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A DESIGN FRAMEWORK FOR ONLINE SUPPORT SYSTEMS OF E-GOVERNMENT IN CHINA

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Abstract

With development of e-government systems, there are many big changes in Chinese government's efficiency. However, the SARS revealed low efficiency is still serious. After the analysis of the factors affected on the efficiency, we find that traditional DSS is hard to support decision maker and that online support systems may improve the officials' work effectiveness better. Unfortunately, little attention has been given to the research. In this paper, we will discuss the cultural characteristics of Chinese government. And then, based on the theory of Time-based Competition in governmental workflow, we summarize the four characteristics of online support systems. Furthermore, we propose the design framework for online support systems (OSS) in context of e-government in China, which consists of three major parts: the single OSS, the collaborative OSS and the mobile OSS. Also the detailed function and procedure of the three parts are presented. Analysis shows that the OSS contributes to developing efficiency in the official decision making.

Keywords: Online Support Systems, E-government Systems, Time-based Competition

Introduction

In early 2003, SARS (Severe Acute Respiratory Syndrome) broke out and spread over the whole China. Superficially, it is the issue of medical field. In fact, it is a serious problem of low efficiency in government. In Hong Kong, some media accused local government of being "impotent" in handling this crisis [1]. Therefore, Wen Jiabao, the premier of the state council in China, said "SARS revealed the government should pay more attention to public service function and its efficiency, while keeping on strengthening the economic adjustment and social supervision," [2].

On the other hand, Chinese government began to build the e-government system in 2001. Many departmental projects which contain the "Golden Customs", "Golden Cards", "Golden Tax Revenue" and other computerized communications systems to

serve the governmental department with their names headed by the acronym "Golden", obtain enormous success [3]. And same time, from regional government perspective, the local government institute realized the online working and created their portal site to release information and provide the access of event processing for citizen and enterprise. With the further development of e-government systems, through reengineering the governmental process, some processing service realized the collaborative work across different departments [4]. In order to avoid the "information island" and achieve information sharing, the country has gradually build government information resource catalog system and exchange system.

Although the governmental operation efficiency is significantly improved, with the continuing promotion of Chinese democratization process, more and more citizen and enterprise asked the government to enhance the efficiency and effect in event handling. The media and the mass response to SARS are merely "a tip of the iceberg". It is necessary to deeply penetrate the inner governmental workflow to find out the major factors in daily work.

Through the investigation of decision node in governmental workflow, there are basically four main factors which affect the decision efficiency. Firstly, before dealing with an event, the official should take massive time to gather or confirm the correlative information by telephone or other e-government systems. Secondly, in practice, the problem need decision is often semi-structured or unstructured. Because the governmental policy is numerous and changeable, even the experienced official would spend massive effort finding the updating information. And the young officials are at a loss for inexperience although who have good capability of receiving new information. Thirdly, collaboration is inevitable in governmental workflow. Because government involves many departments, collaboration becomes more complicated and more information is required to support decision maker. Finally, in present China, it is difficult for the leader in government to have

enough time to deal with things in front of the computer. So, a lot of time is wasted in waiting for leader's treatment.

From what has been discussed above, we may safely draw a conclusion that exploitation of certain system to support decision maker is in great demand, which can improve governmental workflow's efficiency. Some research hit this point. Selber had proposed the concept of OSS and divided it into three classes. From the application perspective, he defined the OSS as "supporting users who must solve particularly pressing problems as quickly as possible and with a minimum of interruption" [5]. But it is unfortunate that further researches never show up.

The paper is organized as follows, in the theoretical background section, we discuss the tradition DSS theory and the culture of Chinese government, and based on the theory of time based competition describe the four characteristics of OSS. Next, we propose the design framework of OSS and explain every component in detail. Finally, we present the research contribution of OSS and future research.

Theoretical Background

In this section, we firstly discuss the DSS design theory and then prove traditional DSS is hard to support the decision maker in governmental workflow. Next, we describe the cultural characteristics of Chinese government. Through the application of the theory of Time-based Competition to e-government systems, we explain real-time supporting is OSS's critical feature. Finally based on the above analysis we summarize the characteristics of online support systems.

Introduction to DSS

Since the early 1970s, model-based decision support systems (DSS) have evolved significantly. The advent of the Internet has given rise to many new applications of DSS [6]. Many technologies such as DW, OLAP, and DM applied in DSS greatly enhance d the performance of distributed information processing and the ability of supporting decision makers who is dispersed in geography but collaborative with each other [6, 7]. However, "there are many well recognized examples of user resistance to model-based DSS in data-rich, uncertain environments" [8]. Similarly, decision support systems are rarely applied in the e-government systems. In some departments, the module with function of DSS is even ruled out. There are following reasons why traditional DSS is unfit for such governmental decision situation.

Firstly, Ujwal Kayande and his research group proved that the decision maker's mental attitude

impact on final decision. So, for lack of decision maker's mental models of the decision environment embedded in the DSS, the traditional DSS always have been excluded [9].

Secondly, in the government workflow, every task cannot be accomplished by single official or department. The official came from different departments and need to collaborate with each other. In order to support the official to make decision, the module should take account of the collaboration among decision nodes, but traditional DSS absent the function.

Last but not least, traditional DSS's models are hard to perceive the current decision environment. For lack of self-adapting ability, traditional DSS seemed to be in difficulty to apply in the governmental workflow, particularly with dealing with small decision.

Thus, in the context of decision nodes attached to daily governmental workflow, the traditional DSS fail to efficiently support decision making.

Culture of Chinese Government

No matter industry or academia has reached a consensus that any management information systems should be suit to local culture. Chinese culture has been regarded as typical eastern characteristics, which differs from the west [10]. The governments preserve the traditional Chinese culture [11]. Therefore, it is indispensable to take the local culture into account when studying the decision support in Chinese government.

In 1985, based on Hofstede's original four dimensions model, he conducted a "Chinese Value Survey" (CVS) and then proposed the well known fifth dimension, Long Term Orientation (LTO), which is also called Confucius values [12]. In 2001, he divided this dimension into the positive pole and the negative pole [10]. Such classification indicates that everything in this world has positive and negative side. So the ideal status is balance between them, and furthermore attaining *Hexie* among collaboration with interactive person. Many Chinese researchers believe that *Hexie* is the basic principle of Confucian value [12]. Especially nowadays China is rebuilding the traditional cultural values and the symbolized concept "*Hexie Society*" was proposed by Hu Jintao, the president of China.

The *Hexie* culture puts emphasis on alleviating contradiction among various kinds of involved person and organization. And this reconciling prefers evolution rather than revolution when new thing appeared. Recently, the e-government systems develop rapidly and departmental and regional e-government systems are taking shape. However rare decision support

system is embedded in them. Compared with rebuilding new e-government systems with DSS, the decision maker, prefers to amend the existing systems to conform to the user's decision requirement. Therefore, embedding decision support models in official's daily systems is acceptable under Chinese culture.

Background of TCB theory

Along with further deepening of government reform and the constant strengthening of expectation from the mass, the government is demanded to have more quick response within complicated, variable and uncertain environment. It required the official to deal with the events limited in a shorter period. In order to enhance the government efficiency, e-government systems need to provide suitable knowledge or decision suggestion to decision maker at the first time. However, current e-government systems only supply online office platform and workflow, and provide rare information and knowledge to the official. The theory of "Time Based Competition" (TBC) provides the new perspective and method for this problem. [14].

In 1988, Boston Consulting Group proposed that time is a competitive advantage resource. They believe that time-based competition is an important strategy to achieve the comparative advantage which is emphasized shortening the whole enterprise operating span including design, manufacture and sell [15]. The theory includes the original theory of Just-in-time (JIT) and subsequent Real Time Enterprise (RTE), which is brought forward by Gartner Group in 2001 [16]. The latter considers that utilizing latest information the enterprise eliminates the delay of management or implementation during critical business process so as to improve competition ability accordingly.

To e-government systems, the inspiration from the theory of TCB is that system should satisfy the real-time demand for decision point to eliminate the delay. From perspective of decision maker, the users hope that the system can provide "the right information to the right people at the right time, so can take action based on the information" [17, 18]. Therefore, the information and knowledge from the systems should guarantee real-time, trustworthy and match with the user requirements [18]. The information and knowledge should be embedded into the official daily workflow. Thus information and knowledge management is an independent and additional energy consuming work [19].

Online Support Systems of E-government in China

From the above analysis, traditional DSS is difficult to provide the information and knowledge to the official in time. Based on the analysis of the culture background of in China government, we address four characteristics of OSS based on TCB theory.

The first characteristic is that the decision problems are semi-structured or unstructured and can be solved by a person. If the problem is well-structured, the official's intuition can help him to solve the problem. If the problem is unstructured, it is difficult to solve by a person, to assure accuracy, group negotiation is required.

The second characteristic is that the OSS is process-driven. It cannot exist without the process workflow, which embedded in the official's daily workflow. When the process arrives, the OSS should provide effective information, knowledge or satisfying decision result. On the other hand, the OSS should be real-time to help the official to extremely save time.

The third characteristic is that the OSS can support the collaborative work. In e-government, for example, "Project Approval" needs more than one official to handle. If a system can provide the real-time and enough information and knowledge to decision maker in the process, it can enhance the decision-making efficiency.

The fourth characteristic is that OSS can support the mobile working. In government, there is a fact that the leader has rare time to deal with problems in front of computer and maybe unfamiliar with computer. So the mobile service in OSS is necessary.

As shown below, these characteristics make system designer feel it difficult to use traditional DSS theories to realize such systems. And then we define the online support system (OSS) as a design framework.

OSS Design Framework

In this section, we describe the architecture of OSS in context of e-government system, and then present every component in detail.

Architecture of OSS

As illustrated in figure 1, the architecture of proposed OSS consists of three major parts: the single OSS, the collaborative OSS and the mobile OSS.

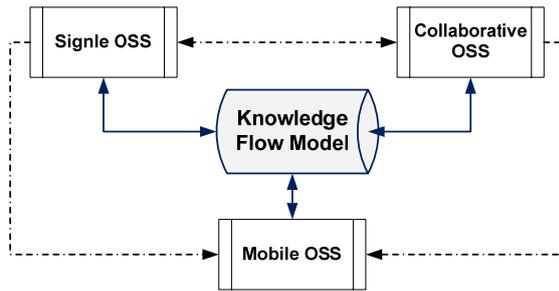


FIG.1. Architecture of OSS

It can be seen from the figure that knowledge flow model play important role during the whole architecture. The solid line represents knowledge flow, while the dotted line indicates invoked information or data in workflow. The single OSS serves official who can complete the process in the workflow without collaboration. The Collaborative OSS help the official cooperated with others in workflow by providing right information and knowledge at suitable time. In the light of the practical situation of leader working, the mobile OSS can provide the mobile information and knowledge to the leaders. The three parts would gain effective knowledge from the knowledge flow model, and then after accomplishing a process they would update the knowledge database.

Knowledge Flow Model

While workflow technology concerned the description and control of business process, knowledge flow model focus on the knowledge generation, transmission and application on workflow. Knowledge derives from the application scenario and previous solved problems. And representation and storage contributed the knowledge discover and reuse. Because knowledge is server for the person, the user play critical role in knowledge production and propagation. So, the primary question is to perceive the user's situation which is also decision problem environment. In knowledge flow model it is knowledge requirement which is designed to gather the demand of user and decision problem. And same time, knowledge requirement became the critical factors of implicit knowledge and its propagation.

Combining with workflow and knowledge flow is a major feature of this model. The OSS is process-driven, which require the knowledge to provide for the decision maker by right way when the process arriving. "Push" technology is simple and effective method for knowledge transferring. This method can automatically deliver the knowledge to the user. Its advantage is to avoid the search cost and needless knowledge transferring.

The validity of the provided knowledge is

another important problem. The case-based reasoning and another computerizing technology can help to enhance the accuracy of knowledge [20].

Single-OSS

When the official deals with a process in front of computer without collaboration with others, the OSS become the Single-OSS which automatically push suitable information and knowledge or decision suggestion to the decision maker according to the situation and preference. Figure 2 shows the basic building blocks of the procedure for online support systems. This is example of procedure for single-OSS. During the implementation, the practitioner can adjust the procedure according to the system situation. Although the procedure seems a little complicated, the effective information and decision suggestion can be pushed to user with the process arriving.

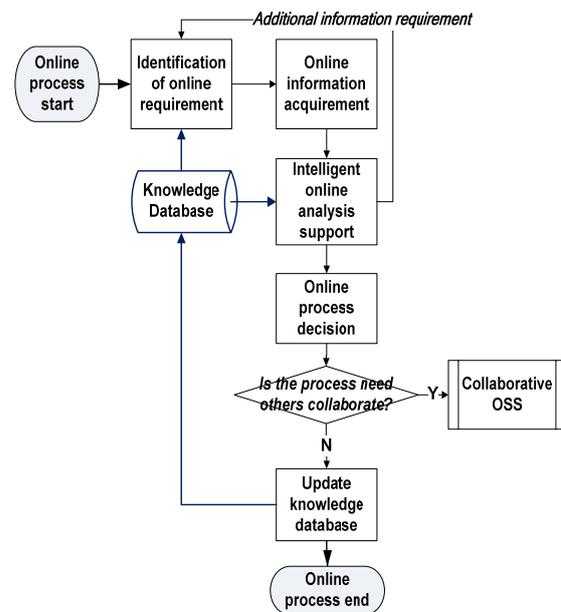


FIG.2. Procedure for Single-Online Support Systems

When an online process started, the single-OSS would identify the online requirement. The requirement is divided into pure information and knowledge requirement. The previous case, the official preference, and problem situation is all provided by knowledge database, the ingredient of knowledge flow model. And then knowledge requirement is acquired. Information requirement is formed according to the demand of workflow. The e-government systems gradually create the government information sharing mechanism. Authorized information requirement is permitted in e-government workflow. With the information and knowledge, the single-OSS begins to analyze the problem and receive the decision suggestion

provided by the previous method stored on knowledge database. If the single-OSS or decision maker found information absent, then the procedure would return the stage of requirement identification. If the process demanded to collaborate with others, the single-OSS would jump to the module of Collaborative-OSS. If the official solved the decision problem, the solution would automatically form case and store on knowledge database.

Collaborative-OSS

With the development of e-government, more and more citizen and enterprise want the government to provide the “one-stop” or “collaborative” service. So cooperating with other officials even other department is unavoidable. The collaborative-OSS doesn't focus on the collaborative process design. It concerns on how to help the official to make correct decision in the process node. Figure 3 shows the basic building blocks of the procedure for collaborative-OSS.

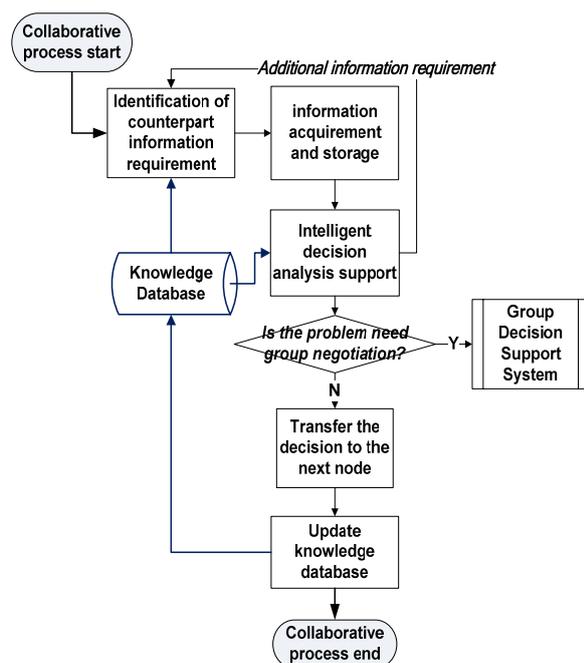


FIG.3. Procedure for Collaborative-OSS

When a task needs cooperation, the collaborative-OSS could be triggered. According to governmental workflow, we can find the counterpart who is next decision node. Furthermore, we can identify the counterpart information requirement. Similar to single-OSS, the information requirement could be divided into two parts. One is knowledge requirement, and another is information requirement. Knowledge is derived from knowledge database, while information is

provided by data collection from the single-OSS. Because it is common to move back and forth between the steps and even iterate the whole process several times, all these information could be store on local document system for the next iteration. With enough information and knowledge, the collaborative-OSS would compute and output the decision suggestion to push the decision maker by the predetermined model. At this point, the decision maker needs to determine whether this problem can be solved in this stage or need group negotiation. If the official find the problem is too complicated and cannot be solved in ordinary process, they can choose to enter the group decision support system. Otherwise, the official can make a decision and transfer the result to the next node. When the procedure accomplished, the solution would automatically form case to store on knowledge database.

Mobile-OSS

In China, governmental leader decision has own characteristics. On the one hand, the leader of government often hasn't enough time to deal with the problems in front of the computer. On the other hand, they generally would rather be familiar with the mobile service such as mobile phone than computer. So, in order to serve for leader decision, the mobile-OSS would provide a way to support the decision by the mobile device. The critical issue of the mobile-OSS is how to represent the information in limited mobile device interface.

As we all know, the mobile device interface is smaller than computer's and the data transmission speed of mobile communication is slower than the internet. In view of above factors, the interface for mobile device cannot simply be transplanted from the interface for computer. It should be adjusted to fit for the small display and limited network flow.

Conclusion

With development of e-government system and democracy, not only citizen and enterprise, the government itself required to enhance the governmental decision efficiency. In this paper, analyzing the traditional DSS, we find it is unsuited to support online decision in governmental workflow. After discussing the culture of Chinese government, we believe that giving up the existing systems and rebuilding the new one is impossible. So, based on TCB theory, we describe four characteristics of OSS, which can support the official decision in real time. Further, we proposed the architecture of OSS. It contains three parts, single-OSS, collaborative-OSS, and mobile-OSS. The single-OSS serves for the official who can complete the decision problem alone. The

collaborative-OSS is responsible for collaboration among different officials or departments. And the mobile-OSS support mobile decision handing for governmental leader.

In this paper, our main contributions are: (1) analysis of the main factors of low effective in government; (2) Form discussion of traditional DSS and Chinese culture, proposition of the OSS four characteristics based on TCB theory; (3) development of the OSS design framework. The further researches focus on how to realize such OSS and the crucial technology.

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