Proposal and Practice of Data Governance Mechanism Based on Universal College Informatization

Qiao Xie and Min Lin

ABSTRACT

In recent years, data quality became the crucial factor of the User-oriented information technology services in many universities. However, low quality of data has seriously restricted the process of information construction. To improve the quality of data, some universities have carried out data governance work, but the results are not satisfactory, and the work promotion is very difficult[1]. One of the fundamental problems is the lack of a complementary and effective institutional system for data governance. This paper studies and explores the data governance mechanism construction, and proposes a set of feasible universal data governance mechanism in Colleges and universities.

1. INTRODUCTION

In the past decade, the informatization construction of universities has gone through the first phase of infrastructure construction and the second phase of application system construction. At present, it has begun to enter the third phase of user-oriented service.

At current stage, some universities which give priority to informationization have achieved certain results by separated management and service, and enhances the experience of teachers and students in using information services. High-quality information services need to be based on high-quality data. However, at present, the data quality of business systems is uneven and the data between systems is not fully shared and interoperable, resulting in serious construction of information services for teachers and students. Restrictions also cause teachers and students to repeatedly fill out similar forms in different systems. Based on the development situation and
existing problems of university informatization, the Ministry of Education has published some directions and guidelines successively:

(1) On January 23, 2018, the General Office of the Ministry of Education issued the Regulations on Educational Data Management of the Organs of the Ministry of Education and the Institutions directly under the Ministry of Education (Educational and Development Office No. (2018)(1). Article no.12 of these Regulations states that "data acquisition units shall formulate standardized procedures for data acquisition, establish a system of data quality verification and technical guarantee to ensure the authenticity, accuracy, completeness and timeliness of data."

(2) The Ministry of Education's Opinions on Fully Promoting the Informationization of Teacher Management (Teacher's Article2 (2017)) in 2017 pointed out: "Implementing General Secretary Xi Jinping's important directive spirit on promoting the modernization of national governance system and governance capacity through informationization, we should comprehensively promote the informationization of teacher management, optimize the governance system of teacher work and enhance the governance capacity of teacher work.

Obviously in the data age, there are more requirements and prospects for data governance in the national level. Correspondingly, the government has also issued a series of policies to ensure and promote data governance. However, the content of existing policies overlaps and does not form a sound and unified policy system. As a result, it is difficult to form a good guidance and normative role for data governance[2].

In order to improve the quality of data, colleges and universities have carried out data governance work, but it is no shortcut to obtain the idealized result. Howard Schultz, an American economist, believes: "any institution is a response to demand that already exists in real life". Based on the view that it’s prior to establish an efficient mechanism before processing the data governance effort. This paper describes a set of basic universal data governance management mechanism in Colleges and universities.

2. CURRENT PROBLEM

Currently, nevertheless lots of resources are consumed on data processing by not only just the university management departments but also the final users including staff and students, but there is little achievement that could make without unified planning and management of data management [3]. At the present stage, the existing problems include[4]:

(1) Lack of management and safeguard mechanisms. At present, most colleges lack relevant mechanisms for data governance. For example, the responsible parties for coordinating performance and scientific research data are not clear, lack relevant policies and management methods, work mechanisms are not clear, and the human and material resources that should be invested are not clear. The standard is not uniform and so on.

(2) Data source definitions and responsibilities are not clear. The definition of the data source is vague, that is, what data source and data fields should be ambiguous, lack of authoritative data standards, data users and producers have huge differences in data understanding, and there are also definitions of the same data asset. The difference is big. The definition of the responsible unit and responsible person of the
data asset is not clear. Some data assets do not have the unit to assume management responsibility, and there are cases where the responsibility is not implemented.

(3) Lack of data quality management mechanisms. For users, the feeling of using digital campus is data error, lag, and often repeat similar data. In the case of good data production, data quality still needs to be managed to ensure that the data meets the requirements for use. The main problems of the existing data quality include: the lack of data is prominent, and many fields that are needed when using the data are missing, because the system design does not consider the relevant fields, and the administrator does not fill in the relevant fields; the data has errors, such as data. The situation is inconsistent with the actual situation, and there are differences between the data standards and the school standards.

(4) Data management is defined as a temporary event. When the task is encountered, the relevant work is carried out. Usually, few people care about it.

(5) Lack of college-level data standards or inadequate implementation results in a large number of heterogeneous data, greatly reducing the quality of data.

(6) Parallel pattern. The system stipulation of business system is inconsistent with the actual implementation, which leads to the data quality not up to the standard.

3. DATA GOVERNANCE MECHANISM

Data governance is a system engineering, a top-down instruction that advances from the bottom-up. Therefore, in terms of guidance, we must get the consensus of all, we must have a strong organization, reasonable charter, clear process, robust system, in order to make the data governance work effectively guaranteed. In order to complete the big project of data governance, the first thing to do is a good job in top-level design, to achieve the system theory methods of conceptual consistency, functional coordination, structural unification, resource sharing and component standardization, and to consider all levels and elements of the project from a global perspective[5].

Based on the above data governance definition, basic goal and its implementation strategy etc., we propose implementation framework(figure 1) for higher education institution data governance. In this framework, data governance organization and management mechanism ensure the implementation of data governance; management methods and data standards clarify the data governance principle, specification, process, standard etc.; financial funding, human resources, technology and evaluation are the supporting elements which sustain the data governance process in the implementation framework.
3.1 Organizational Structure

Data governance is a "Top Leadership" project. Without the high attention of the leaders of schools and the establishment of a school-level management and co-ordination organization for data governance[11], all data governance work will be meaningless. First of all, a data governance committee should be set up to take charge of overall planning, organization and coordination, formulate strategic plans for data management, and assess data management. The principal leaders of the University shall be the chairman and vice-chairman. Under the Data Governance Committee, the Data Governance Office is composed of the administrative units at or above the important department level and the core technical support management departments. It is responsible for the implementation and implementation of the specific work of data management, formulating the working steps, technical schemes and data standards of data management, and promoting data governance, data sharing and data exchange. Work to provide technical support and platform support for data management. The detailed organizational structure is shown in the following figure 2:
3.2 Working Mechanism

As the executive department of the specific work, the Data Governance Office is responsible for formulating the plan, which includes demand research, data source standard formulation, workload assessment and implementation plan, and submits it to the Data Governance Working Committee for discussion. After the plan has approved, the working committee is responsible for the overall implementation of the plan, including system rectification, input of initial data, evaluation of data quality and acceptance of the plan, and submits it to the Working Committee for discussion. After the adoption of the scheme, it entered the normal operation state, including conventional data production and data audit [12].

Here we could build RACI matrix model (TABLE I) [10] to define the working relationship between the corresponding character and activities.

R=Responsible, i.e. the character responsible for carry out the activity;  
A=Accountable, i.e. the character responsible for the activity;  
C=Consulted, i.e. the person who owns the data or has the ability to complete the project;  
I=Informed, i.e. the person who needs to be informed of the results.
### TABLE I. RACIMatrix Model of Data Governance.

|                        | Data Governance Committee | Data Governance Office | Data governance project manager | Data Management Business Administrator | Data Governance Technology Administrator |
|------------------------|---------------------------|------------------------|---------------------------------|----------------------------------------|------------------------------------------|
| Develop work plan      | A                         | R                      | C                               | I                                      | I                                        |
| Review work plan       | R                         | A                      | C                               | I                                      | I                                        |
| Implementation programme | I                       | A                      | R                               | R                                      | R                                        |
| Acceptance programs    | R                         | A                      | C                               | C                                      | C                                        |
| Scheme normalization operation | I                  | I                      | A                               | A                                      | A                                        |

1. Data Governance Committee: Coordinates university data governance work, and is responsible for data planning such as overall planning, cross-departmental organization and coordination, review and acceptance programs, and supervision and evaluation.

2. Data Governance Office: Develop a data governance work plan to carry data governance forward.

3. Data governance project manager: The officers who are in charge of the informatization and the heads of various departments in university, implements the specific implementation of data governance work, and is responsible for business data quality.

4. Data Management Business Administrator: Responsible for the business data definitions, business rules, and implementation-related normal standards for which they are responsible.

5. Data Governance Technology Administrator: Ensure that data governance is effectively understood, used, and shared to meet governance and integrity standards.

### 3.3 Data Governance Management Methods and Data Standards

University data management requires the development of data management methods suitable for the school. Data management method is the authoritative provision basis for the entire data governance work. It defines the principles of data management, management organizations and responsibilities, working procedures, assessment criteria, etc. Therefore, at the same time, schools also need to determine a unified data coding standards and operational specifications, and all systems strictly comply with this standard, which provides a solid foundation for the unification of data coding.
3.4 Human Resources and Financial Support

Manpower is the basis of implementing data governance. It is necessary to objectively evaluate the workload of data governance in order to formulate a plan for manpower investment. In data governance, the main human resources are consumed in data production, quality management, exchange and sharing, and technical services. It is necessary to quantify the labor costs through statistical data and refine it to the workload of each data table and step.

Funds are the assistant factors of data governance. Specific funds can accelerate the progress and quality of data governance, such as purchase of decision-making consultation, data entry services, expert consultation and review, data audit services, data quality assessment, etc.

3.5 Quality Management Evaluation

Data integrity, accuracy and consistency are the basis for ensuring high-quality data services and business operations [6]. However, with the improving of business and the advancement of information technology development, more and more front-end and back-end business system platforms are available. At the same time, due to the decentralized management of business data used by each platform system, coupled with standard differences and human errors, these factors directly affect the availability of data[7]. Data quality evaluation could be used to diagnose and evaluate data quality. The quality of data could be evaluated through multiple dimensions, such as quality of existing data, environmental quality, data representation, data accessibility etc., in order to assess the compatibility of the data with requirements[8][9]. Therefore, the Data Governance Office needs to establish an independent quality assessment mechanism, including third-party services and technical platforms, to objectively evaluate and verify the quality of the data produced by business departments.

3.6 Technical Support

Technical support includes: data platform construction, data usage authorization, data technology services, data security management and data backup, etc. Platform technology support work is carried out by the school's information technology department under the guidance of the Data Governance Office, involving the business department system, and the relevant technical work is the responsibility of the business department.

4. CONCLUSIONS

The difficulty of data governance is a giant problem encountered by most colleges and universities. This paper analyses the status quo of data quality in colleges and universities, from the organizational structure, working mechanism, management methods, data standards, human and financial security, quality management evaluation mechanism and technical support. Then this paper proposes a set of data governance mechanism suitable for colleges and universities. At present, Jinan University takes
this set of data governance mechanism as the route guidance, adjusts and optimizes the organizational structure, and prepares the “Jinan University Informationization Data Management Measures” in preparation for capital and technical strength. We hope that the data governance system proposed by this paper can provide some reference for the data governance work of domestic universities.

ACKNOWLEDGEMENTS

This paper is one of the achievements of Guangzhou Science and Technology Innovation and Development Special Fund Project(2019) "artificial intelligence-based human-computer interaction intelligent learning platform development and application" (project number: 201902010041).

REFERENCES

1. Peng Xuetao. 2017. "Data Governance of American Universities and Its Enlightenments," E-education Research. 2017, 38(6):76-81.
2. Binfang Liu,Wei Wei, Xiaomi. 2019. "An Analysis of Government Data Governance Policy in the Era of Big Data," Journal Of Intelligence. 2019, 38(1):141-147.
3. B.Tulasi. 2013. "Significance of Big Data and Analytics in Higher Education," International Journal of Computer Applications. 2013, 68(14):21-23.
4. Zhong-mei Shu, Qiong-fei Qu . 2013. "Research on Higher Institutional Mechanism of Information Management and Decision Support in Big Data Era," Journal of South China University of Technology(Social Science Edition). 2013, 15(6):96-101.
5. Data Management Association International. 2009. "The DAMA Guide to the data management body of knowledge," New York: Technics Publications. 2009:12-13.
6. Hu L. 2009. "Research on quality control and quality assessment for scientific data resources," E-Science Technology & Application. 2009:50-55.
7. Weberk, Otto B, Osterle H. 2009. "One size does not fit all - A contingency approach to data governance," Journal of Data and Information Quality. 2009, 1(1):1-27.
8. B.Tulasi. 2013. "Significance of Big Data and Analytics in Higher Education," International Journal of Computer Applications. 2013, 68(14):21-23.
9. SHU Zhong-mei, QU Qiong-fei. 2013. "Research on Higher Institutional Mechanism of Information Management and Decision Support in Big Data Era," Journal of South China University of Technology(Social Science Edition). 2013, 15(6):96-101.
10. Lin Li, Dandan Qian, Tingting Huang, Xuhui Chen, Hesong Wang. 2017. "Discussion on the data Governance of University informationization," The Chinese Journal of Ict in Education. 2017, 5:66-68.
11. Jokonya Osden, Lubbe Sam. 2009.04. "Using information technology governance, risk management and compliance (GRC) as a creator of business values—A case study," South African Journal of Economic and Management Sciences. 2009-04, 12(1):115-125.
12. Wiedenhof, Guilherme Costa, Luciano Edimara Mezzomo, Magnagnigo Odirlei Antonio. 2017.04. "Information Technology Governance in Public Organizations: Identifying Mechanisms That Meet its Goals while Respecting Principles," JISTEM-Journal of Information Systems and Technology Management. 2017-04, 14(1):69-87.