Advances in Social Science, Education and Humanities Research, volume 378
6th International Conference on Education, Language, Art and Inter-cultural Communication (ICELAIC 2019)

Analysis of Information Ability Factors of Young Civilian Faculty in Military Schools in the Age of Big Data

Kang Yi
College of Information and Communication
National University of Defense Technology
Xi'an, China 710106

Yuting Zhao
College of Information and Communication
National University of Defense Technology
Xi'an, China 710106

Qiang Wei
College of Information and Communication
National University of Defense Technology
Xi'an, China 710106

Na Zhang
College of Information and Communication
National University of Defense Technology
Xi'an, China 710106

***Abstract*—This paper studies the information ability of young civilian faculty members in military schools in the era of big data, and puts forward 26 information capabilities that should be possessed. The factor analysis is carried out by SPSS software, and five common factors and their weights are obtained. The basis for the design and evaluation of the faculty information capacity scale is provided.**

Keywords—information ability; big data; young civilian faculty in military schools; factor analysis

I. INTRODUCTION

In military academies, civilian personnel have gradually become an important part of the faculty. They are engaged in science and technology-intensive work such as teaching and research. They are not only the implementers of education, but also the subjects of education. Their information ability is of great importance and plays a vital role in the training of military talents in the new era. At present, in the military academies, the civilian staffs are mainly this year's graduates. They have certain information capabilities before entering the job, but there is still a certain gap with the requirements of the posts. This paper mainly analyzes and models the information ability of civilian faculty, and provides a basis for their information ability evaluation and targeted training.

II. THE CONNOTATION AND EXTENSION OF INFORMATION ABILITIES

The description of relevant information capabilities in the era of big data has related terms such as information ability, information literacy, information quality, and data literacy. Among these terms, the first three can be traced back to Information Literacy, first introduced by Paul Zurkowski, President of the American Information Industry Association in 1974. With the deepening and development of related research, the connotation and extension of these three nouns are slightly different. Information ability refers to the ability to understand, acquire, utilize and use information technology [1]. Information literacy is an ability to adapt to the information society, including basic knowledge and basic skills about information and information technology, the ability to use information technology to learn, cooperate, communicate and solve problems, as well as information awareness and social ethics issues [2]. Information quality is a part of human quality. It is a stable, basic and inherent personality mental quality formed by human society's information knowledge, information awareness, received education, and environmental factors. Its connotation includes four aspects: information consciousness, information ability, information ethics and lifelong learning ability [3]. As can be seen from the above definitions, the definition of information capability is relatively narrow, involving only basic comprehension of information understanding, acquisition and application, while information literacy includes information awareness and information ethics; the information quality and information literacy are not much different, which includes the additional lifelong learning ability.

Data Literacy is a noun rising in the era of big data. At present, the industry has not yet decided on the specific meaning of data literacy [4]. Data literacy stems from information literacy and is a new requirement for people's data-based information acquisition, understanding, evaluation, transformation and utilization in the era of big data. It can be said that data literacy education is the expansion and continuation of social information literacy education in the big data environment and is the new requirement for individual information literacy and the direction of educational development [5]; data literacy education will take data literacy, which is mainly represented by data operation ability, as the core component of information literacy (covering the ability of individuals to

acquire, interpret, evaluate, transform and rationally use data) [6].

The information ability of this paper, its connotation and extension is more biased towards the definition of "information literacy" in the literature [2], covering not only the basic ability of information understanding, acquisition, application, but also information consciousness and information ethics.

III. Information Ability of Young Civilian Faculty Members in Military Schools

In order to better study the information ability of the young civilian faculty members of military schools in the era of big data, it is necessary to model the information capabilities. The first is to determine the scope of information capabilities. Based on a large number of relevant literature researches such as information ability, information literacy, information quality and data literacy, this paper puts forward the initial value of 26 information abilities that faculty members should have, including:

The information needs (X_1) ability refers to the ability of the faculty members to discover his own needs and express them correctly. This need includes requirements for the form, content, and carrier of the information.

The information sensitivity (X_2) ability refers to the ability of information workers to quickly discover information clues and values, and can also be said to be the ability to distinguish and judge new situations, new problems, and new experiences [7]. In the era of big data, faculty members need to get a lot of complicated information every day, and they need to quickly and accurately find useful information about their work.

The information acquisition ability (X_3) is the ability to have a strong intention and desire for information and to obtain the required information from multiple sources [8]. Information acquisition ability is a kind of traditional information ability. To be able to obtain information correctly, it is necessary to understand and be familiar with various information sources, information formats and information tools, which requires a certain amount of time to accumulate.

The information conversion (X_4) ability refers to the ability to convert acquired information into the format or content that it needs.

The information inspection (X_5) ability refers to the ability to judge the degree of authenticity of information. The information inspection ability is somewhat related to the faculty's own knowledge and skill base.

The information selection (X_6) ability refers to the ability to correctly select the information that you need when facing multiple messages. The total amount of information in the era of big data has exploded; much information appear repeatedly; some information has been artificially processed or modified, and some redundant components have been intentionally or unintentionally added, making it difficult to distinguish which information is truly applicable. Sometimes, due to the complexity, symbolization and diversification of terminology in various professional fields, it has brought great difficulties to people's information selection.

The information deep mining (X_7) ability refers to the ability to judge, select, find patterns, and ultimately discover valuable information from a variety of data. In the era of big data, data mining is a very important topic. The really valuable information is hidden in a huge amount of information, and people need to find it.

The metadata (X_8) refers to data describing objects such as information resources or data. Since a large number of information resources in the era of big data are standardized and structured in electronic form, metadata is a necessary means for people to effectively manage and acquire resources.

Information understanding and interpretation (X_9) ability means that to use information, people must first understand and accept this information. In general, it is important to understand that information must have the same level or level of knowledge as the level or level of knowledge reflected in the information.

The information classification preservation (X_{10}) ability: due to the explosive growth of knowledge and information in the era of big data, and the various forms of information (text, audio, video), it is necessary to have the ability to classify and preserve information.

The information analysis (X_{11}) ability is the ability to carry out in-depth thinking processing and analysis of a large amount of relevant information according to the needs of specific problems, and to form new information that is helpful for problem solving.

The information utilization (X_{12}) ability refers to the ability to integrate information into the realities of work or life and to provide a basis for forecasting and decision-making activities.

The information modeling (X_{13}) ability is the ability to sample and standardize the same type of information, and provide the basis for the establishment of various information systems and the standardized interaction between information.

The information tracking update (X_{14}) ability is ability highlighted in the era of big data. Since a typical feature of information in the era of big data is "changeable", the form, content, or processing of information may change rapidly in a short period of time. Therefore, in order to effectively use information, people must have a strong ability to track and update.

The information processing innovation (X_{15}) ability and information creation production (X_{16}) ability, both of which are the ability to create information, and the difference is that the former is the creation of existing information, while the latter is to produce new information.

The information transformation teaching (X_{17}) ability is a subset of information utilization ability and a special information utilization ability that teachers should possess.

For the faculty, the information ultimately needs to generate value or promote efficiency in the teaching, and the information must be actually transformed in the process of teaching.

The information technology means (X_{18}) is an important topic that can't be avoided in education and teaching in the era of big data. Information technology means can realize the intuitive and dynamic display of teaching content, and can provide students with space for independent learning and expression. It can track and feedback the learning effect of students, and can meet the needs of personalized learning such as cooperative learning and mobile learning.

The ability to use the information management platform (X_{19}) is also an important ability in the era of big data. In the era of big data, information resource management technology has also undergone tremendous changes, forming an information management platform based on computer network technology and database technology, integrating various software components. In the process of teaching and research practice, teachers will inevitably use various information management platforms, such as the MOOC platform, the academic literature query platform, and the educational management platform. Therefore, it has become an important capability in the era of big data.

The information analysis software and tools (X_{20}) is similar to the information management platform (X_{19}), and the use of information analysis software and tools has become an important auxiliary technology for data analysis and mining in the era of big data.

The information exchange expression (X_{21}) ability, which is an important part of information ability, is the ability to transmit, exchange and share information through language, visual and text.

The information sharing (X_{22}) ability, unlike the information exchange expression (X_{21}) ability, doesn't require understanding and interpretation of information content, but only emphasizes the awareness and behavioral ability to achieve information sharing. On the one hand, teachers in the era of big data must have the awareness of increasing the sharing of information resources and actively sharing high-quality resources. On the other hand, they should also have the ability to realize sharing through information system technology and transmission technology.

The information evaluation (X_{23}) ability is also the ability to comprehensively evaluate the information volume, accuracy, timeliness, pertinence, and processing degree of information in the context of the surge in the number of information in the era of big data.

The information security (X_{24}) ability refers to the ability to protect information from accidental or malicious causes, damage, change, and disclosure to ensure the integrity, availability, confidentiality, and reliability of information.

The information policies and regulations (X_{25}) are related policies and regulations on the development, dissemination, management and utilization of information that are formulated and enforced by state agencies.

The information ethics (X_{26}), also known as information ethics, refers to ethical requirements, ethical guidelines, ethical protocols, and new ethical relationships formed on the basis of information development, information dissemination, information management and utilization [9].

IV. Information Ability Factor Analysis

Based on 26 basic abilities, the questionnaire to collect data is designed. The questionnaire adopts the Likert five-point method, which divides each information ability into five levels of "completely agree", "basically agree", "neutral", "not very much agree" and "completely disagree", and respectively give them the scores of "5, 4, 3, 2 and 1" to make it convenient for collecting survey participants' understanding of the importance of each ability. The questionnaires are mainly composed of young civilian faculty in military colleges under 35 years old, covering the four levels of education background from junior college to doctoral candidate. The professional title structure is mainly composed of teaching assistants and lecturers. In order to collect data scientifically and facilitate the interviewees to clearly understand the meaning of ability, there is a concise description of ability in the questionnaire. According to the survey feedback, each respondent believes that the questionnaire entries are clear and well-defined, and can make scientific judgments.

In the survey of the author's unit, a total of 50 questionnaires were issued, and 31 questionnaires were returned, with a recovery rate of 62%. At the same time, 30 newly-added doctoral and master's faculty were selected from other brothers' colleges, and 25 questionnaires were collected. A total of 56 questionnaires were obtained. After retrieving the questionnaire, all the questionnaires were first examined to remove 2 invalid responses with incomplete answers or incorrect answers, and then the SPSS software was used to test the reliability and validity of the data.

A. KMO Sampling Suitability Test and Bartlett Spherical Test

First, the questionnaire was tested for KMO sampling suitability test and Bartlett spherical test to determine whether the questionnaire is suitable for factor analysis.

The KMO sampling fitness test examines the partial correlation between variables. The value of KMO is generally between 0 and 1. The closer the value is to 1, the higher the correlation between variables. If the KMO>0.9, it indicates that the effect is excellent; if the KMO>0.8, the effect is very good; if the KMO>0.7, the effect is acceptable; if the KMO>0.6, the effect is general; and if the KMO<0.5, it is not suitable for factor analysis.

Bartlett's spherical test is a test method that tests the degree of correlation between variables [10]. The statistic of the Bartlett spherical test is obtained from the determinant of the correlation coefficient matrix. If the value is large and its corresponding companion probability value is less than the significance level in the user's mind (generally less than 0.05), then the null hypothesis should be rejected, and the correlation coefficient can not be a unit matrix, that is, there

is a correlation between the original variables, which is suitable for factor analysis. On the contrary, it is unsuitable for factor analysis.

If the KMO value is too small, or the significance is greater than 0.05, the factor analysis is not recommended because the factors produced are not representative.

From the results, the KMO value reaches 0.750, and the Bartlett spherical test approximates the chi-square value of 1185.156. The degree of freedom is significant, which is suitable for factor analysis (see "Table I").

TABLE I. KMO AND BARTLETT'S TEST

KMO Measure of Sampling Adequacy.		.750
Bartlett's Test of Sphericity	Approx. Chi-Square	1185.156
	df	325
	Sig.	.000

B. Principal Component Analysis

In the questionnaire, one raised 26 questions, corresponding to 26 variables. Due to the large number of variables, it is not conducive to further analysis. There is a certain correlation between variables, which can be interpreted as some overlap between the information reflected in the variables. In this case, principal component analysis is needed. Principal Component Analysis (PCA) is also known as principal weight analysis or matrix data analysis. It transforms the relevant variables into a number of uncorrelated comprehensive index variables by means of variable transformation [11], thus achieving dimensionality reduction on the data set, which simplifies the problem.

The results of the questionnaire were extracted by principal component analysis, and then rotated by Caesar's normalized equal-maximum method. After 7 iterations, the rotation was converged, and the rotated component matrix was obtained as shown in the following "Table II".

TABLE II. THE ROTATED COMPONENT MATRIX

	Component				
	1	2	3	4	5
Information analysis software and tools	0.902	0.019	0.065	-0.044	0.128
Information exchange expression	0.883	0.186	0.103	0.031	0.060
Information ethics	0.843	0.011	0.092	-0.080	0.185
Information sharing	0.830	0.417	0.110	-0.130	-0.046
Information understanding and interpretation	0.819	0.291	0.037	0.094	0.038
Information evaluation	0.816	0.253	0.082	0.129	0.148
Information security	0.802	0.033	0.033	0.113	0.073
Information policies and regulations	0.786	-0.082	0.175	0.072	0.147
Information utilization	0.776	-0.061	0.282	-0.162	0.171
Information classification preservation	0.745	0.178	0.034	0.403	0.050
Information management platform	0.732	0.214	0.084	0.421	-0.014
Metadata	0.702	0.487	-0.048	0.178	0.048
Information modeling	0.688	0.608	0.048	0.028	-0.016
Information creation production	0.675	0.046	0.161	0.420	0.007
Information conversion	0.572	0.348	0.363	0.299	0.001
Information processing innovation	0.557	-0.059	0.098	0.472	-0.050
Information selection	0.168	0.845	0.115	0.277	0.019
Information sensitivity	0.136	0.814	-0.058	0.066	0.096
Information transformation teaching	0.223	-0.061	0.836	-0.027	-0.062
Information technological means	0.124	0.017	0.829	0.039	0.137
Information tracking update	0.072	0.475	0.605	0.191	0.037
Information needs	-0.010	0.356	0.113	0.722	0.163
Comparative analysis of information	0.098	0.350	-0.217	0.506	0.483
Access to information	0.230	-0.125	0.068	0.011	0.852
Deep information mining	0.086	0.533	0.221	0.061	0.563
Information inspection	0.082	0.465	-0.002	0.166	0.566

From the results of principal component analysis, a total of five common factors were extracted, and the coefficients of the variables in each common factor were ranked from high to low. Since the coefficients of the sub-variables of each common factor are greater than 0.5, no variables are eliminated and all are retained. The five common factors were named based on the meaning of the variables. The fifth common factor is named information acquisition, inspection and mining; the fourth common factor is named information requirement and analysis; the third common factor is named information technology and teaching application; the second common factor is named information sensitivity and selection; the first common factor is the most complex one, including information tools, communication, sharing, etc., the main body of which is the information utilization related factors, so it is named comprehensive utilization of information.

The weighting coefficient of each factor can be obtained by weighting the factor contribution rate normalization method as shown in the following "Table III".

TABLE III. THE WEIGHTING COEFFICIENT OF EACH FACTOR

Common factor	Contribution rate	Weight
Comprehensive utilization of information	44.028%	0.604
Information sensitivity and selection	11.770%	0.162
Information technology and teaching application	7.204%	0.097
Information requirement and analysis	5.584%	0.076
Information acquisition, inspection and mining	4.448%	0.061
Total	73.034%	1

It is generally considered that if the cumulative variance contribution rate of the extracted common factors is more than 55%, it is considered acceptable. The variance contribution rate of the five common factors obtained from the principal component analysis method reaches 73.034%. And it can be considered that the model better reflects the influencing factors of the instructor's information ability.

From the results of factor analysis, information selection, comprehensive utilization and teaching application, especially the comprehensive utilization of information, have a greater weight in information abilities, while information needs and acquisitions have less weight.

V. CONCLUSION

This paper studies the information ability of the young civilian faculty members in the military school of the big data era, analyzes the connotation and extension of the information ability, and puts forward the 26 information abilities that the young military faculty members of the military academy should possess, and analyzes the factors and obtains five common factors such as comprehensive utilization of information and their weights. Based on this, the scale of design information capability evaluation is used to evaluate the information ability of military young faculty members, which provides a direction for the next step of developing targeted information abilities.

REFERENCES

[1] Encyclopedia. Information Capabilities. https://baike.baidu.com/item/%E4%BF%A1%E6%81%AF%E8%83%BD%E5%8A%9B [EB/OL]. (in Chinese)

[2] Encyclopedia. Information Literacy. https://baike.baidu.com/item/%E4%BF%A1%E6%81%AF%E7%B4%A0%E5%85%BB [EB/OL]. (in Chinese)

[3] Encyclopedia. Information Quality. https://baike.baidu.com/item/%E4%BF%A1%E6%81%AF%E7%B4%A0%E8%B4%A8 [EB/OL]. (in Chinese)

[4] MANDINACH E B, GUMMER E S.Navigating the landscape of data literacy:it is complex[EB/OL].[2016-11-10]. http://www.wested.org/online_pubs/resource1304.pdf.

[5] Huang Ruhua, Li Baiyang. Data Literacy Education: The Expansion of Information Literacy Education in the Age of Big Data [J]. Library and Information Science, 2016(1): 21-29. (in Chinese)

[6] PRADO J C,MARZAL M A. Incorporating Data Literacy into Information Literacy Programs: Core Competencies and Contents [J].Libri,2013,63(2):123-134.

[7] Zhang Chenxi. On Information Sensitivity [J]. Friends of the Secretary, 1992(3): 9-10. (in Chinese)

[8] Encyclopedia. Information Acquisition Capabilities. https://baike.baidu.com/item/%E4%BF%A1%E6%81%AF%E8%8E%B7%E5%8F%96%E8%83%BD%E5%8A%9B [EB/OL]. (in Chinese)

[9] Encyclopedia. Information Ethics. https://baike.baidu.com/item/%E4%BF%A1%E6%81%AF%E4%BC%A6%E7%90%86. (in Chinese)

[10] Song Zhigang. SPSS 16 Practical Tutorial [M]. Beijing: People's Posts and Telecommunications Press, 2008. (in Chinese)

[11] Wang Yingluo. System Engineering [M]. 4 edition. Beijing: Mechanical Industry Press, 2008. (in Chinese)