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Abstract: Data is exploding in the age of big data, and the users' requirements for knowledge organization level are increasing day by day. Aimed to the characteristics of problem and the data to solve the problem which are multiple, redundant, complex, chaotic and new, the traditional first organizing mode could not solve the users' problems effectively. Therefore, in this paper question driven construct the knowledge organization from the macro level, with the help of knowledge granularity and knowledge unit to design its process, and knowledge is stored on knowledge warehouse through the navigation of question to acquire, order, associate, regenerate and apply the knowledge unit. According to the different types of problems, the knowledge unit network is built oriented to the question based on node of knowledge unit and tie of knowledge relation. Mine the evolution rule from question to knowledge unit and question answered, promote the generation of the new knowledge unit. Ultimately knowledge service is provided for the application of water information efficiently and actively, with promoting the sharing, innovation and application of knowledge.

Keywords: knowledge unit, knowledge organization, granularity principle, question driver, relationship

1. INTRODUCTION

In the era of big data, all kinds of data are coming. People are often confused about what to do in the ocean of data. Faced to the large, complex and swelling data, how to ensure the role they are playing in the knowledge service and make them ordering converges to efficient knowledge service. In the past, it regarded knowledge as a resource. Also, knowledge was organized and supplied by the way of resource driven. But under the background of big data, this method would make the knowledge organization lacking the targeting effect to solve the problem. So, from the perspective of knowledge application and final problem solving requirement, it is necessary to build knowledge organization from question driven. The trouble is facing to the large, complex and swelling data, how to extract and organize targeted knowledge from big data and how to integrate knowledge support efficiently to provide effective solutions. Based on users' requirements for knowledge organization level enhancing unceasingly under the big data environment , this paper put forward: from the macro level, use question driven to construct the knowledge organization; from the micro level, explore the logical and physical structure of knowledge; from the angle of application, study the technological achievement with knowledge organization. The characteristics of problem and the data to solve the problem are multiple, redundant, complex, chaotic and new, aimed to this, knowledge organization process is designed in virtue of knowledge granularity and knowledge unit which is acquired, ordered, associated, regenerated and applied through the navigation of question. Use knowledge warehouse to store knowledge; mine the evolution rule from question to knowledge unit and question answered, and eventually promote the sharing, innovation and application of knowledge by the efficient knowledge service. It's helpful to improve and deepen the theory and framework of knowledge organization and the level of the knowledge service, as well as to provide depth and reliable knowledge service for innovation of enterprise technology and government management. Meanwhile, it

provides knowledge protection to implement the strategy of innovation driving development and to perfect the knowledge innovation system which put forward in the eighteenth National Congress of the Communist Party of China.

Domestic and foreign research about the knowledge organization are very fruitful. In CNKI there were 2398 articles about retrieval topics as "knowledge organization" on January 30, 2014, and articles after 2006 accounted for 70.7%, references with retrieval topics contained both "knowledge organization" and "knowledge unit" were only 71 , while no reference with retrieval topics including "knowledge organization", "knowledge unit" and "problem driving", it suggested that research about knowledge unit or organization form the angle of question driven was less. The present study focus on three aspects: knowledge organization principles, framework and process; knowledge organization structure and association; knowledge organization practice and problem driven application practice.

1.1 Knowledge organization principle, framework and process related research review

Foreign research about Knowledge Organization mainly focus on the NKOS (Networked Knowledge Organization Systems/Services), such as the *Library of Congress Subject Headings* with SKOS semantic description released by American Congress Library. Mai[1] combined users' requirements to describe and organize knowledge from the cognitive perspective. Pastor - Sanchez[2] compared SKOS with other dictionaries and thesaurus, and then put forward that we could research SKOS from the angle of users' demand. Yuan Hanqing[3] was the first one in China who thought that literature work was the work of organizing knowledge. Since Liu Xun firstly regarded knowledge organization as a part of the study of library and information science in 1985, knowledge organization began to enter the field of library science. Liu hongbo[4] revealed the principle for simulating the knowledge memory structure of the brain in knowledge organization, with considering the users' individual factors. Jiang Yongfu[5] discussed the basic principle and method of knowledge organization from the angle of library intelligence theory. Wang zhijin[6] pointed out that the knowledge organization complied with the development of the information society and knowledge society, and explored the method, goal and task of knowledge organization deeply. Wang Yuefen[7] researched knowledge organization process and method for personal service. Xue Chunxiang[8] based on the study of summarized word and from the perspective of integration built knowledge organization system in the specific areas. He defang[9] from the angle of knowledge organization system construction and application summed up that the priority of users' participation and application was the trend of knowledge organization. Teng Guangqing[10] researched the target and content of knowledge organization in digital library from the angle of semantic, and analyzed evolution path of knowledge organization system constantly diffusion and complicated. Ma Feicheng[11] faced the difficulties in the network information resources integration and put forward the integration framework based on correlation data of network information resource.

1.2 Knowledge organization structure and related research review

Alon Friedman[12] firstly put forward the knowledge organization method which combined the knowledge representation, linguistics model and theory. Gail Hodge[13] defined general knowledge organization as 3 levels, 11 types in the level of semantic tools. June Abbas[14] published monograph on exploring the structure of traditional knowledge organization, the representation of knowledge organization in the personal information and personal and social information under Web2.0. Christopher[15] introduced Common Logic which was a semantic representation method based on the humble predicate logic, and also introduced how the method to represent the knowledge sharing and reasoning for Internet information. Wen Youkui[16] thought knowledge structure consisted of the smallest knowledge unit, and then studied knowledge association, organization, retrieval and so on respectively. Wen Tingxiao[17] reviewed the studies on knowledge unit, and suggested that

knowledge unit was the basic unit of the knowledge control and treatment, with discussing the connotation, characteristics and types of correlation knowledge. Zeng Jianxun[18] reviewed the knowledge linking research and practice, and thought that knowledge organization linking based on consumer was the trend of knowledge organization development. Wang Jun[19] described and explained the knowledge structure systematic under the network environment, and on this basis, promoted application development on the information organization, representation and retrieval based on content.

1.3 Knowledge organization practice and problem driven application related research review

Science and Technology Information Research Institute of China built a prototype system based on New Energy Vehicles field which could realize knowledge service functions such as multiple language monitoring, cross-language management and document delivery and linking. Knowledge Innovation Program of the Chinese Academy of Sciences built the knowledge environment oriented southwest biodiversity. Yang Ren-Zi, Yan Hong-Sen[20] oriented to the needs of users, with the help of granularity principle and optimization algorithm researched and discussed the structure, association and measure of knowledge network in manufacturing system. Xia Lixin[21] studied the application of e-government portal knowledge organization from the angle of users' personal services. Hu Ruiping[22] used Probability and Mathematical Statistics course as an example, and discussed the workflow model and application about question driven teaching method. Wang Bo,Zhao Haiyan,Zhang Wei[23] researched the question driven requirements' elicitation method to help stakeholders analyze and find solutions together.

Based on the analysis of literature, current research on knowledge organization and application showed such features:①Existed research results focused on knowledge organization basic theory, key technology, method and the representation, and lacked research combined knowledge organization theory with application. ② Current research results lack systematically study about knowledge organization and its structure, and also lack deeply investigation about its system and structure from the angle of the question driven. This cause the poor performance of knowledge organization application. ③Research depth of knowledge organization structure is not enough, current research focus on the concept, characteristics and association of knowledge unit, and lack the study about depth organization and regeneration of knowledge such as knowledge unit network structure, restructure and regeneration. ④Knowledge organization application emphasized on the literary service, and had the very big disparity from the knowledge service. This couldn't meet the needs of consumer. Therefore, we will take the question driven perspective to construct knowledge organization framework from the macro level; we will discuss knowledge organization process such as the knowledge unit's acquisition, reorganization, and regeneration from the micro level; we will explore knowledge organization structure, and through the test and feedback for optimizing knowledge organization framework and process and promoting the efficient solutions with users' problem.

2. QUESTION DRIVEN KNOWLEDGE ORGANIZATION OVERALL FRAMEWORK

Question driven knowledge organization overall architecture hopes that data, information and knowledge stored in database would meet the knowledge demand of users to solve problems and support decision. So, knowledge organization not only focus on how to offer knowledge to the user, it also includes solution and feedback for user problem, so that the knowledge organization and application will be more perfect and practical. Therefore, knowledge organization overall architecture construct by users' problems solution, with the help of granularity principle to design the logical and physical structure of knowledge organization and knowledge unit, storing knowledge in warehouse collaborated with question library, scene library, knowledge library, answer library, answer effect library and so on, guiding knowledge organization process with problem solving such as

knowledge unit creation, ordering, relevance and regeneration, supporting problem solving services by the approach of knowledge map visualization, and finally through the answer and feedback to improve and optimize the knowledge organization framework and process, with promoting the application of knowledge and innovation. Problem driven knowledge organization framework is as shown in figure 1 .
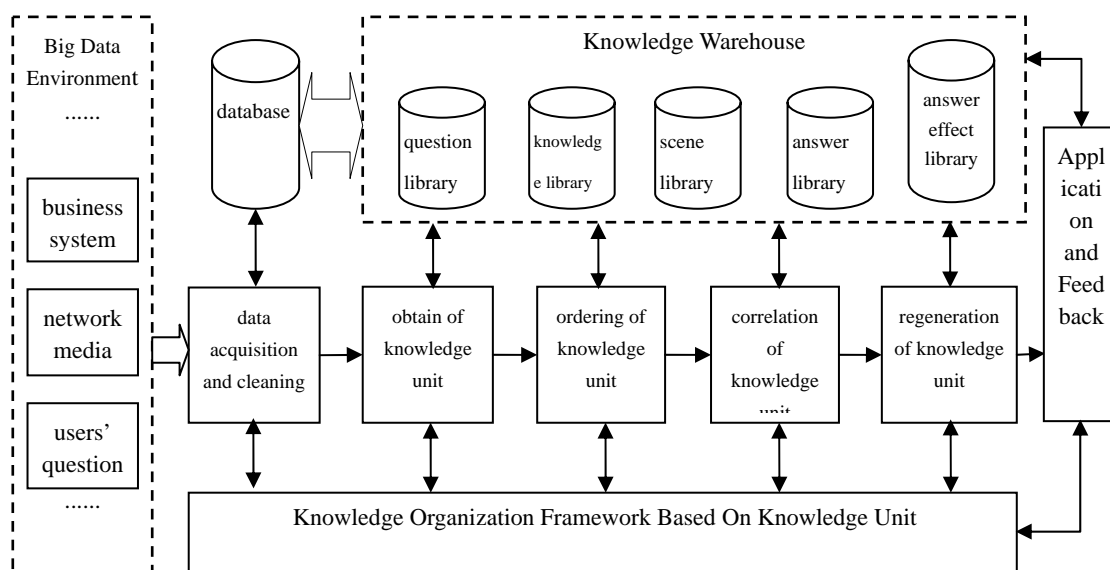

Figure 1　　problem driven knowledge organization framework

2.1　Users' requirements on problem driven

Users' demand for knowledge is different because of different culture degree, knowledge background and profession. On the basis of question, requirements were solved. According to the different requirements and kinds, problem was organized. According to the information about question kinds and characteristics, users' problem library was built. At the same time, through analyzing the various acquisition problems and extracting the common characteristics and differences of different problems, in general users' problems are divided into general issue, key problem and innovation problem which should adopt different problem solving process , eventually form question driven with user-oriented demand driven and provide navigation for knowledge organization.

2.2　Question driven macro architecture knowledge organization process

From the macro level, knowledge organization process includes the objective, principle, elements and level system. The objective is to obtain satisfied answer at the low cost. The principle is user-centered. The elements are problem solution provider, knowledge resources, solution receiver, knowledge organization tools driven by problem solutions. This form the level system with user layer, data layer, knowledge organization layer and knowledge resources service layer and finally achieve general design of　knowledge organization process.

3.　KNOWLEDGE ORGANIZATION BASED ON KNOWLEDGE UNIT MICRO DESIGN PROCESS

On the microscopic process knowledge organization is based on the knowledge unit, including data acquisition and cleaning, knowledge unit acquisition[24], ordering, relevance, regeneration, application and feedback process. The data is acquired and cleaned by question driven to answer the question. And data-resource base is supported by positioning. By means of the knowledge granularity principle different knowledge unit are created to represent data and its associated static[25]. Through the methods like clustering and classification, knowledge unit is ordering. Set up explicit and implicit association of knowledge unit by means of mapping between knowledge and users' question, and then form the network of knowledge unit. Using

reasoning algorithm and tool for deep mining and reasoning would promote new knowledge cell regeneration and as a source of new knowledge.

3.1 Problem oriented knowledge unit initial network creation

According to the types and characteristics of the problem with the problems and solutions related, required data and knowledge are obtained which are described on the basis of the knowledge unit, and knowledge unit can describe the correlation between problem driven and different knowledge unit[16]. Knowledge unit consists of name, property, operation, condition and navigation. Name is the object for knowledge unit study, areas under its jurisdiction included. Property is attribute set for all the knowledge unit. Operation is the method or ability for knowledge unit to solve problem. Navigation is the link among different knowledge unit, mainly including consistency, subordination and correlation. After the access to knowledge unit driven by problems, its information about condition and property would be modified for environment dynamically. For general problem, clustering analysis with knowledge unit property and condition, finding similar problem oriented knowledge unit, mining knowledge unit linear relationship with knowledge unit as the network nodes and forming problem oriented knowledge unit initial network from the linear relationship can directly provide answers to users. However, for the key and innovation problem, it needs to mine on the depth of knowledge unit net.

3.2 The semantic web knowledge unit based on knowledge warehouse building

In order to solve the users' key and innovation problem, there is no solution for knowledge unit net simple association. It is necessary to express knowledge and problem by the principle of granularity. Through the characterization for knowledge unit and problem, it lays a foundation for deepening knowledge unit and the relationship between knowledge unit. First of all, the process like selection, screening, classification and reasoning constructs question library, knowledge library, scene library, answer library and answer effect library. And the collaborative mechanism among different libraries forms the corresponding knowledge warehouse. By key and innovation problem driven, knowledge unit is the core[26], knowledge warehouse is the carrier and semantic relevance is the basis. Candidate knowledge unit pairs for question solution is formed by its condition and navigation. On the basis knowledge unit of semantic web is formed by deeply mining and reasoning with the new knowledge regenerating. At last, form libraries cooperative knowledge unit of semantic web, figure 2 shows the process for building knowledge unit of semantic web which support to solve the key and innovation problem.
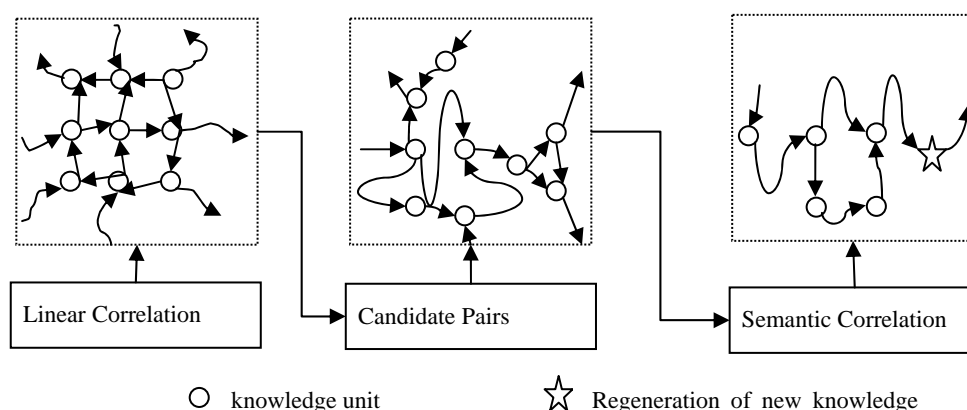

| Linear Correlation | | Candidate Pairs | | Semantic Correlation |

○ knowledge unit   ☆ Regeneration of new knowledge

Figure 2 unit semantic web build process knowledge

4. A SERVICE-ORIENTED APPLICATION KNOWLEDGE ORGANIZATION AND FEEDBACK

In order to resolve a contradiction that effectively solve the problem doesn't match knowledge, knowledge

organization is necessary to verify and improve the framework and structure through the practical application. In the filed of water conservancy industry information, regard problems of pumping station operation maintenance as breakthrough points, by gathering this, problems are divided into general problems, key problems and innovation problems. Knowledge unit is used to describe the pump station operation maintenance problems and mechanical or electronic knowledge for solving these problems. And the knowledge unit initial network and semantic web are constructed for pumping station operation maintenance. For users' general problem as an example: water collector can't collect water level. First of all, acquire the knowledge unit related water collector and its failure, and then form the knowledge unit initial network covered the front terminal and background of software failure. Seek variety of possible reasons for the failure by the way of problems stratification, lastly form initial network for solving the problem that the water collector can't collect level. As figure 3 shown.
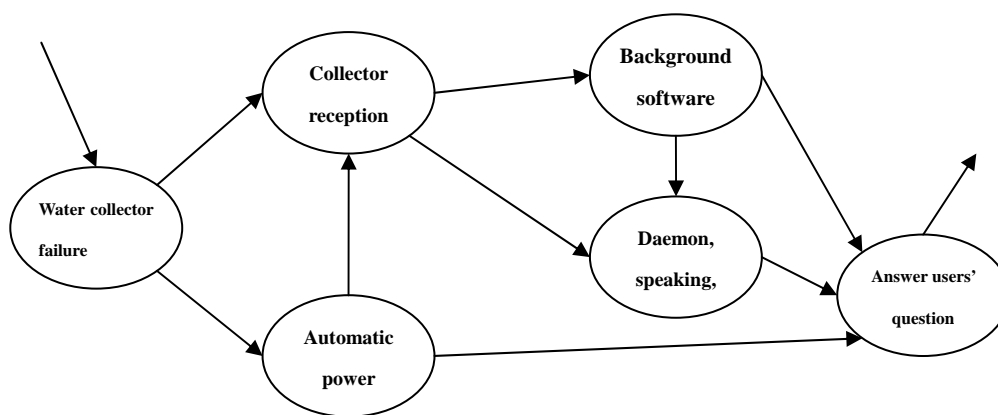

Figure 3 Initial network of water collector can't collect level knowledge of problem solving

From posing questions to evaluating the question answered affect, knowledge organization framework and structure continue to test, feedback and improve for improving the quality and efficiency to solve the problems. Knowledge organization and its practical application are realized by using visualization technology such as knowledge map. Through the similarity of questions and answers, answer library is improved. Also, knowledge organization framework and process are optimized and improved by the answer effects.

5.   CONCLUSIONS

Problem driven method to knowledge organization effectively avoids the limitation from the traditional knowledge organization to solve the problem and enhances the pertinence with problems and its solutions. Knowledge organization process is based on knowledge unit. With the help of granularity principle to describe knowledge and relationships, different level knowledge are organized by different problems as general users' problems, key problems and innovation problems. This form knowledge unit initial network and semantic network, at the same time this generate favorable conditions for creating the new knowledge unit. The next step is to continuously improve quantitative relationships that a relationship is between knowledge unit and users' problem and a relationship is between different knowledge unit through practical application, to facilitate the achievement of knowledge organization, with improving the quality and efficiency of problem solving.

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