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The Identification of the Determinants of the Quality of Academic Functions Based on the Glassick's Six Criteria for Scholarship

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Abstract

Background & Objective: The quality of functions and the academic environment of universities have been considered to be significant challenges in higher education, which have been addressed using several approaches. The present study aimed to assess the determinants of the quality of academic and scientific functions based on the Glassick's six criteria for scholarship.

Materials and Methods: This study was conducted with a mixed qualitative-quantitative approach. The qualitative segment was based on content analysis via semi-structured interviews with 20 higher education professionals in the four fields of medical sciences, humanities, basic sciences, and engineering. Data collection continued until data saturation, and data analysis was performed using the deductive reasoning method. In the quantitative segment, the face and content validity of the questionnaire was initially assessed from the perspective of five medical and higher education specialists. The construct validity of the researcher-made instrument was evaluated by 300 faculty members of Shiraz University and Shiraz University of Medical Sciences with the completion of 265 questionnaires. In addition, the reliability of the instrument was confirmed at the Cronbach's alpha coefficient of 0.96, and exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were performed in SPSS version 22 and LISREL version 8.8.

Results: In the qualitative content analysis, 153 open codes, which were summarized in six main classes, 13 intermediate components, and 29 items. In the EFA, the highest factor loading belonged to the 'knowledge dissemination' items, such as the presence of an established mechanism for information distribution, recording and maintaining of knowledge and expertise, and individual beliefs for knowledge dissemination. The other EFA factors included effective results, preparedness, methodicalness, purposefulness, and self-criticism. The fit index of the CFA was also confirmed by the CFI, GFI, and NFI with the values of less than 0.90.

Conclusion: In addition to established mechanisms, knowledge dissemination is influenced by latent factors such as trust, interaction, and internal commitment. Moreover, knowledge dissemination was most commonly affected by communication as it also an influential factor in the development of other components due to its impact on the flow of knowledge and information in an organization.

Introduction

As a social demand, the quality of scientific activities is considered to be a major challenge in higher education, so that a scientific activity would be defined as performing a high-quality task (1, 2). In recent decades, faculty members' activities have expanded quantitatively and in terms of variety, which has in turn added to the diversity of academic roles and social expectations. Based on the historical analysis of university functions, the initial purpose of academic establishments was to transfer the ancient knowledge and heritage to the next generations (3, 4). In the post-World War II era, the impact of politics on the scientific community resulted in the competitive production of science and research activities and capital, and research activities became the foremost function of universities (5, 6). With the passage of time, environmental changes, and expectations of the society, other roles such as the application of science and use of universities in social services were also perpetuated (7). Notably, one of the pivotal roles of higher education was succeeded by another in each era, and the quantitative aspect of academic publications overshadowed and dominated the activities of faculty members (8, 9). Due to the consequences of this one-dimensional approach, a gradual change occurred toward the integration and connection of various branches of science in universities.

In the 1990s, Ernest Boyer redefined the scholarship inquiry, proposing five new scientific functions, including science discovery, science

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transfer, science application, science integration (10-12), and social engagement (9, 13, 14). Despite the broad definition of university functions, this classification failed to provide a vivid definition of the criteria and qualitative features of scientific functions and only addressed the scope and quantity of scholarship, while lacking a clear definition of the quality indicators and criteria of scientific functions. After the 1990s, other scholars attempted to provide new definitions for scientific functions. Diamond and Adams believed that a scholarly activity undoubtedly demands a high degree of specialized knowledge, creates a significant impact, expands the limits of knowledge, is methodically repeatable and documentable, and should be evaluated in a critical environment by other peers (15). According to Schulman, the most distinctive feature of scientific activity is a reflective critique by peers and public accessibility (16, 17). Cuthill and Brown consider social accountability as the definition of high-quality and committed scientific activities (1).

Glassick et al. were the only individuals to define the qualitative characteristics of scientific activities through research and realized that the validity and quality of this function is the principal factor for the prominence of research among all scientific functions and various faculty members. In 1994, they conducted extensive research in this regard and interviewed 51 institutions granting research funds, posing this question "What features and indexes are required for individuals and organizations to receive a fund?" In addition, the researchers asked 31 editors of reputable scientific journals about their criteria for the rejection or acceptance of a research article, while 58 publishing directors were also interviewed regarding the required characteristics of books and journals for publication by their institutions. These experiments lay the basis for the six cross-cutting criteria of Glassick et al., including clear goals, adequate preparation, appropriate methods, significant results, knowledge dissemination, and reflective critique (18-20). The Glassick's criteria for scholarship are a universal approach to the evaluation of scientific functions in universities. In the past decade, several other researchers have also redefined the quality of scientific functions in their studies, such as education, research, integration, and application.

Wise et al. describe a scientific function as a creative action that enhances our scientific background and provides scholars with valuable and valid data (21). In another study on the activities of clinical assistants, Simpson et al. elaborated on the six criteria of Glassick et al. through 15 examples, including clear goals (problem-oriented, reasoning, and expression of hypothesis), adequate preparation (text study, consultation with relevant scholars, development of high-quality studies, and compliance with high standards), appropriate methods (analysis of reports and methodical design of consultations and studies), significant results (significant quantitative research, the reliability of qualitative research, and capable of results in the sample study group) knowledge dissemination (organizing scientific activities such as a structured and complete abstract and its presentation on the Internet), and reflective critique (revision of scientific work, discussions, and responsiveness) (2). A similar qualitative study based on Glassick's approach was carried out by Wilkes et al. on nurses in Australia, the United Kingdom, and Canada, aiming to evaluate the scientific criteria of academic activity. The nurses assumed that scientific activities should be evidence-based and purposeful and contribute to the scientific field, while also interacting with research and practicality, become published, and be exposed to peers (22).

On a small scale, each of these interpretations defines a distinct part of the scientific concept, while the university is a living organism through which a vast network of diverse scientific outcomes runs on a daily basis. The main difference of universities does not lie in the type of the academic functions; regardless of the share of the functions, there is limited variation between colleges. However, the merging and deployment of these functions are categorized beyond the quantity and shape the quality of scientific functions. The notion of the quality of scientific functions is derived from various branches of knowledge, cognition, beliefs, principles, and repository thoughts in universities as a reflection of the academic environment.

The present study aimed to identify and elaborate on the quality determinants of academic and scientific functions. Several approaches are used for the assessment of the inputs, processes, outputs, and consequences of higher education and universities. The six cross-criteria of Glassick are chiefly concerned with scientific functions, encompassing all the areas of discovery, integration, application, teaching, and social engagement. These criteria are also capable of presenting a schema of an academic environment and provide a mechanism for its assessment. Considering the various aspects of the Glassick model, another objective of the current research was to examine the qualitative components of the scientific functions of universities to address two critical questions:

o *What are the determinants of the quality of scientific functions according to higher education professionals?*

o *Which factors play a pivotal role in the elaboration of these factors?*

Materials and Methods

This study was conducted with a mixed qualitative-quantitative approach sequence. The qualitative segment was carried out using content analysis via semi-structured interviews. The sample population of the qualitative segment included the higher education professionals who were selected via targeted sampling from four fields of higher education, including engineering, humanities, basic sciences, and medical sciences. Five professionals were selected from each field, and interviews continued until reaching data saturation. In total, 20 educational experts were selected from nine universities, including Tehran University, Tehran University of Medical Sciences, Shahid Beheshti, Shahid Beheshti University of Medical Sciences, Shiraz University, Shiraz University of Medical Sciences, Iran University of Science and Technology, Tarbiat Modares University, and the Institute for Research and Planning in Higher Education (IRPHE). The participants included 17 men and three women aged 42-71 years, with the mean age of 54.5 years. In terms of the academic ranks, the sample population included 14 professors, five associate professors, and one assistant professor with the seniority rank of 13-40 years (mean: 24 years).

In the qualitative segment, the participants were asked the following questions: "*What is your understanding of the quality of the university's scientific functions?*" and "*How do you define an academic space?*" For validity and reliability assessment, various diversifications and integration strategies were employed in data collection and analysis. Samples were collected with maximum disciplines, seniority, and academic rank diversity, and the perspective of four peers were applied to code and categorize the data. To ensure the integrity of the data and dimensions, the interviews continued until data saturation and reaching the duplication point. Since the Glassick model has specified the evaluation domains (18), the directional and deductive content analysis method was employed for qualitative data analysis. Following that, the six-criteria category of the codes was considered as the basis of the quantitative questionnaires. Initially, the face and content validity of the questionnaires was confirmed by five experts using the content validity index (CVI), and structural validity was evaluated using the factor analysis method. The sample population of the quantitative segment included the faculty members of Shiraz University and Shiraz University of Medical Sciences with a minimum of two years of academic experience.

The sample size of the study was estimated at 300 using the Krejcie and Morgan's table (23). In total, 265 complete questionnaires were returned, and the content validity of the structure we assessed using exploratory factor analysis (EFA). Since the disciplines have been previously determined, confirmatory factor analysis was the basis of factor analysis. However, since no similar studies have been conducted in this regard, the

Bartlett's test of sphericity and Kaiser-Meyer-Olkin (KMO) index were used to define the adequacy of the samples and compatibility of the EFA items in the Glassick model.

Finally, the confirmatory factor analysis (CFA) was assessed in SPSS version 22.0 and LISREL version 8.8. The reliability of the research tool was determined to be 96% based on the Cronbach's alpha coefficient. The consent of all the participants was obtained, and the questionnaire data were analyzed anonymously.

Results

After the analysis of the qualitative and quantitative content of 20 structured interviews with the higher education experts selected from the universities of the Ministry of Science and Ministry of Health, 153 open-source items were extracted regarding one of the aspects of the scientific functions and repeated at least once by each candidate. The content of the open-source items was extracted from the interviews and analyzed using a deductive method based on the six criteria of Glassick et al., as well as the classification of the main categories (six criteria of Glassick et al.) and 13 intermediary components (Table 1; the asterisk sign [*] signifies that the candidate mentioned the concept at least once).

Table 1: Classification of Qualitative Criteria of Scholarship Based on Quantitative Content Analysis

Components	Disciplines	Medical Sciences					Basic Sciences					Humanities					Engineering					Interviewer=20	
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	N	Percentage
Clear Goals	Importance	*	*	*	*	*	*	*	*	*		*	*	*	*	*	*	*	*	*	*	19	95
	Clearance		*	*	*	*			*	*				*	*					*	*	10	50
Adequate preparation	Study		*	*	*	*	*	*	*	*	*	*	*	*	*	*		*	*		*	17	85
	Specialty								*	*	*				*		*					5	25
Appropriate Methods	Method	*		*	*		*	*	*	*	*			*	*	*	*	*	*	*	*	16	80
	Tools								*	*	*		*	*	*					*	*	8	40
Significant Results	Coverage	*	*	*		*			*	*	*					*		*		*	*	11	55
	Presentation		*	*	*				*		*				*					*	*	8	40
	Effects	*	*	*	*	*		*	*	*	*	*	*	*	*	*		*	*	*	*	18	90
Self-reflective Critique	Analysis	*	*	*	*	*									*	*				*		7	35
	Criticize		*	*		*								*	*	*				*		7	35
Knowledge Sharing	Sharing	*	*	*	*	*	*	*	*	*	*					*		*		*	*	14	70
	Extent	*	*	*	*	*	*		*	*	*					*		*		*	*	13	65

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The research structure was defined as the 'quality of scientific functions' following the extraction of the determinants of scientific functions and supplementary studies for textual analysis. Afterwards, a quantitative questionnaire with 29 items was developed and implemented on the faculty members of Shiraz University and Shiraz University of Medical Sciences. The factor analysis was applied to assess the weight and impact of each factor in the completed questionnaires (n=265). The characteristics of the candidates are presented in Table 2.

Table 2: Demographic characteristics of faculty members in the quantitative part of research

Demographic characteristics		Shiraz University of medical Sciences			Shiraz University (Non-medical sciences)			Total
		Engineering	Humanities	Basic Sciences	Clinical Medicine	Medical Basic Sciences	Paramedical	
Gender	Female	2 (1%)	9 (3%)	9 (3%)	13 (5%)	15 (6%)	26 (10%)	74
	Male	47 (18%)	37 (14%)	38 (14%)	31 (12%)	25 (9%)	13 (5%)	191
	Total	49 (19%)	46 (17%)	47 (17%)	44 (17%)	40 (15%)	39 (15%)	265
		Female=54(21%) Male=69(26%)			Female=20(7%) Male=122(46%)			
Academic Rank	Instructor	0 (0%)	3 (1%)	2 (1%)	0 (0%)	2 (1%)	26 (10%)	33
	Assistant Professor	19 (7%)	32 (12%)	15 (6%)	24 (9%)	14 (5%)	10 (4%)	114
	Associate Professor	17 (6%)	7 (3%)	16 (6%)	12 (5%)	16 (6%)	3 (1%)	71
	Professor	13 (5%)	4 (2%)	14 (5%)	8 (3%)	8 (3%)	0 (0%)	47
	Total	49 (18%)	46 (17%)	47 (18%)	44 (17%)	40 (15%)	39 (15%)	265
Working year	3-10	21(8%)	19 (7%)	14 (5%)	22 (8%)	11 (4%)	16 (6%)	103
	11-20	13 (5%)	17 (6%)	13 (5%)	14 (5%)	20 (8%)	18 (7%)	95
	> 21	15 (6%)	10 (4%)	20 (8%)	8 (3%)	9 (3%)	5 (5%)	67
	Total	49 (19%)	46 (17%)	47 (18%)	44 (17%)	40 (15%)	39 (18%)	265
		123(46.5%)			142(53.5%)			

The qualitative results of the second question ("Which factors play a pivotal role in the elaboration of these factors?") were initially evaluated using factor analysis and examined experimentally and confirmatory. Table 3 shows the collective elaboration of each of the questionnaire items. The validity of the structure was initially reviewed using the EFA (KMO=0.92;

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P<0.001) and CFA methods. The Kaiser criterion was employed to define the factors, while EFA was used for the analysis of the main components, and VARIMAX rotation was applied to clarify the correlations between the rotatory factors. The Kaiser criterion produced six factors, which were in line with the proposed number of the factor analysis test, number of the scholarship criteria extracted in the qualitative section of the research, interviews with the higher education professionals, and six criteria of Glassick et al. Therefore, the six extracted factors could explain approximately 69% of the variance of the quality criteria of scientific functions.

The validity and structure relevancy of the criteria in the qualitative segment were observed based on the variance and alignment of the qualitative and quantitative sections, and the items with a high correlation rate were included in the factor analysis segment. In addition, the factor load (FA) indicated the correlation between each item and factor, and the values higher than 0.03 or 0.04 were considered significant. The high FA of an item often implies its significant impact on the elaboration of the type of a component (24). The EFA results showed the knowledge dissemination to be the most crucial FA in explaining the quality of scientific functions, while the remaining criteria (significant results, adequate preparation, appropriate methods, clear goals, and reflective critique) yielded lower FA values.

Table 3: Results of rotation of factors by Varimax method in order of factor loading

Criteria	N	Items (Factors)	Factor load	Rating
Clear Goals	Q1	Scientific activities based on thinking, not merely repeating others' researches	0.617	The Fifth
	Q2	Scientific goals and concerns based on the needs and main issues of society	0.714	
	Q3	Preference of scientific approach over personal interests and quantitative approaches	0.823	
	Q4	Transparency and problem-orientation, not just doing work and counting activities	0.723	
	Q5	Hypothesizing, questioning and innovative thinking in scientific activities	0.603	
Adequate preparation	Q6	Identify all the variables affecting the problem and conduct adequate studies on it	0.617	The Third
	Q7	Study and evaluate all aspects of the problem after identifying needs	0.769	
	Q8	Adequate preparation to enter the problem and lack of haste in achieving the result	0.794	
	Q9	Search, evaluate and critically select previous studies	0.633	
	Q10	Adequate consideration before applying a method or making a decision	0.571	
	Q11	Attention to a coherent and comprehensive conceptual framework	0.547	
Appropriate Methods	Q12	Correct methodology in scientific activities	0.593	The Fourth
	Q13	Accuracy in recording and reporting scientific activities and experiences	0.732	
	Q14	Transparency in expressing work methods, conditions, tools, etc.	0.797	
	Q15	Considering quantitative and qualitative approaches in conducting scientific activities	0.468	

Significant Results	Q16	Transparent and comprehensive presentation of the results of scientific activities	0.616	The Second
	Q17	Significance of the results obtained and answering an important question	0.661	
	Q18	The impact of scientific activities on expanding the frontiers of knowledge or changes	0.699	
	Q19	Reliability and significance of results	0.708	
Self-reflective Critique	Q20	Analysis and self-expression in scientific activities with a critical approach	0.586	The sixth
	Q21	Clearly state the limitations and drawbacks of work by academics	0.683	
	Q22	Critique and analysis after scientific activities to prevent waste or rework	0.788	
	Q23	Tolerating criticism against different perspectives	0.545	
Presentation (Knowledge Sharing)	Q24	Distribution and sharing the results of scientific activities with other colleagues	0.741	The First
	Q25	Knowledge management and Documenting academic and managerial experiences	0.728	
	Q26	Create a mechanism for maintain educational experiences of faculty members	0.730	
	Q27	Existence of scientific Meetings to present and exchange academic experiences	0.716	
	Q28	Existence of a formal mechanism for the exchange of knowledge and experiences	0.781	
	Q29	Existence of an inner desire to knowledge sharing with close colleagues	0.740	

At the next stage, the fitting index of the model was estimated using the CFA (Figure 1). The expected t-value for a significant confirmation equaled two, which was in line with the significance of all the factors with higher values than two. Table 4 shows the fitting indices according to the studies by Sobhani Fard, Akhavan, Habibi, and Edenvar (24, 25).

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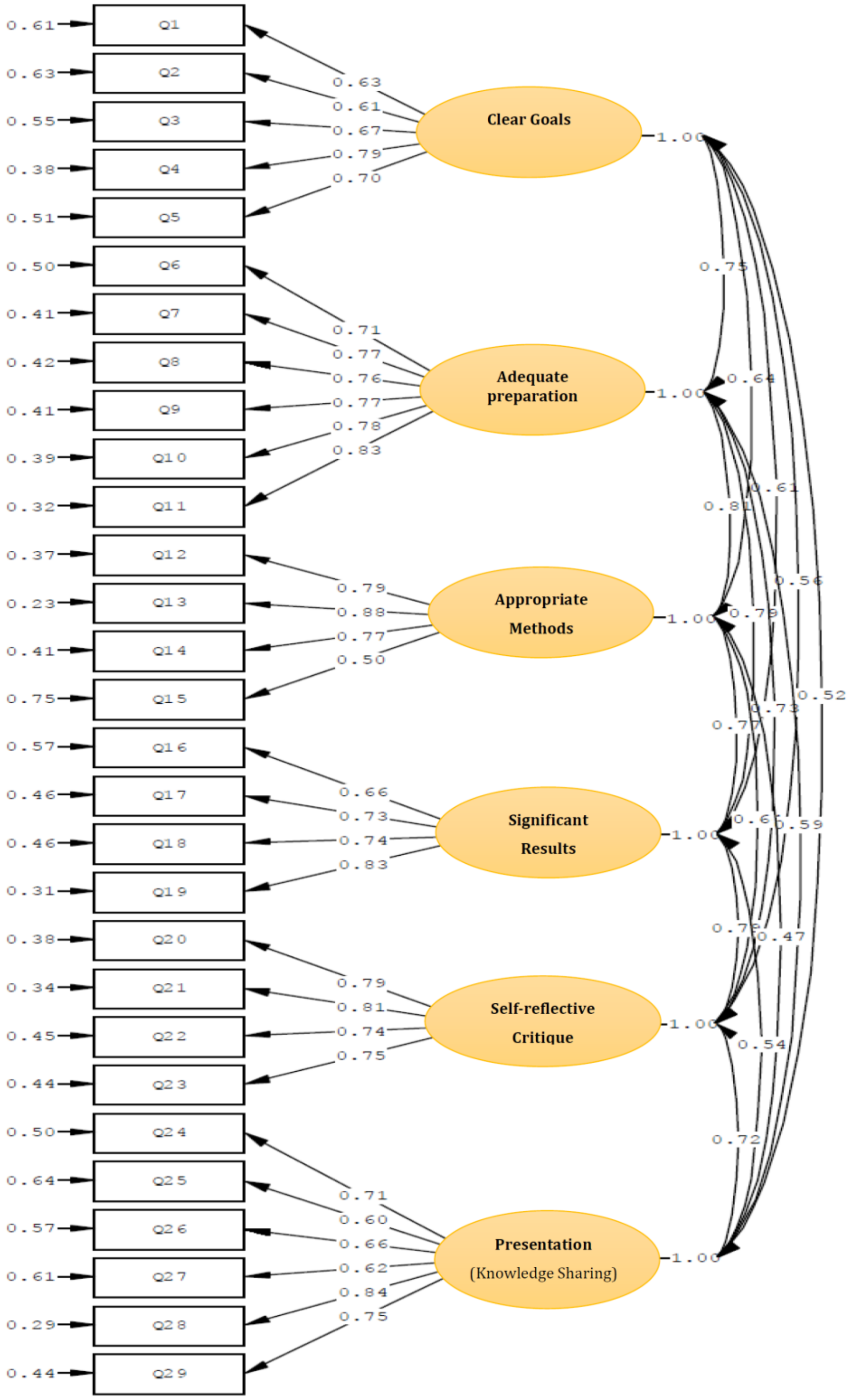

Figure 1: Results of standard factor load estimation for 29 criteria of scientific functions

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Table 4: Fitness indices of the confirmatory factor analysis of the qualitative criteria of scholarship

index	Expected values	Observed index
χ2	-	992
Pvalue	≤ 0.05	0.001>
df	-	362
χ^2 /df	≤ 3	2.7
RMSEA (Root Mean Square Error of Approximation)	≤ 0.1	0.08
NFI (Normed Fit Index)	≥ 0.90	0.94
CFI (Comparative Fit Index)	≥ 0.90	0.96
GFI (Goodness of fit index)	≥ 0.90	0.90

Discussion

According to the EFA results, the essential determinants of scientific function were knowledge dissemination, significant results, adequate preparation, appropriate methods, clear goals, and reflective critique, respectively. The fitting index of qualitative functions was assessed using the CFA. Although limited studies have been focused on the qualitative criteria of these functions quantitatively and based on the criteria of Glassick et al. (18), the results of the present study are consistent with the theoretical basis. Similarly, the outputs of the qualitative segment, content analysis, and scholars are in line with the results of the EFA and CFA in elaborating the criteria for scholarship.

According to the findings of Diamond and Adams, Schulman, and Rice, indicators such as reflective critique and significant results are the main criteria of scientific function (15-17, 26). In the study by Wise et al., the impact of scientific activity on knowledge development and the development of valuable data were emphasized as a qualitative index, which is similar to the factor number 18 of effective outcomes in the present study (21). In line with our findings, the results obtained by Morahan et al., Simpson et al., Wilkes et al., and Lanning et al. indicated that knowledge dissemination, reflective criticism, significant results, appropriate method, adequate preparation, and clear goals are the major indices of scientific functions (2, 19, 21, 22, 27). Furthermore, Wilkes et al. conducted a study on the nurses in the universities of Australia, the United Kingdom, and Canada, reporting knowledge dissemination as the 'gold standard' of scientific function (22).

Several other factors such as knowledge dissemination, proper problem statement, suitable scientific background, innovation, avoidance of excessive modeling, and rapid execution of scientific activities were also noted by the participants in the qualitative segment of the current research (No. 1, 5, 7, 8, 14, and 17). One of the participants (No. 1) from the engineering department explained the inadequate knowledge of the problem before initiating the implementation process as "mentioning the subject without fully addressing it." Another participant (No. 8) from the humanities department mentioned the "lack of a proper conceptual framework", and participant (No. 17) referred to "hasty implementation without adequate scientific background." According to the obtained results, a large portion of the theoretical studies and conceptual frameworks in this regard is inadequate, which has led to the insufficient background for the formulation of a proper link between the extracted knowledge from multiple studies (28-30). Part of this precipitancy is due to the use of a quantitative approach toward these studies and the importance of the production of scientific materials within the first years of recruiting faculty members (31).

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In the present study, self-criticism and the existence of a critical academic environment were the typical results of the qualitative and quantitative segments. According to Lawrence, the improper critical judgment of scientific activities by the peers is a contributing factor to the reduced quality of scientific activities (32). Similarly, the weakness of scientific methods in the presentation of articles was emphasized in the study by Albert (33).

In the current research, coherence was observed between the components of scientific functions in the qualitative segment and the acquired FA in the quantitative segment of the present study with the findings of the previous studies in this regard. In a mixed qualitative-quantitative study conducted by Lanning et al. in dentistry, four criteria were noted as the determinants of the quality of scientific activity, including appropriate methods (comprehensive observation, proper design, accurate data analysis, and reliability), reflective critique by the peers and re-examination, self-criticism and reconceptualization, and public accessibility (19).

Recently, there has been an increasing demand for the deployment of the Glassick model of scholarship for the elaboration of scientific functions and evaluation. In the qualitative studies by Chan et al. and Toma et al. on the opinions of scholars regarding the qualitative criteria of scientific activities in social networks, the indices of authenticity, theory orientation, research and practice, submission and publication, possibility of critique and discussion by the peers, efficiency, possibility of legal prosecution, and intellectual property were reported to be the major determinants of scientific function (34, 35). Although the advancement of communication and IT has provided the required technical and formal infrastructures for knowledge dissemination within a greater scope, the concern of intellectual property needs more attention and should be regarded as an indicator of the quality of scientific functions.

Another study was conducted by Cabrera et al. regarding scholarship through modern technologies, and in addition to the criteria of Glassick et al., several other indices were proposed, including audience awareness, appropriate goals and platforms, authentic content, the possibility of data analysis and reporting, review of the previous studies, and the impact of technology-based activities on various disciplines (36). In a systematic review of 145 articles conducted by Hosseini et al., teaching and learning criteria were defined based on eight principles of background, knowledge, the possibility to criticize and discuss, critical process, commitment, the possibility of publication, dynamics, and learning (37).

It could be stated that knowledge dissemination was the key feature of the current research since it was the most prevailing factor, chiefly linked to the element of communications, which influences the development and improvement of other components. Therefore, knowledge dissemination could be employed to maintain the flow of information in an academic environment, thereby providing a critical platform for the peers, offering feedback, and developing the quality of activities. Meanwhile, knowledge dissemination is significantly associated with the element of trust, existence of publishing mechanisms, and sharing of knowledge.

According to the results of the qualitative segment, the participants assumed that faculty members tend to publish the results of their research activities in foreign scientific journals and are reluctant to publish their findings in the working environment. In this regard, Schimanski believes that faculty members prefer to present the results of their research and activities to a larger number of audiences and tend to have less regard for their publication, which is in line with the results of the present study (8).

In the study by Wilkes et al., nurses believed that the majority of individuals hold a possessive approach toward knowledge, refusing to share or publicize it as they mostly value self-enhancement over the accessibility of knowledge to the community (22). According to the results of the thesis conducted by Salimi, despite the willingness of faculty members to collaborate, they tend to favor indirect knowledge dissemination (i.e., scientific journals) rather than sharing it directly with their colleagues (38). Although this is partly due to the intellectual property factor, the question remains as to whether knowledge dissemination is concerned by software factors (e.g., trust, interaction, and individual motivation) or hardware factors (e.g., structures, regulations, evaluation, reward systems, and external motivation). Various studies have contributed to resolving this issue using different approaches and responses. Some literature reviews include references to the organizational effects of rewards on the presentation of knowledge.

The findings of Alavi et al. demonstrated positive correlations between knowledge sharing and several factors, including trust, human resource interactions, information systems, reward systems, and certain aspects of organizational structure (39). Furthermore, Lee and Hong reported that factors such as organizational status, degree, gender, and cultural factors influence the presentation of knowledge and innovation. Some organizational factors such as the level of IT development, support of the senior managers, and organizational trust, could also be particularly effective in knowledge dissemination (40).

A series of studies performed by Brands et al. indicated that organizations need to be inspired by human interactions in order to present knowledge and innovation (41). In addition, Krogh et al. proved the influence of major barriers in structural hierarchy on knowledge dissemination and innovation. Some of these barriers included excessive occupancy, job insecurity, lack of error assessment mechanisms and feedback, variations in the organizational experience, lack of communication, human interactions, and social networks, and organizational monopoly for the presentation of knowledge (42). Meanwhile, some studies have confirmed the positive impact of organizational rewards in this regard. For instance, Bock et al. reported a negative correlation between anticipated rewards and the attitude toward knowledge sharing (43), while Bock and Kim reported no clear association between knowledge sharing and reward systems, failing to signify a positive correlation between expected rewards and knowledge sharing approaches. In the mentioned study, it was claimed that rewards were had no impact on attitude since rewards lack practicality commitment (44). The study by Saba et al. study also demonstrated that rewards and external factors may not be effective in knowledge sharing in organizations (45). Overall, previous studies have confirmed that this factor could be modified by several active and latent components, and the causes of willingness or reluctance in this regard require further assessment.

Conclusion

According to the results, knowledge dissemination was the most prominent determinant of scientific functions in universities. However, the results of the qualitative and quantitative data analysis revealed that formal mechanisms such as legal contexts, regulations, evaluation, promotion systems, external resources, and rewards are essential to the development of scientific functions. The sustainability of these mechanisms is determined by internal factors such as trust, spontaneous interaction, and the internal commitment of individuals to the presentation of knowledge. In order to convey latent knowledge effectively, a suitable context is required, which is initially formal, and informal communities and spaces must be created for individuals to be able to easily express and share their experiences. The fulfillment of this approach requires the elimination of information-based control methods and their replacement with commitment-based control. Therefore, managers play a key role in the development of interactive environments based on trust, understanding, and empathy for the sharing of knowledge and information. In other words, the deployment of scientific criteria in the evaluation and equalizing of objective functions is remarkably effective in

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the integration of educational development, services, and other scientific innovations. On the other hand, latent elements such organizational context, teamwork, organizational affiliation, and the tendency to sharing information with the peers are believed to be a culture rather than a tool to improve the scientific environment. This goal could be achieved through a wide array of activities, including the establishment of scientific centers in the form of educational groups to publish scientific experiences in various fields, using electronic devices to boost organizational knowledge, assessment of the intellectual property of faculty members, research, and practicality.

Since the questionnaire used in the present study was only examined based on the notions of the faculty members of the two selected universities, it is imperative to be cautious with the generalization of the results and ensure the validity of the applied tools by re-running the tests in various scientific societies.

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Conflicts of Interest: The authors declare that there are no conflicts of interest.

References

1. Cuthill M, Brown A. Sceptics, utilitarians and missionaries: Senior managers' perceptions of engagement in an Australian research university. Aust J Univ Community Engage. *2010; 5(2):126–146*
2. Simpson D, Meurer L, Braza D. Meeting the Scholarly Project Requirement-Application of Scholarship Criteria beyond Research. J Grad Med Educ. *2012;4(1):111–112. doi:10.4300/JGME-D-11-00310.1*
3. Clark K, The Uses of the University, translated by Seyed Mostafa Hadadi, Ali Golmohamadi, Tehran: Institute for Social Cultural Studies, Ministry of Science and Research and Technology, *2010. [Persian]*
4. Ferastkhah M, University and Higher Education; World Perspectives and Iranian Issues, Tehran: Ney, First Edition, *2010. [Persian]*
5. Bettie, D. S. Expanding the view of Scholarship. Acad Med. *2000; 75(9): 871-75*
6. O'Meara K, Encouraging multiple forms of scholarship in faculty reward systems: influence on faculty work life. Plan. High. Educ, *2005; 46(5), 479–510.*
7. Jalili M, Mirzadeh A, Jafarian A. Expanding the concept of scholarship: Educational scholarship and its application in Iran, IJME, 2009; 9 (2): 168-180
8. Schimanski LA, Alperin JP. The evaluation of scholarship in academic promotion and tenure processes: Past, present, and future. F1000Res. *2018; 5(7):1605. doi:10.12688/f1000research.16493.1.*
9. O'Brien B.C, Irby D.M, Durning S.J, Hamstra S.J, Hu W.C.Y, Gruppen L.D, and Varpio L, Boyer and Beyond: An Interview Study of Health Professions Education Scholarship Units in the United States and a Synthetic Framework for Scholarship at the Unit Level, Acad Med, *2019; 94(6) :893-901*
10. Boyer EL. Scholarship Reconsidered: Priorities of the Professoriate. San Francisco, CA: Jossey-Bass; 1990.
11. Grady EC, Roise A, Barr D, Lynch D, Lee KB, Daskivich T, Dhand A, Butler PD. Defining scholarly activity in graduate medical education. J Grad Med Educ. *2012;4(4):558-61.*
12. Hofmeyer A, Newton M, Scott C. Valuing the scholarship of integration and the scholarship of application in the academy for health sciences scholars: recommended methods. Health Res Policy *Syst. 2007; 29;5(5): 1-8.*
13. Boyer EL. The scholarship of engagement. J. High. Educ. Outreach Engagem.. *1996; 1(1):11–20.*
14. Beaulieu M, Breton M, Brousselle A. Conceptualizing 20 years of engaged scholarship: A scoping review. PLoS One. *2018;13(2):e0193201. doi: 10.1371/journal.pone.0193201.*
15. Diamond RM, Adam BE. Changing Priorities at Research Universities. Syracuse University; 1998.
16. Shulman, L. The scholarship of teaching; New Elaborations, New Developments. Change, *1999; 31(5): 10-15*

17. Shulman L. Featured essays: the scholarship of teaching and learning, a personal account and reflection, Int J Scholarsh Teach Learn, *2011; 5 (1): 1-7*
18. Glassick CE, Boyer's expanded definitions of scholarship, the standards for assessing scholarship, and the elusiveness of the scholarship of teaching. Acad Med *2000;75(9):877-80 PMID:10995607*
19. Lanning SK, McGregor M, Crain G, Van Ness CJ, Keselyak NT, Killip JW, The status of the scholarship of teaching and learning in dental education. J Dent Educ. *2014;78(10):1353-63.*
20. Bourgeois JA, Hategan A, Azzam A. Competency-based medical education and scholarship: Creating an active academic culture during residency. Perspect Med Educ. *2015;4(5):254–258. doi:10.1007/s40037-015-0218-4*
21. Wise G, Retzleff D, Reilly K: Adapting scholarship reconsidered and scholarship assessed to evaluate university of Wisconsin-extension outreach faculty for tenure and promotion. J. High. Educ. Outreach Engagem *2010; 7(3):5–18*
22. Wilkes L, Mannix J, Jackson D. Practicing nurse's perspectives of clinical scholarship: a qualitative study. BMC Nurs. *2013;12(1):21. doi:10.1186/1472-6955-12-21*
23. Krejcie RV, Morgan DW. Determining sample size for research activities. Educ Psychol Meas. *1970; 30: 607–610.*
24. Sobhanifard Y, Akhavan-Kharrazian M, Factor Analysis, Structral Equation Modeling, Tehran: Imam Sadiq University Publisher, 2012[Persian].
25. Habibi A, Adnvar M, Structral Equation Modeling and Factor Analysis, Application Training of LISREL Software, Tehran: Jahad Daneshgahi Publisher, *2017[Persian].*
26. Rice R E. Beyond scholarship reconsidered: Toward an enlarged vision of the scholarly work of faculty member. In K J Zahorski (ED), Scholarship in the postmodern era: New Venues, New Visions (pp 7-17), New directions for teaching and learning. San Francisco: Jossey-bass, *2002; 90: 7-17.*
27. Morahan PS, Fleetwood J.The double helix of activity and scholarship: building a medical education career with limited resources. Med Educ. *2008; 42(1):34-44. doi: 10.1111/j.1365-2923.2007.02976. x.*
28. Norman G. Editorial—how bad is medical education research anyway? Adv Health Sci Educ Theory Pract. *2007; 12 (1):1– 5.*
29. Bordage G. Conceptual frameworks to illuminate and magnify. Med Educ. *2009; 43 (4): 312– 319.*
30. Maggio LA, Sewell JL, Artino AR Jr. The Literature Review: A Foundation for High-Quality Medical Education Research. J Grad Med Educ. *2016 Jul;8(3):297-303. doi: 10.4300/JGME-D-16-00175.1.*
31. Harley D, Acord S, Earl-Novell S, Lawrence S, King C. Assessing the future landscape of scholarly communication: an exploration of faculty values and needs in seven disciplines, California Digital Library, Center for Studies in Higher Education, UC Berkeley University of California, *2010*
32. Lawrence D, Ebrall P. The scholarship of critical review: improving quality and relevance. J Can Chiropr Assoc. *2008; 52(4):211–223.*
33. Albert M, Hodges B, Regehr G. Research in medical education: balancing service and science. Adv Health Sci Educ Theory Pract. *2007; 12 1: 103– 115.*
34. Chan TM, Thoma B, Krishnan K, et al. Derivation of Two critical appraisal scores for trainees to evaluate online educational resources: a METRIQ study. West J Emerg Med. *2016; 17:574-84.*
35. Thoma B, Paddock M, Purdy E, Sherbino J,Milne K, Siemens M, et al. Leveraging a virtual community of practice to participate in a surveybased study: a description of the METRIQ Study methodology. AEM Educ Train *2017; 1:110-3.*
36. Cabrera D, Vartabedian BS, Spinner RJ, Jordan BL, Aase LA, Timimi FK. More than likes and tweets: Creating social media port-folios for academic promotion and tenure. J Grad Med Educ 2017;9: 421-5.
37. Mirhosseini F, Mehrdad N, Bigdeli S, Peyravi H, Khoddam H. Exploring the concept of scholarship of teaching and learning (SoTL): Concept analysis. Med J Islam Repub Iran. *2018; 32:96. DOI: 10.14196/mjiri.32.96*
38. Salimi, Gh. Designing and Explaining the Model of Knowledge Sharing among Faculty Members in Tehran State Universities, [Doctoral Thesis] supervised by Dr. Zahra Sabaghian, Shahid Beheshti University, Faculty of Educational Sciences and Psychology, *2012[Persian]*
39. Al-Alawi. A. I, Al-Marzooqi. N. Y, Mohammed. Y. F. Organizational culture and knowledge sharing: critical success factors., J. Knowl. Manag, *2007; 11(2): 22–42*
40. Lee HS, Hong SA. Factors affecting hospital employees' knowledge sharing intention and behavior, and innovation behavior. Osong Public Health Res Perspect. *2014; 5(3):148-55. doi: 10.1016/j.phrp.2014.04.006.*
41. Brandes P., Dharwadkar R., Wheatley K. Social exchange within organization and work outcomes:

the important of local and global relationships. Group Organ Manag. *2004;29(3):276–301.*

42. Von Krogh G, Ichijo K, Nonaka I. Enabling knowledge creation: how to unlock the mystery of tacit knowledge and release the power of innovation. New York: Oxford University Press; *2000*

43. Bock, G. W., & Kim, Y. Breaking the myths of rewards: an exploratory study of attitudes about knowledge sharing. Information Resources Management Journal, Inf. Resour. Manag. J. *2002; 15(2): 14-21*

44. Bock, G., Zmud, R., Kim, Y., & Lee, J. (2005). Behavioral Intention Formation in Knowledge Sharing: Examining the Roles of Extrinsic Motivators, Social-Psychological Forces, and Organizational Climate. MIS Quarterly, *2005; 29(1), 87-111. doi:10.2307/25148669*

45. Seba, I., Rowley, J & Lambert, S. Factors affecting attitudes and intentions towards knowledge sharing in the Dubai Police Force, Int. J. Inf. Manag, *2012; 32. 372–380.*

Karimian Z. The Identification of the The Identification of the Determinants of the Quality of Academic Functions Based on the Glassick's Six Criteria for Scholarship. J Med Educ Dev. 2020; 13 (37) :1-14