libraries" and "welcoming of changes by the employees" with the average of 0.69 and total of 9 positive scores had the next places and had the largest effects on future of academic libraries. The analysis of the results indicates two facts regarding

academic libraries. The first fact is that, through a small amount of effort, academic libraries are able to retain their traditional position in educational institutes. The second fact is that distancing the general process of academic libraries from critical and undesirable results, requires four main activities including "development of strategic plans for libraries", "using employees who are enthusiastic regarding change", "compatibility between managers' specialties and information science and scientometrics" and "systemic thoughts and creativity of library managers". The results of this study can be used for decision making and planning of higher education managers and authorities. Identifying the driving forces and their interactions can be used for decision making and planning for the future of academic libraries.

Keywords: Forecasting, Academic Libraries, Cross-Impact Analysis.

Introduction

Academic libraries provide the necessary information structure for higher education. For a long time, these centers were known as the gateways for accessing information and therefore had a direct, essential and undeniable role in expanding science in academic centers. In the past, the main role of academic libraries was to provide the information sources necessary for meeting educational and research needs (Lewis, 2007) and traditionally, librarians had a static role in universities. Therefore, in the eyes of managers, libraries were likened to costly and useless warehouses while faculties considered academic librarians as partners in their research and responsible for gathering and safekeeping of books (Simmons-Welburn, Donovan, & Bender, 2008). However, novel technological advances have resulted in rapid advances in all sectors including higher education. Academic libraries as one of the subsystems of the main educational system must therefore change based on new advances and changes in order to harmonize themselves with the current advancing environment. Today, academic libraries have turned into a competitive advantage and are at the center of learning and research in universities. This has challenged their traditional role in supporting educational and learning activities (Walther, 2018).

In the past, library managers attempted to control changes to benefit their organization but in the current dynamic and uncertain environment, using this approach is not effective (Roy & Hallmark, 2017). Adaptation of libraries in such an environment requires higher levels of innovation and efficiency (McKnight, 2010). Talking about the future always involves uncertainty and various conditions have equal probabilities of occurring (Godet, 2006; Corral, 1995). Therefore, the main challenge in forecasting process of academic libraries is the unpredictable nature of future changes and uncertainties of library management. This means that problem solving using this approach requires identification of the paths for all possible occurrences and requirements and prediction of final situation under different conditions. By moving from traditional services toward modern activities, library managers must have a precise understanding of possible future trends affecting academic libraries in order to succeed in their strategic planning, manage uncertainties and achieve an awareness regarding the role of libraries and libraries (Martell, 2008; Miller, Knapp, & Wood, 2007; Sidorko, 2007).

Without doubt, identification and recognition of driving forces influencing the future of a certain topic is one of the most important activities in the forecasting process. These forces can cause new occurrences or stop current trends in the present or future. Studying trends affecting present and future is one of the most important sources of driving forces during study of forces influencing academic libraries.

Some of the new trends affecting academic libraries include cloud computing, internet of things, robots and automated equipment, and mobile library services (Bowlby, 2012; Kaur, 2018; Kaushik & Kumar, 2016; Kubat, 2017; Mavodza, 2013; Wada, 2018). Use of information technologies must always be considered along with technical and efficiency considerations because academic libraries are among organizations which always make use of the most novel technologies based on customers and various available options. This means that the structure of these organizations is more compatible with the use of novel and specialized technologies. Identification and use of novel technologies can help librarians in developing libraries in present and future (Roy & Hallmark, 2017).

The rate of technological changes in academic libraries and research centers is constantly increasing. On the other hand, changes such as new frameworks in university plans, changes in the structure of educational, research and curriculum plans of universities, changes in previous approaches, moving toward the use of strategic planning, increased desire for financial gain in universities, acceptance of virtual students, reduced number of staff members and organizational positions, and free access to information have also greatly influenced academic libraries (McKnight, 2010). Therefore, academic libraries must change to accommodate these rapid changes and advancements and move forward together with the rest of the world. As a result, academic libraries will have to adject their services with new conditions or risk becoming redundant or defuncted.

Therefore, managers of academic libraries must create roadmaps based on organizational environment, as well as available resources and capacities and use these roadmaps for planning the future. During the planning process, managers will require to use novel planning tools which enable them to expand their horizons and move toward the future with a higher level of certainty and knowledge. One of these tools is knowledge regarding driving forces and their interactions affecting the future of the organization. Therefore, the main goal of the current study is to identify the driving forces influencing the future of academic libraries. Understanding and monitoring these forces allows managers to move toward a more desirable future.

Data and methodology

This is an applied study and the results are expected to be useful in decision making and planning of authorities in higher education for twenty and fifty-year horizons.

In the first stage, a literature review was carried out in order to identify the driving forces affecting academic libraries. During the search in Iranian and International sources, two general topics were emphasized: first, studies related to libraries, especially academic libraries and second, studies with the subject of forecasting and driving forces of forecasting in academic libraries. However, the priority was studies which investigated both these topics simultaneously. After literature review, a list of the most important factors affecting the future of academic libraries was created. After identifying the driving forces influencing the future of academic libraries, survey method was used in order to gather the experts' opinions and increase the credibility of the results. In this stage, a questionnaire containing two group of questions and one open question was used. The first group of questions gathered the demographic information of the participants while the second group contained 70 items in 9 categories scored based on Likert scale (table 1). At the end of the questionnaire, the respondents were asked to mention any other factors which might influence the future of academic libraries in their opinions.

Table 1
The Likert scale used in scoring the questionnaire

Selected answer	Fully agree	Agree	Somewhat agree	Disagree	Fully disagree
Score	5	4	3	2	1

The study population included 100 experts and elites active in the field of academic libraries which had three characteristics of related work experience, related academic and research activities and expertise in the field of scientometrics and informatics. These experts were selected due to their role in actively shaping the future of academic libraries or their clear understanding regarding current trends in academic libraries worldwide. The participants were selected using purposeful sampling approach. After follow ups with the participants, 70 questionnaires were returned and analyzed in the next stage.

In the next stage, the identified factors were selectively presented to active experts in the field of academic libraries who were then asked to provide their opinions regarding any additional missing factors or to eliminate factors with low levels of importance. Finally, a total of 70 items in 9 categories were selected for the next stage of the study and presentation to stakeholders. After identification of driving forces, the interaction between these forces and identification of the forces influencing the future of academic libraries in Iran were investigated using interaction identification and analysis approach.

The majority of interaction identification and analysis approaches are carried out in three steps. In the first step, factors affecting the system (descriptors) are identified using various methods such as literature review, experts' opinions and interviews. In the second step, the relation between these factors is determined based on the size of their interactions. Finally, in the third step, key factors are identified and presented for use in future analyses.

One of the common methods for showing the interaction between variables is the use of two-dimensional matrix called interaction matrix. In this matrix, the influencing factors are shown in rows and columns. The number of variables affects the number of columns; this means that if a total of n variables is identified, the final matrix is a n×n matrix which shows the interactions between variables. The sum of scores for each row indicates the influence of each factor on others while the sum of scores for each column shows how much that variable is being influenced by other factors (Asan & Asan, 2007). Filling this matrix is a qualitative process. For each pair of variables in this matrix's columns, it is asked whether the variable of that row affects the variable of that column or not. If such an influence doesn't exist, that element is 0, while 1 shows a weak influence, 2 shows a mediocre influence and 3 shows a large influence.

In the next stage, MicMac software were used for complex matrix calculations using interaction matrix. After filling the interaction matrix, data was imported into MicMac software. In order to facilitate data import, first the matrix was entered in MS Excel environment before being imported to MicMac software. The resulting output facilitates easy analysis of interactions and system structures. The output of this software is divided into two categories: one category is the result of analysis for direct effects of driving forces while the other category is the analysis results for indirect interactions between these driving forces. Although studying the interaction matrix can identify variables with the largest amount of influence, this, on itself, is not enough for identifying all influencing factors because sometimes, the size of indirect effects on the system is larger than that of the direct effects. However, MicMac software is able

to calculate both of these interactions (Godet & Coates, 1994).

Graphs are useful in presenting the results of any system analysis. One of the outputs of MicMac software is the changes in the position of variables (driving forces) using influence – influenced graph (figure 1). In this graph, the horizontal axis shows the amount of influence for the variable while the vertical axis shows the amount of being influenced by other variables. The influence – influenced numbers are obtained from the interaction matrix. To this end, the sum for each column shows the influence of that variable while the sum of the scores for each column shows how much that variable is being influenced by other variables. A variable which directly influences a small number of other variables has a small effect on the system as a whole.

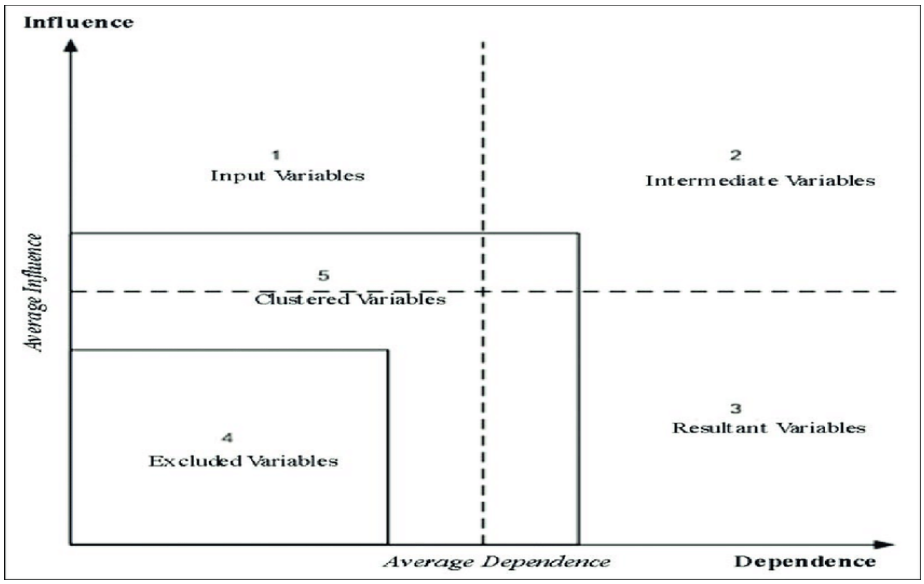

Figure 1: Influence – Influenced graph

Variables are categorized based on their position on this graph. Since this position is related to the system's dynamics, the details for each category is presented in the following section.

First Category: Determinant or influential variables

These variables are located on the north west region of the graph (upper left quarter). These variables have the highest amount of influence and are rarely influenced by other variables. This means that system stability is dependent on these variables. Influential variables are the most critical variables for controlling the system because overall system performance is dependent on them. On the other hand, these variables are considered as inputs for the system. This category of variables usually contains environmental variables or textures which significantly affect system performance. Since these variables are located outside of the system, they can't be controlled by the system itself.

Second category: Bidirectional variables

This category of variables greatly influences other variables while also being greatly influenced by others and any change in these variables can affect other variables. These variables are located at the northern (upper) end of the graph and toward north east of influence – influenced graph. The nature of these variables includes uncertainty and any changes on them results in interaction and changes in other variables. These results and interactions often have

boomerang effects which can lead to intensification or attenuation of the initial effect.

Third category: Risk variables

These variables are located on the north eastern side of the graph in the diagonal region. These variables can potentially turn into key system variables and due to their unstable nature have the potential to act as connection points in the system.

Fourth category: Target variables

Target variables are located in the north eastern region of the graph under the diagonal line and closer to the horizontal axis. This group of variables can be considered as fulcrum points of the system due to being influenced by other variables more that influencing others. Changing these variables can result in change and development of the system in a desired direction. Therefore, these variables indicate possible targets of the system more than showing predetermined results.

Fifth category: Influenced or outcome variables

Due to low influence and high amount of being influenced, this category of variables is very sensitive to changes in other variables including influential and bidirectional variables and can be considered as system outputs. These variables are located on the south eastern region of the graph.

Sixth category: Independent or exceptional variables

This category of variables is not affected by other system variables while also having no influence on other variables. These variables have low interaction with the system and can't result in change or development of other main variables. This category can itself be divided into two groups:

a) Discrete variables: these variables are located on the south western side of the graph and under the diagonal line. Due to the low amount of include, these variables are ineffective regarding change in system dynamics and can be removed from the system.
b) Secondary leverage variables: These are the fully independent variables which, due to their higher influence, can be used as evaluation variables. These variables are located in the south west region of the graph, above the diagonal line.

Seventh category: Regulating variables

These variables are often located at the center of the graph or very close to the center and are known as regulating variables since small changes in them can changes them into secondary leverage variables, weak target variables or influential or determinant variables (Pourmohamadi & Zali, 2010).

Findings

This study was conducted in order to answer the question of what are the key driving forces influencing the Future of Academic Libraries**?**

The results of the current study can be presented in several sections.

Identification of the most important influential force

Based on the literature review and survey of experts' opinions, the driving forces influencing the future of academic libraries were identified in 9 categories and 70 items. Among these forces, "information and communication technology" with the score of 4.34 and importance coefficient of 86.87% was identified as the most influential factor. Furthermore, "environmental stability" with the score of 3.77 and importance coefficient of 75.54% was in the last place (table 2).

Table 2
Different categories of driving forces influencing the future of academic libraries

No.	Factor	Cronbach's Alpha	Mean	SD	Importance coefficient
1	Information and communication technology	0.902	4.344	0.736	86.87
2	Facilities and equipment	0.741	4.297	0.809	85.93
3	Social dimensions	0.871	4.273	0.791	85.46
4	Educational dimensions	0.926	4.184	0.935	83.67
5	Management and human resource development	0.929	4.176	0.847	83.52
6	Research position	0.828	4.169	0.784	83.37
7	Economic factors	0.863	4.042	0.989	80.83
8	Political factors	0.742	3.938	0.965	87.75
9	Environmental stability	0.772	3.77	0.971	75.54

The results of interaction matrix

In order to identify key driving forces influencing the future of academic libraries, MicMac software was used for data analysis. The summary of interaction matrix is shown in table 3. This matrix contains 1046 zero elements which indicate lack of interaction between two variables (70 of these 0 elements are on the main diagonal of the matrix). Furthermore, this matrix includes 2259 weak interactions, 1290 mediocre interactions and 305 strong interactions.

Table 3
Summary of elements in the interaction matrix

Index	Dimension	Repeats	Zeros	Ones	Twos	Threes	Total	Non-zero element%
Value	70×70	2	1046	2259	1290	305	4900	78.65

Categorization of interactions between Key driving forces

The result of categorization of key driving forces based on their influences and interactions are as follows:

- **Influential (determinant) variables**

This category includes two driving forces of "similarity between the expertise of library managers and librarianship and information science" and "systemic thinking and creativity of library managers".

- **Bidirectional variables**

"Development of strategic plans for libraries" is located exactly on this position while "correct management of print materials" and "use of knowledge management in library planning" are close to this position.

- **Risk variables**

The forces of "online citation to published sources by the library", "electronic publication", "Production of electronic content", "the nature of information and access methods", "development of information and communication technologies" and "reducing the intermediary role of librarians" are close to this position.

- **Target variables**

Six forces of "automated library services", "development of traditional electronic service environments", "development of text knowledge and data mining and use of large date", "intelligence storage and optimal access to information", "decentralization and use of mobile services" and "use of multimedia measures" are placed in this category.

- **Influenced or dependent variables**

Fourteen driving forces were identified in this category, including "standard collection for each field based on student to faculty ratio", "stable collection with tendency toward open-source resources", "provision of required information sources for educational groups", "training in information literacy and media literacy", "providing cost-effective resources for students (reducing the costs for students)", "data extraction using internet (digital) search instead of using books", "participation in interlibrary cooperation for academic libraries", "customer-based outlook toward library's users", "facilitating document access services", "development of coded retrieval plan and acting according to that plan", "accommodating users' habits with electronic libraries", "budget allocation based on results, outputs, and achievements instead of number of members and registers", "budget allocation based on number of students and faculty members", and "providing all services related to academic publications by publications and providers of these services (such as indexing and citation management services)". Figure 2 shows the distribution of variables influencing the future of academic libraries in an influence – influenced graph based on direct interactions. The presence of a significantly large number of driving forces at the center of the graph and also in the risk and target variables is a noticeable characteristic of this graph.

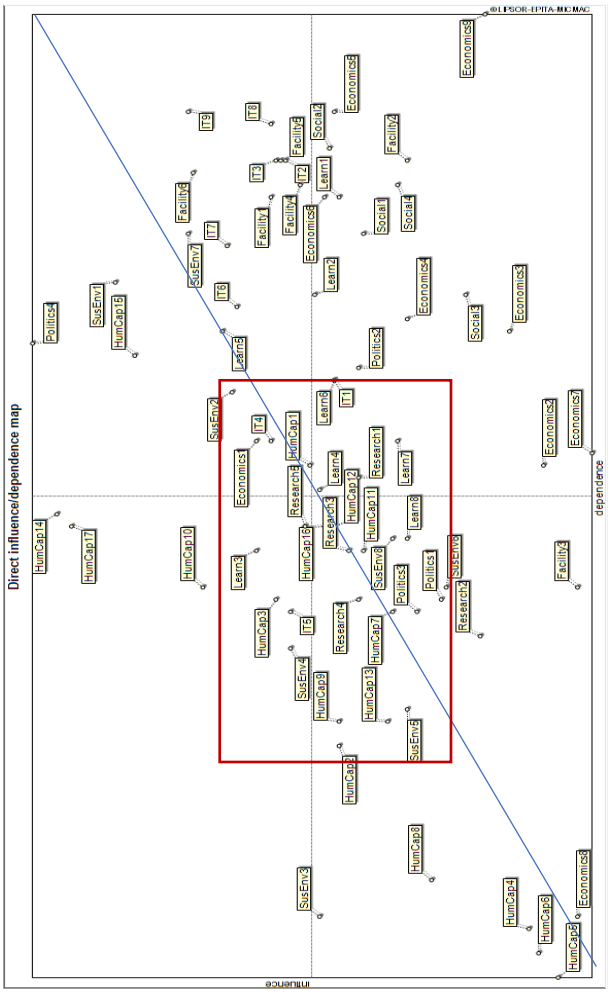

Figure 2: Distribution of driving forces in the influence – included graph based on direct interactions

- **Independent and exceptional variables**

Among the identified driving forces, five were placed among discrete variables including: "role of library in creation and development of higher education", "recycling management of selected books", "importance of the library and publications in scientific development of faculty members", "ranking systems" and "changes in payment methods for accessing information databases".

Another fourteen variables were among secondary leverage variables including: "building architecture for maximizing space usage", "creation of suitable interactions between employees and users", "Motivating the employees", "improving the position of employees to the position of research partners instead of research servants", "implementation of suitable and effective employee evaluation systems", "implementation of land usage for library purposes", "use of strategic and innovative methods for filling vacant or empty positions", "prioritizing organizational factors in improving employee efficiency", and "use of outsourcing instead of hiring in unprofessional positions".

- **Regulating variables**

A total of twenty-seven driving forces were identified in this category, including "embracing change by employees", "being calculated in per-capita educational environment statistics", "updated library employees in regards to relevant professional knowledge",

"construction of environmentally friendly spaces and use of clean energy", "internet usage rate and its quality", "the role of libraries in display of academic ranking of universities", "being calculated in per-capita research space statistics", "implementation of suitable and efficient evaluation systems for employees", "attention toward international students", "holding short-term educational programs and issuing certificates by the library", "use of books instead of class notes", "spread of service ethics among employees", "the role of libraries in displaying the academic ranking of the country", "variety of specialties among employees in order to facilitate various research activities", "cooperation of employees in library management through the use of cooperative management approaches such as suggestion system", "playing the role of one of the pillars of educational system", "providing basic textbooks", "financial independence of the library", "the situation related to information and communication technology infrastructures of the library", "training and education in project management methods and use of proper tools in library organization", "supervision on collections", "the role of libraries in students' success", "commitment to stable scientific and research information ecosystem", "use of cloud computing services", "cooperation with activities related to students' learning" and "interaction between library, faculty members and students".

Figure 3 shows the distribution of factors affecting the future of academic libraries using influence – influenced graph for indirect interactions. Changes in these factors compared to the results for direct interactions are presented in figure 4. These changes were very small and no significant changes in rankings or categorization of factors was observed.

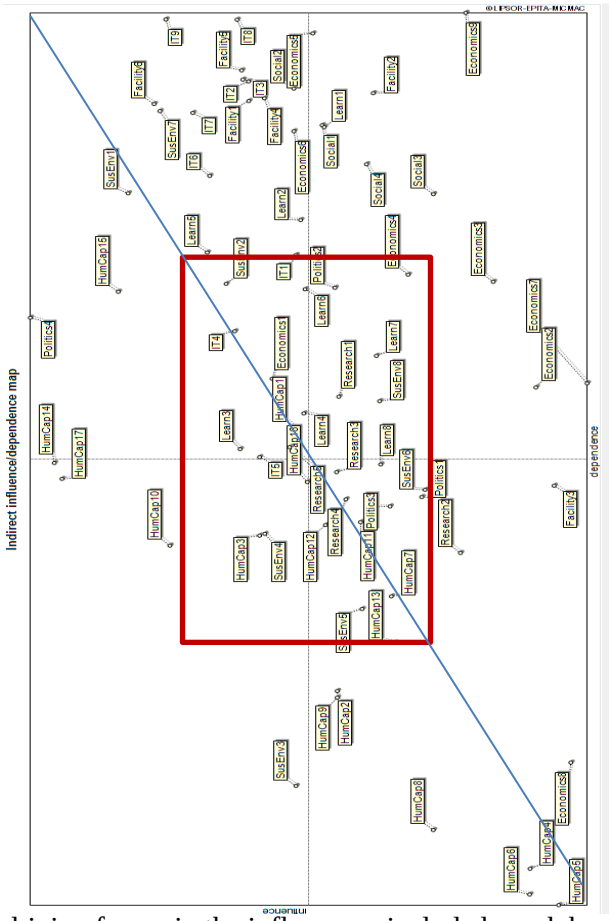

Figure 3: Distribution of driving forces in the influence – included graph based on indirect interactions

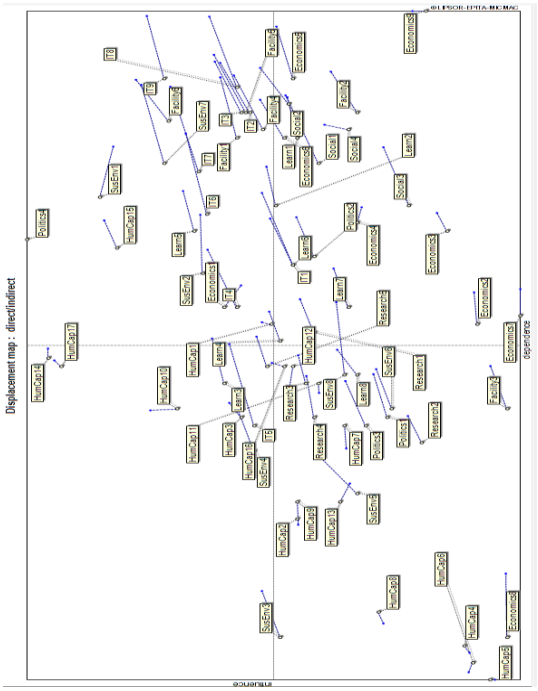

Figure 4: Changes in distribution of driving forces between direct and indirect interactions

Selecting key driving forces influencing the future of academic libraries

Based on the main aim of this study and the large number of driving forces identified (70 variables), high complexity and lack of an applicable result at the end of analysis, the table for ranking the direct and indirect interactions between driving forces divided by influencing or being influenced was used. Table 4 shows that until rank 13 in the table, there is a certain order among the driving forces seen in table's columns. In this stage and for the development of forecasting scenarios, these thirteen driving forces were selected as key driving forces. It is evident that other factors are also used in analysis of scenarios and final conclusion.

Table 4

Ranking of interactions between driving forces

Rank	Direct				Indirect			
	Variable	Influencing	variable	Influenced	Variable	Influencing	variable	Influenced
1	Politics4	251	Economics 9	205	Politics4	245	Economic s9	200
2	HumCap1 4	243	Economics 5	191	HumCap1 4	236	IT9	199
3	HumCap1 7	238	IT9	191	HumCap1 7	233	IT8	199
4	SusEnv1	222	IT8	189	HumCap1 5	214	Economic s5	197
5	HumCap1 5	215	Social2	185	SusEnv1	210	Facility5	191
6	SusEnv7	196	IT2	184	Facility6	201	IT3	189
7	IT9	196	IT3	184	SusEnv7	199	IT2	189
8	Facility6	194	Facility2	184	IT9	197	Social2	188
9	HumCap1 0	191	Facility5	184	HumCap1 0	195	Facility2	187

Rank	Direct				Indirect			
	Variable	Influencing	variable	Influenced	Variable	Influencing	variable	Influenced
10	Learn5	184	Facility6	182	IT7	187	Facility4	186
11	IT7	182	Social4	180	Learn5	182	Facility1	186
12	SusEnv2	180	Facility4	180	IT6	181	Facility6	186
13	IT6	179	Economics 6	179	SusEnv2	175	SusEnv7	184

As can be seen in table 2, the study of 13 key driving forces based on their direct and indirect interactions showed that these forces are repeated in both factors and only in some cases, their ranking has changed. This confirms the validity, accuracy and reliability of the calculations. The studies on influential key driving forces based on influenced ranking shows that among these 13 key driving forces, 12 have been repeated and only one variable shows any changes.

Among the 13 key driving forces, the scores for correct management of print materials, preparation of textbooks, electronic publication, preparation of strategic plans for libraries, embracing change by employees, compatibility between library manager's specialty and librarianship and information science, use of knowledge management in library planning, systemic and creative management, preparation of electronic content, nature of information and access methods, development of information and communication technologies and reduced intermediary role of librarians, role of libraries as a pillar of educational system were all repeated in direct and indirect interactions for influencing or being influenced with only changes in their rankings.

Discussion and conclusion

Given the dynamic scientific environment as a result of technological advances and the necessity of forecasting in the academic library sector, the current study was carried out in order to provide forecasting for academic libraries using interaction identification and analysis approach. The most important part of the current study was the identification of driving forces affecting the future of academic libraries. Understanding and evaluation of these forces by managers can help achieve a more desirable future. The system of driving forces influencing the future of academic libraries in Iran is an unstable system with most variables showing a boomerang effect, both influencing and being influenced by other variables (Kyrillidou, 2009).

In the current study, 70 identified driving forces in 9 main categories were identified. Then, after validation of the identified factors through experts' opinions and interaction analysis, 13 variables were selected as the key driving forces. Among these, "proper management of print materials" was one of the factors influencing the future of academic libraries. Acquisition of books without proper surveys, purchase of books simply in order to improve library's performance indices, wasteful publication of documents, and regulations requiring the delivery of paper copies for theses and journals to libraries all result in mismanagement of print materials. Awareness of managers and staff members of academic libraries regarding principles of management, creation of long-term roadmaps and use of information technologies for management of print materials creates a logical interaction between various factors affecting past, present and future trends and facilitates proper management of print materials. A study by Ghafari, Roshandel, & Ziai (2013) indicated a desire in customers for use of non-paper library resources.

In the environment category, "Acquisition of basic textbooks" is one of the other key driving forces influencing the future of academic libraries. Libraries play an active role in acquisition of educational resources and necessary textbooks in institutes. However, this role must become more effective. This effect can be achieved by offering consultation to faculty members regarding newer and more cost-effective sources. This will help turn the library into a source for meeting educational needs (Feret & Marcinek, 1999). "Electronic publication" is one of the other driving forces affecting the future of academic libraries. Acquisition of electronic resources and necessary tools for providing electronic services to library's customers is one of the most important approaches in future libraries. Allen, & Seaman, (2014) believe that advantages of electronic publication include income generation through sale of electronic products, reduced cost due to shared use, possibility of interuniversity interactions for use of costly electronic resources and improved position of the institute in regards to its electronic resources.

Among the political factors, "development of strategic plans for libraries" was among the key driving forces. It can be said that any strategic planning requires forecasting and information regarding future trends. Since environments can change constantly, it is necessary for strategic plans to also change in order to accommodate and balance these external changes. In this regard, Hayes and (Al Hijji, 2014; Düren, 2010; Hayes & Walter, 1996; Mason, 1999), Düren (2010) and Al Hijji (2014) emphasized the importance of strategic planning for libraries in their studies. Therefore, in order to achieve desirable situations in academic libraries, it is necessary for university's senior management to recognize existing strategic plans and monitor their implementation and progress.

Four key variables were selected among management and human resource development category. "Embracing change by employees" was one of the key driving forces selected from this category. Librarians and other staff members in academic libraries must seek to develop new skills along with providing traditional library services in order to prepare themselves for new roles in the future. Improving one's organizational position and financial bonuses is one of the methods used for creating motivation among staff members regarding organizational changes. Baughman (2012) believed that factors such as in-service training, planning, and monitoring and guiding staff members regarding the use of their new knowledge and novel technologies are useful in creating acceptance for new conditions. Bozkurt, Okur, & Karadeniz (2016) also investigated the attitude of academic libraries regarding their future position based on technological changes and showed a significant effect for internal factors on librarians' positive attitude. An important point is that librarians are knowledgeable regarding the conditions governing their profession and its close relation with novel technologies and often attempt to adapt to these changes.

"Compatibility between library manager's specialty and librarianship and information science" was another key driving force in this category. Nowadays, acquisition of knowledge and proficiency occurs through various methods. Expansion of communication tools and development of electronic education and distant learning means that often, classic courses are not necessary for learning new skills and proficiencies. On the other hand, development of short-term training courses and emphasis on self-learning have decreased the need for long-term university courses. These conditions can threaten the balance between specialty and occupational position. This is especially important for management positions which include various incentives and bonuses (Walther, 2018). Observations of the current situation regarding

managers of academic libraries also confirm these results. Under these conditions, the main aim of management is to use the existing opportunities and situations for the duration of his tenure in this position. However, improving the situation of academic libraries can only be achieved through the use of individuals with knowledge regarding information science and scientometrics at management positions of academic libraries (Moore & Pearce, 2017).

"Use of knowledge management in library planning" was another driving force of this category. Knowledge management includes gathering of knowledge, logical capabilities and experiences of members in an organization in order to make it possible to recycle and use these organizational resources. In other words, knowledge management emphasizes on storage and reuse of professional information (Branin, 2003). What makes the use of knowledge management in academic libraries significantly more important is the fact that the responsibility for providing knowledge management services in institutes falls to libraries. Therefore, before provision of such services, libraries must have successful experiences in this regard and actualize the definition of knowledge management by creating a knowledge database and knowledge sharing between libraries staff members and customers (Shanhong, 2000).

The final supporting driving force identified in this category was "systemic thinking and creativity of library managers". Systemic thinking is an approach which considers the entirety of a problem and emphasizes on the interactions between different parts instead of investigating each part separately. This approach, instead of trying to divide the system into different parts for separate analysis, attempts to understand the interactions between all parts of the system (Senge, 2006). This approach results in a comprehensive outlook of the problem. Investigating the dimensions of systemic thinking in Iranian academic libraries is not unheard of. For example, the results of the study by Nemati (2018) on the effect of systemic thinking of central public library managers of Tehran on job satisfaction of librarians confirm the results of the current study.

Driving forces identified in information and communication technology category included "production of electronic content", "development of information and communication technologies and reduction of librarians' intermediary role", and "online citation to publishing source by the library". Although production of electronic content is not the main goal of academic libraries, it can be a powerful tool for their development. Electronic content is an important part of collections and an archive whose importance has increased in recent years, with a large volume of resources at organizational, regional, national and international levels being used for production, storage, and distribution of these resources. The strategic value of electronic content is due to its fluidity, updated nature, and its ability to answer essential information needs and providing various occupations as intellectually energizing factor (Dulock & Long, 2015). Having a desirable situation in this factor will increase the emphasize on production of electronic resources and sharing them. This approach along with possible income generation (to be used for achieving organizational goals) can create a share for libraries in the production and distribution market for electronic resources and enables libraries to act as the base for teaching methods of production for these resources in their organization.

"Development of information and communication technologies" in libraries has resulted in advent of a new generation of libraries which are defined by Harati (2016) as fifth generation libraries. In this definition, the first generation are the traditional libraries which existed before the introduction of computers. Second generation are automated libraries which used computers in provision of some services such as indexing and title management and were the first users of

library software. Third generation are the electronic libraries which existed along physical libraries and became possible due to development of library software applications and electronic resource services. Fourth generation are digital libraries which added digital resources including texts, pictures, sound, movies, and maps to library software in order to facilitate quick and easy access to these resources. Finally, fifth generation libraries are virtual libraries which lack any defined physical location and use links to digital documents to provide an organized collection of links to documents, software, pictures, databases and other resources in a distribution network. Libraries with good situation in this variable, the entire library services are provided by information and communication systems which also minimizes the role of librarians. In these libraries, librarians take up new roles which are known as knowledge workers in information science literature.

"Online citation to publishing source by the library" is one of the other driving forces influencing the future of academic libraries. Today, one of the factors used to evaluate the importance of a scientific research is the number of citations it received from other credible studies. Therefore, the majority of databases pay a great deal of attention to citation and use various methods for registering and reporting citations. In this regard, libraries are in a suitable situation and can act as an active member or partner of credible scientific databases and use the facilities provided by these databases to distribute their own publications and monitor their citations.

The driving force of "nature of information and access methods" was selected from facilities and equipment category. In this regard, Manjunatha and Shivalingaiah (2003) stated that information overload, information quality, information management and access speed are among the main topics of information technology worldwide. Lack of attention to these factors can be dye to traditional and outdated services of libraries. If library services are limited to lending books and provision of newspapers and journals for their customers, it is probable that no attention will be paid to the nature of information and creation of various methods for accessing the information. Libraries must understand the nature of different types of information and have systems in place for storage and sharing of different information. They also must understand the behaviors and interests of their customers in order to meet their information needs. Attention to this driving force makes libraries more sensitive to their audiences and helps them monitor their information seeking behaviors. This in turn helps with creation of necessary infrastructures for providing data storage and management services for researchers while also providing them with suggestions regarding information sources. Such suggestions can be delivered even if the customer doesn't visit the library.

Finally, "role of libraries as a pillar of educational system" is among important educational factors. Although the role of academic libraries in Iran and their respective educational institutes is defined as a service position, this understanding requires a great deal of change in order to reach current international trends. Nowadays, more than any other time, academic libraries are asked to prove their worth to stakeholders, investors and government organizations. Proving this worth requires the measurement of indices evaluating the influence of libraries on learning and success of students and meeting of organizational goals. Due to lack of consensus regarding these indices, the problem of evaluating academic libraries is often given to their host institute. This results in various problems for librarians because they have to provide completely different services with different goals to different parts of their parent institute (Jones & Salo, 2017). If this driving force is at critical conditions, it means that libraries are at the edge of educational

system. Under these conditions, libraries are created simply for their presence in the organizational structure, various unrelated duties are defined for libraries and it is possible for parts of the library space to be partitioned and delivered to other units. Furthermore, under these conditions, inefficient and ineffective personnel are exiled to libraries. Libraries can have suitable situations and reputation when they play an active role in educational planning and act as an effective consultant for providing faculty members with useful suggestions regarding educational resources. Under these conditions, library staff have the necessary education and scientific standing and libraries provide independent training and education in the institute.

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