Students' sense of self-efficacy in searching information from the Web: A PLS approach

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Abstract

The role of self-efficacy in different task and organizational settings has largely been highlighted, especially in searching for information by web users. The current research was conducted to reemphasize the mentioned role and also to show possible relationship existing between the sense of self-efficacy and success in information searching. A survey was conducted in a sample of post-graduate students at Shahed University, Tehran, Iran. Factor analysis using Structural Equation Modeling by PLS software showed high factor loadings related to all of the items indicating goodness of fit for all of them. The scale was validated according to the structural and overall goodness of fit indicating a high quality of measuring the variable in the context studied. The results of the study reflect the importance of studying the students' searching behavior as it is now possible to help them improve their information searching and evaluating skills, which

are largely related to their sense of efficacy. The more self-efficacy they have, the more success in information searching could be expected. Designers of information systems, managers of instructional programs related to information searching, psychologists and the like could find the research results of interest in their professional operations.

Keywords

Information searching; Information literacy; Self-efficacy; Web information seeking

Introduction

Psychological traits such as confidence, anxiety, motivation, and proficiency could play important roles in how any given work is undertaken in different organizational settings. One of the proposed theories in the field of social psychology, which has been tested a lot in the past decades, is Social-Cognitive Theory. This theory, which has a considerable position in psychology, was proposed for the first time by Albert Bandura in 1977. The theory was starting to emerge as a theoretical reaction to predominant theories which seemed to be inadequate in meeting key problems in human behavior. After Skinner, Freud, and Piaget, Albert Bandura is identified as the fourth most influential theorist in psychology and the most cited psychology theorist alive in the world due to his theory (Haggbloom, 2002), for which he has won many awards until now. Such self-systems as self-efficacy are taken into consideration in this theory.

Self-efficacy has been investigated in various fields as well as by Bandura himself (1977, 1986, 1993, 1997, 2001). In short, self-efficacy means what a person can do in a set of behaviors depends on his/her beliefs about him/herself in relation to successful completion of the action at hand (Bandura, 1977, 1997, 2001). These beliefs of self-efficacy depend to a person's knowledge of "what-to-do" and "how-to-do" mechanisms, which are actually his merits (Savolainen, 2002).

On the other hand, information skills are of high importance in today's organizational and professional performances and workflows and also dependent on a sense of efficacy. As a consequence of newly emerged information systems, self-efficacy is characterized as computer self-efficacy, ICT self-efficacy, internet self-efficacy and also searching self-efficacy, all of which can be related to information literacy self-efficacy (Kurbanoglu, 2003). Information literacy self-efficacy thus has a critical role, particularly in new media and information environments.

Problem Statement

Both self-efficacy and information searching are interrelated if we closely study success in information seeking behavior in general, and in the Web environment in particular. As such, the

degree by which a given user could search successfully and in different spans of time is highly related to the skills and emotions triggered respectively by information literacy and self-efficacy. As a result, people should have a positive perception of self-efficacy in using their information skills to utilize their information problem-solving skills successfully and be self-directed, self-motivated and lifelong learners (Kurbanoglu, Akkoyunlu & Umay, 2006). Since many of the works in the current organizational and personal settings are undertaken by searching via the information environment of the Web, there is a pressing need to know how users feel about their information searching self-efficacy.

Research findings have found a significant relationship between self-efficacy and the behavior of information searching in the sense that the more a person has self-belief, the higher the level of their ability for information searching will be (Ata & Baran, 2011; Adalier & Serin, 2012; Çakmak, 2010). However, the concept of information searching self-efficacy as an integrated concept is people's belief about accessing, using, sharing and evaluating of information (Kurbanoglu, Akkoyunlu & Umay, 2006). Therefore, it is important to know how such a belief works in different contexts by different users and in different periods of time.

Students of higher education are extremely dependent on the information they find on the Web to complete their assignments and projects. Because of the importance of information searching self-efficacy in the community of post-graduate students, who are going to write their thesis and dissertations, the current research was taken into consideration. Understanding how students of the highest level of education feel about their self-efficacy in their information literacy skills would largely shed new lights on the knowledge in fields like designing information retrieval systems, instructional programs for student users, information processing mechanisms, and how a successful search could emerge. Studies have shown that metacognitive strategies, management efforts, interpretation, critical thinking and control beliefs predict different aspects of information literacy self-efficacy (Kurbanoglu, 2003; Çakmak, 2010).

The sense of self-efficacy needs also to be investigated more to bridge the current gap between its theoretical and practical instances in real and everyday life information seeking. The present study, therefore, is an attempt to fill the gap, especially in an academic setting in Iran as a developing country and by the use of an existing tool to be verified in the Persian language. The results of the study can provide information specialists, psychologists, information system designers and also users with valuable insights.

Literature Review

Most studies in the field of self-efficacy in information literacy have been conducted by Turkish researchers in recent years. The leader of these researchers is Serap Kurbanoglu, who has also presented a validated scale of information literacy self-efficacy (Kurbanoglu, Akkoyunlu &

Umay, 2006). Other researchers of this country (e.g., Ata & Baran, 2011; Adalier & Serin, 2012; Usluel, 2007, Tunser & Balci, 2013; Çakmak, 2010; Korkut & Akkoyunlu, 2008) have also tried to study the concept in more details.

 The concept has also explored in different scientific contexts and disciplines. Most of the research efforts have been made in communities like students, teachers, and learners who greatly rely upon information online. For example, Bronstein (2014) studied the concept in the community of Library and Information Science students. Results of the research showed a high level of self-efficacy among students. Also, three of the four mentioned sources of self-efficacy had a great influence on forming self-efficacy beliefs. Similarly, Bronstein and Tivian (2013) have studied the concept in a group of specialists of information and library science. Findings of the research implied that participants had a high level of self-efficacy in the case of retrieving information. Also, all four information sources of self-efficacy had an impact on the development of self-efficacy beliefs. Some differences in self-efficacy perceptions were identified in relation to socio-demographic variables.

The role of information literacy self-efficacy in students' learning and educational achievements has also been taken into consideration by De Meulemeester (2013). The results of the research showed that the test of improving students' information literacy did not change after the second year while their information literacy self-efficacy increased by raising their educational level. The relationship between information literacy self-efficacy, academic motivation, and employment has been explored (Ross, Perkins & Bodey, 2013) among students with and without paid employment. The findings indicate the importance of motivation in information literacy self-efficacy. A significant relationship was also found between the amount of time spent studying and information literacy self-efficacy. The relationship between psychometric characteristics of students' information literacy self-efficacy has also been explored (Brown, 2005). Students reported their self-efficacy in 11 different phases to show their information literacy using a positively packed rating scale. The 11 phases, factors measured by a matching pair of self-efficacy questions, were confirmed. The test also provided unique information about students' self-efficacy for information literacy in classrooms.

Online learning and manipulation are other areas for which some study have been conducted. In the study of Tang and Tseng (2013), there was a significant correlation between self-efficacy for information seeking and self-efficacy for online learning, as well as between self-efficacy for information seeking and self-efficacy for information manipulation. Students with high information seeking self-efficacy were more likely to use library databases, while low self-efficacy respondents more often chose commercial search engines.

In addition to students, some other related communities have also been studied in order to understand their efficacy about information skills. For example, teachers extremely involved in

education and learning are highly dependent on information literacy skills. The importance of teachers' information literacy self-efficacy, thereby discovering clues to possible gaps in teachers' knowledge and skills, was investigated by Zinn (2013). Twenty-nine teachers completed a pre-and post-course information literacy questionnaire. The results of the study indicate that the intervention of the course had a positive effect on teachers' information literacy. The sense of self- efficacy of foreign language instructors in information literacy and computer literacy after an in-service training on ICT skills at the Gazi University is the main focus of another study (Eksi, 2012). The results showed the instructors had high self-efficacy scores in both areas. There was no statistically significant difference in information literacy and computer literacy self-efficacy scores of instructors according to sex and experience. The findings also show that information literacy and computer literacy skills reinforce each other.

To investigate and evaluate elementary student teachers' perceived information literacy self-efficacy in terms of the use of information and communication technologies, Demiralay and Karadeniz (2010) considered 1801 student teachers using the ICT survey and perceived information literacy self-efficacy scale. The findings of the research revealed that most of the elementary student teachers used ICT frequently, at least at the intermediate level, and accessed ICT from multiple locations. Furthermore, elementary student teachers' computer experience, skills and frequency of computer and internet use, opportunities for access to computer and the internet had a significant effect on their perceived information literacy self-efficacy. The relations between information literacy self-efficacy and computer self-efficacy as well as the achievement of information literacy have also been examined by some researchers like Tuncer and Balci (2013). Their findings show that computer self-efficacy has a positive effect on information literacy self-efficacy. Nonetheless, it was observed that the information literacy self-efficacy had no significant effect on the achievement of information literacy, and also the computer self-efficacy had no significant effect on the achievement of information literacy.

The possible relationship between the teacher candidates' social demographic characteristics and their information literacy self-efficacy was the aim of a research conducted by Adalier and Serin (2012). In this study, using Information Literacy Self-Efficacy Scale developed by Kurbanoğlu, Akkoyunlu, and Umay (2006), a Cronbach alpha reliability coefficient of .91 was used in data analysis. Considering the purposes of the study, percentage, documentation average, t-test, ANOVA, Scheffe test and Levene's test were figured out in data analysis. The statistical significance level was accepted as .05 in the study. Similarly, to investigate the possible relationship between information literacy self-efficacy perceptions of prospective teachers and their studying approaches, Geçer (2012) selected 703 students. The results showed that prospective teachers' information literacy self-efficacy was very high. Prospective teachers who used computers at advanced levels had the highest mean score in terms of their preference for the deep studying approach. The prospective teachers who found themselves successful preferred the deep studying approach more, compared to the other prospective teachers' preferences.

Furthermore, there was a slight positive correlation between the deep studying approach and prospective teachers' perceptions of information literacy self-efficacy. The reciprocal relations among computer self-efficacy, scientific research, and information literacy self-efficacy were explored by Tuncer (2013). Research findings showed that computer self-efficacy had a positive effect on information literacy self-efficacy. Additionally, information literacy self-efficacy positively affected scientific research self-efficacy. It was also designated that computer self-efficacy had a positive impact on scientific research self-efficacy.

There are also studies conducted to develop new information searching self-efficacy scales. For example, Tepe and Tepe (2015) developed a scale to test information literacy knowledge. This study resulted in the development of three instruments: a 25-item information literacy self-efficacy survey, a 50-item information literacy knowledge test, and a 25-item information literacy knowledge test. The information literacy self-efficacy survey and the 25-item version of the information literacy knowledge test have shown preliminary evidence of adequate reliability and validity.

Materials and Methods

The current research has been conducted in an applied manner using the survey-descriptive method. The statistical population of the study was master's and Ph.D. students in five faculties including humanities, pure science, engineering, agriculture and arts at Shahed University, Tehran, Iran. Regarding different scientific areas in which they were studying, a random stratified sampling method was used. Based on Cochran sampling formula with 0.063 errors, a total of 206 people was determined as the sample size but 210 questionnaires were distributed among the population.

Table 1. Statistical population and sample

Students	Population No.	Sample No.
Master	1287	190
Ph.D.	111	16
Total	1398	206

Data was collected by a questionnaire, which is the Persian translation of Information Literacy Self-Efficacy Scale, a validated 28-item scale developed by Kurbanoglu, Akkoyunlu and Umay (2006) in English language. Validity and reliability for the scale have been confirmed in different studies (for example Kurkut & Akkoyunlu, 2008; Cakmak, 2010; Tuncer & Balci, 2013). The data was collected based on 7-point Likert scale (1= Never, 2= usually not true, 3= seldom, 4= occasionally, 5= often, 6= usually true, 7= always). The questionnaire was arranged in three parts. The first part was about personal and demographical information; the second part was about scientific products; and the third part was about students' information literacy self-efficacy with 28 answers. For validity, the questionnaire was distributed to a group of Library and

Information Science faculty members and experts. The questionnaire was amended based on their views and distributed to the participants. Also, for reliability, the questionnaire was distributed to 30 master and Ph.D. students in the different task settings mentioned earlier and the final Cronbach Alpha coefficient was 0.93, which is a significant value.

Results

Factor analysis

The self-efficacy questionnaire has 6 factors including identifying, locating, assessing, interpreting, communicating and evaluating; thus, we used factor analysis with six specified factors.

Table 2. KMO test and Bartlett's test

KMO test		0.906
Bartlett's test	Chi 2	2869.667
	DF	325
	Sig.	0.000

If KMO value is more 0.70, then the data is a good fit for factor analysis. As the table above shows, the KMO value is 0.906, which means self-efficacy variables data is appropriate for doing factor analysis.

Five factors of information literacy self-efficacy had the potential for a statistical explanation of variances. The first, second, third, fourth, and fifth factors respectively had variances of 18.134, 12.299, 12.126, 10.735, and 7.596. In sum, the variance was 60.890.

Descriptive statistics

Ninety-one point four percent of the respondents were master's students and the remaining 8.6 percent were Ph.D. students.

Table 3. Participants' frequency in different faculties

Faculty	Frequency	Frequency percentage
Humanities	83	39.5
Fundamental sciences	29	13.8
Technical and engineering	50	23.8
Agriculture sciences	40	19
Art	8	3.8
Total	210	100

Fitting of the model

Analysis of the model was conducted by Structural Equation Modeling by PLS (Partial Least Squares) approach, which is used as an algorithm with widespread use in different research efforts. In this algorithm, there are two major stages: 1) Fitting of the model, and 2) research hypotheses testing. Fitting of the model is done in three stages including measuring the fitting of the model, fitting of the structural model, and fitting of the general model.

Evaluation of Model Fitting

Based on the algorithm of PLS analysis, for evaluating the goodness of fit for the model, three criteria including reliability, convergent validity, and divergent validity should be tested. Reliability is evaluated with three methods including Factor Loadings, Cronbach Alpha, and Composite reliability (Rho).
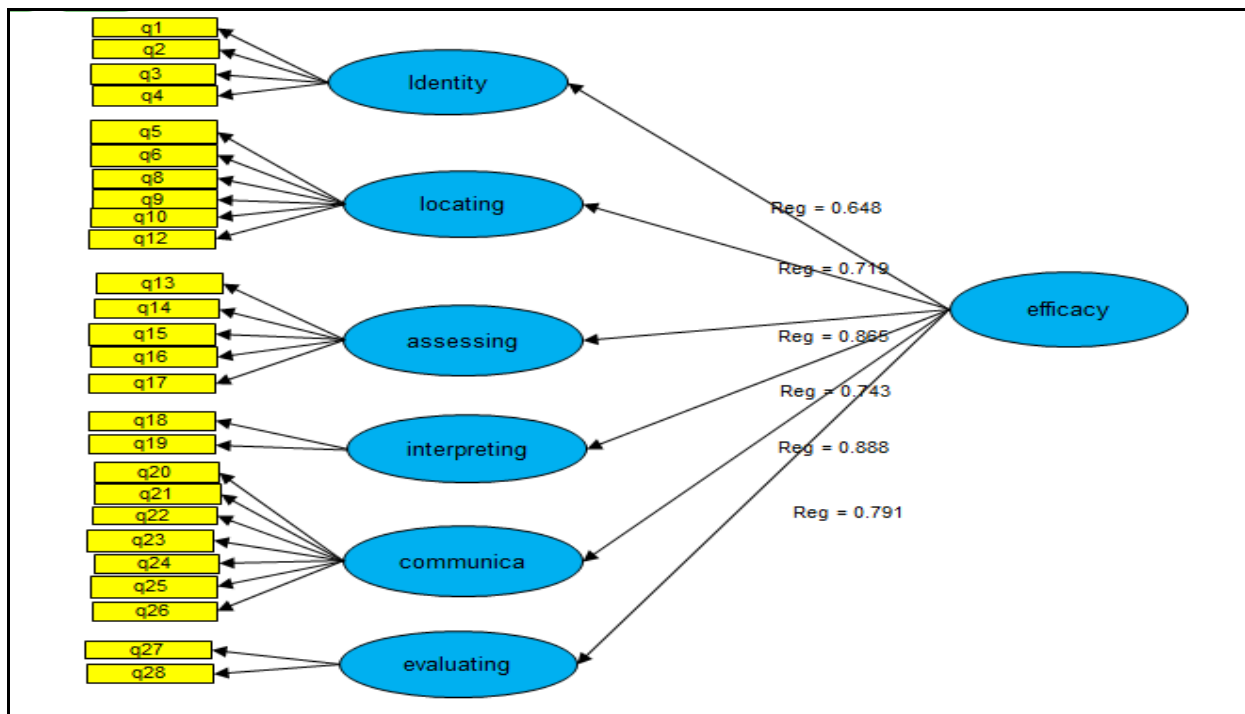

Figure 1. Measuring the research model

Factor Loadings

A factor loading is a numerical value by which the relationships between a hidden variable (construct) and evident variable (indicator) are measured in the process of path analysis. When factor loading values of an indicator is more in comparison to those of a construct, that indicator has more fitting. Factor loadings should normally be more than 0.4 (Nunnally, 1978).

Table 4. Factor loadings for research variables

Variable	Indicator	Loadings	Variable	indicator	Loadings
Identifying	q1	0.866	Assessing	q16	0.792
	q2	0.852		q17	0.759
	q3	0.744	Interpreting	q18	0.899
	q4	0.651		q19	0.867
Locating	q5	0.562	Communicating	q20	0.647
	q6	0.695		q21	0.764
	q8	0.771		q22	0.795
	q9	0.775		q23	0.795
	q10	0.716		q24	0.795
	q12	0.710		q25	0.790
Assessing	q13	0.732		q26	0.743
	q14	0.816	Evaluating	q27	0.904
	q15	0.823		q28	0.863

Data analysis showed a high factor loading for of all the answers, which was more than 0.4. Thus, the present research model is appropriate.

Cronbach Alpha and Composite reliability (Rho)

The reliability of a construct is calculated by taking into account the correlation(s) among its underlying factors/constructs. If composite reliability value for an indicator is 0.7 (Nunnally, 1978), then that model has appropriate internal reliability.

Table 5. Cronbach Alpha, Composite reliability (Rho)

Construct and variable	Cronbach Alpha	Composite reliability
Identifying	0.77	0.79
Locating	0.78	0.75
Assessing	0.84	0.84
Interpreting	0.71	0.84
Communicating	0.88	0.85
Evaluating	0.72	0.84
Self-efficacy	0.93	0.88

As shown in the table above, the Cronbach Alpha and Composite reliability (Rho) are appropriate for all of the constructs as well as for the self-efficacy variable. Among these values, the one corresponding to 'communicating' is higher than the rest except for the one belonging to 'self-efficacy'.

Convergent validity

An appropriate value for Average Variance Extracted (AVE) was determined to be 0.5.

Table 6. Average Variance Extracted

Construct	AVE> 0.5
Identifying	0.61
Locating	0.5
Assessing	0.62
Interpreting	0.78
Communicating	0.58
Evaluating	0.78

AVE value for Locating construct is less than 0.5, thus questions 7 and 11 which had smaller factor loadings were discarded and then AVE was measured again. As the table above shows, Average Variance Extracted for all the constructs is more than 0.5. Thus, the present research model has an appropriate Convergent validity.

Divergent validity

Cross- loadings: in this method, correlations between a construct and its factors as well as correlations between its factors and other constructs are examined.

Table 7. Cross-loadings

Questions	Identifying	Locating	Assessing	Interpreting	Communicating	Evaluating
q1	**0.866**	0.387	0.412	0.471	0.371	0.338
q2	**0.852**	0.341	0.391	0.440	0.402	0.372
q3	**0.744**	0.202	0.301	0.373	0.274	0.256
q4	**0.651**	0.275	0.355	0.281	0.308	0.255
q5	0.569	**0.562**	0.516	0.511	0.539	0.469
q6	0.181	**0.695**	0.295	0.206	0.330	0.258
q8	0.217	**0.771**	0.392	0.238	0.282	0.295
q9	0.169	**0.775**	0.315	0.139	0.240	0.217
q10	0.152	**0.716**	0.333	0.196	0.345	0.288
q12	0.197	**0.710**	0.394	0.284	.0353	0.338
q13	0.367	0.547	**0.732**	0.494	0.554	0.542
q14	0.349	0.404	**0.816**	0.453	.494	0.435
q15	0.430	0.396	**0.823**	0.467	0.595	0.572
q16	0.313	0.493	**0.792**	0.372	0.573	0.473
q17	0.376	0.343	**0.759**	0.541	0.508	0.458
q18	0.419	0.439	0.597	**0.899**	0.542	0.541
q19	0.481	0.274	0.442	**0.867**	0.499	0.527
q20	0.293	0.355	0.548	0.434	**0.647**	0.390
q21	0.409	0.392	0.598	0.549	**0.764**	0.585
q22	0.351	0.375	0.552	0.406	**0.795**	0.496
q23	0.330	0.370	0.492	0.441	**0.794**	0.552
q24	0.353	0.360	0.547	0.424	**0.793**	0.536
q25	0.289	0.465	0.499	0.449	**0.790**	0.564
q26	0.304	0.478	0.509	0.439	**0.743**	0.636
q27	0.333	0.473	0.598	0.563	0.709	**0.904**
q28	0.370	0.345	0.520	0.503	0.530	**0.863**

As can be seen from the table above, the correlations (shown in boldface numbers) between indicators and their corresponding constructs are higher that their correlation with other constructs. This means that the proposed model is both reliable and valid.

Fitting of construct model

For the model to be fit, the Z significant coefficient (t-values) must be higher than 1.96 so that they can be considered significant at confidence level of 95%.
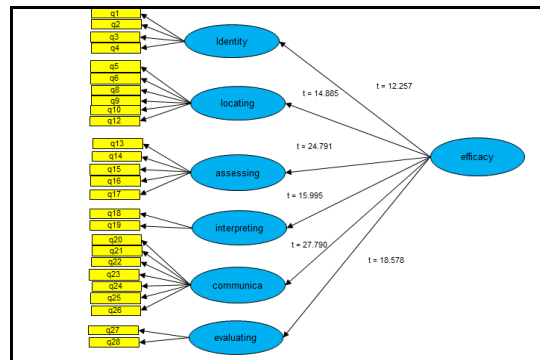

Figure 2. Fitting of model with Z Significance coefficient

As can be seen in Fig.2, all the Z significance coefficients are higher than 1.96, which means that all the items and the relations among the variables are significant at a confidence level of 95%.

R Square criterion

Hidden variables coefficients are endogenous. R Square criterion indicates the influence of an exogenous variable on an endogenous variable and has three values including 0.19 (weak), 0.33 (average) and 0.67 (strong). R-square values in the present research model were 0.42 for identifying, 0.51 for locating, 0.75 for assessing, 0.55 for interpreting, 0.79 for communicating, and 0.62 for evaluation. Hence, the fitting of the model was confirmed. The estimation method in PLS is nonparametric. Therefore, all indicators obtained in PLS shows quality fitting. These indicators have values between 0 and 1 and the closer the values are to 1, the better the fitting of the model will be. These indicators in order are named absolute, relative, external model, and internal model.

Table 8. Model fitting indicators

Model fitting indicators	Values
Absolute	0.547
Relative	0.776
External model	0.995
Internal model	0.78

Values of all indicators are in the expected domain. Although the absolute indicator is more than 0.5, its value is smaller in comparison with that of the other three indicators.

Model's general fitting (Goodness of Fit)

The goodness of Fit is related to the general fitting of structural equation models. This criterion was introduced by Tenenhaus et al. (2004) and is measured by the following formula:

$$GoF = \sqrt{Communalities \times R^2}$$

where communalities is the average of every construct value and R^2 is the average of endogenous construct values. Wetzels et al. (2009, p.187) have introduced three values of 0.1, 0.25, and 0.36 for weak, average, and strong values, respectively.

Table 9. Model's general fitting

Constructs	Communalities	R^2	Rank
Identifying	0.61	0.42	6
Locating	0.5	0.51	5
Assessing	0.62	0.75	2
Interpreting	0.78	0.55	4
Communicating	0.58	0.79	1
Evaluating	0.78	0.62	3
General fitting	**0.63**		

As a great finding of the study, model fitting is 0.63, which indicates that the model has a strong general fitting. As a result, students showed a high sense of efficacy regarding the six dimensions from which communicating and assessing are the most- and identifying and locating are the least-mentioned dimensions.

Discussion

The findings were in accordance with the other studies conducted specially in Turkey as the original scale was from that country (such as, Ata & Baran, 2011; Adalier & Serin, 2012; Usluel, 2007, Tunser & Balci, 2013; Çakmak, 2010). Findings from factor analysis showed that all the questions in the scale have a good fitness for the final model and are capable of explaining the variance. Five factors of information searching self-efficacy have potentials for a statistical explanation of variances.

For the fitness of the measurement model, Cronbach Alpha, composite reliability, convergent and divergent validities indicated the appropriateness of using structural modeling for the analysis. It

was concluded from the results that all of the questions and the relationships between variables are significant at 0.95 degrees of confidence. The Average Variance Extracted for all constructs is bigger than 0.5, and therefore the present research model has appropriate Convergent validity. Moreover, the divergent validity of the model was measured by the correlation between different factors of the variable. As mentioned before, fitting of the model is done in three stages including measuring the fitting of the model, the fitting of the structural model, and the fitting of the general model. Thus, it can be concluded all three models have goodness of fit.

The population of the study showed a high degree of self-efficacy in all of the dimensions from which communicating and evaluating are the most- and identifying and locating the are least-mentioned dimensions. What remains to be a question is why students showed lower degrees of self-efficacy in the basic and first dimensions of identifying and locating. Such skills are fundamental in a serious research project for which the students must have the required knowledge and skill. The variety and quantity of resources available online could impact the students' sense of efficacy, leading them to frustration in identifying and locating appropriate and quality information. In contrast, students show a high degree of self-efficacy in communicating and assessing retrieved resources, which are also very important skills in conducting a research project. Such a variance in different skills related to information literacy should be taken into consideration by policy-makers and information providers.

The findings are important regarding the methodology of the research. The research is among the few studies conducted via SEM in information literacy literature. Although SEM is a method to have recognized in management studies for four decades, there exists a lack of research in information seeking and literacy, which has employed this method. The findings are also important because of the context in which the research has been conducted. The research setting in a developing country, in which there are many universities and students, is another value of the findings by which decision-making could be easier for the authorities of the universities than ever.

Evaluating self-efficacy solely by scales is a task of high risks to the point that Bandura (2001) advised the researchers to use them carefully. He proposed "particularized self-efficacy" which means self-efficacy with regard to actual and real situations and not limited to the laboratory or controlled research methodologies. The present research has these limitations, leading us to use the result with care especially in different settings and with different populations. It is advised from the findings of the current research that methodologies like pre and post-tests, quality methods like interview and observation, and specifically mixed methods should be considered important components to reach results that are close to actual situations. The use of the validated Persian scale is advised for different information literacy contexts.

Conclusion

The goodness of fit from the aspects measurement model, structural model, and general model have promising insights for future studies in the related research. It is advised from the results of the study that users' sense of self-efficacy plays an important role in successful information seeking. Although different values were identified in various subscales indicating different beliefs about different skills, the overall understanding of the users regarding their information skills seemed to be high. The population of the study showed a high degree of self-efficacy in all of the dimensions from which communicating and evaluating are the most- and identifying and locating the least-mentioned dimensions. Findings also show the importance of such psychological traits as confidence, anxiety, motivation and proficiency in how a given work is undertaken in different organizational settings. Specifically, psychological and mental abilities are of utmost importance in serious takes like information searching. By keeping in mind that vulnerable users of the Web information, like the youth and ill people, are becoming more and more dependent on searching information on the Web, powerful affective issues such as self-efficacy could lead them to successful results with the lowest degree of misinformation, which exists on the Web. Users could find more valuable results when they have empowered mental abilities.

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