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Adoption and Penetration of e-Government Systems: Conceptual Model and Case Analysis based on Structuration Theory

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ABSTRACT

The study of IT/IS adoption has by far largely relied on social psychological theories which lack the capability to explain why and how systems continue to be used after they are adopted. Incorporating Structuration Theory from the sociology realm, this paper proposes a “structure-pattern” conceptual model for analyzing the adoption and application practice of e-Government systems from an organizational level perspective. Based on this model, a case study with regard to the practice of an e-Government application in Chaoyang District of Beijing City is conducted, so as to validate the interpretive ability of the model, as well as to reveal the evolution process of typical e-Government applications. Results from this case study may provide helpful insights for related practice. It is also demonstrated that Structuration Theory based Concepts and the case study methodology are promising for tackling the long existing difficulties in the traditional IT/IS research.

Keywords

IT/IS Adoption, Structuration Theory, e-Government, Case Study.

INTRODUCTION

The past decade has witnessed rapid progress in the application of e-Government systems in China. Seeing e-Government application as necessary infrastructure supporting the transition from administration-oriented towards service-oriented organizations, Chinese governmental agencies on various levels have all been strongly promoting its development. With the implementation of a series of initiatives called “Four Golden Projects” (Golden Bridge Project for public communication backbone network, Golden Tariff Project for foreign trade information network, Golden Card Project for banking and payment, and Golden Tax Project for tax levy) (Tang, 1998), as well as continuous efforts in extensively building governmental websites, e-Government application has become an integral part of the overall IT/IS growth in China (Ma et al., 2005, Zhang et al., 2009). According to reports released by United Nations and other organizations, the ranking of China in the chart of e-Government application maturity (or readiness) has been rising as well (UN, 2005, Liu, 2006, West, 2006). It is reasonable to predict that the e-Government development in China will keep its fast pace and enjoy a broad stage.

However, it should not be overlooked that, despite the rising in the ranking systems which are mostly based on evaluating the functions of government web sites, IT/IS application in Chinese governments still lacks the abilities to support achieving the goal of “providing more services and more convenience to citizens,” which is generally considered as the essential target for e-Government applications (Holliday and Yep, 2005). As has been mentioned in various literatures, the problem of ineffective investment and duplicate construction has long been troubling Chinese governmental organizations in the process of IT/IS application (Chen et al., 2007, Wang and Xu, 2009). One of the most important causes for this problem could be that the adoption and use of implemented systems does not last. Evidences from the practice in China revealed that, in many cases, the user acceptance of a new technology starts satisfactorily well when it is strongly promoted or even enforced to be used, but declines sharply after the initial stage is over (Zhang et al., 2010). Such short life cycle and insufficient utilization of e-Government systems have led to doubts in the value of e-Government investments (Wang and Wilson, 2005).

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Individual level IT/IS adoption research has shown that, in terms of user cognition, e-Government systems adoption largely depends on the perceived fit or compatibility of the system, while a low perceived fit is usually attributed to the misalignment between the system and the operations practice within the organization, as well as the lack of cross-system integration (the so-called “Information Islands” problem) (Zhang et al., 2010). Notably, these long-existing issues have been repeatedly illustrated in the annually released “China e-Government Development Report” (Wang and Xu, 2009). So far, however, no effective strategy or route has ever been proposed to evade such problems in e-Government projects.

On the other hand, although IT/IS adoption research has been prevailing in the IS area for almost twenty years, most studies in this field are conducted at the individual level, aimed at exploring the influence mechanism between individual cognition and adoption decision-making from a social psychological perspective (Benbasat and Barki, 2007). With respect to the organization-oriented complicated application systems such as e-Government systems, theories based on individual cognition provide fairly limited explanation capability. Furthermore, existing models for IT/IS adoption are mostly focused on the decision-making behaviors at a single time point, without considering the penetration and evolution process of systems in an organization. In other words, social psychological based theories, such as TAM (Technology Acceptance Model) (Davis, 1989) and its derived models (Venkatesh et al., 2007, Venkatesh et al., 2003), suffer from the lack of capability to explain why and how systems continue to be used after they are adopted. Although there have been efforts in attempting to explore post-adoption issues and interpret the continued use of IT/IS (Kim and Malhotra, 2005, Bhattacharjee, 2001, Bhattacharjee and Premkumar, 2004, Burton-Jones and Straub, 2006, Straub and Burton-Jones, 2007, Limayem and Cheung, 2008), most of them are still at the individual level and cannot be easily adapted to the organizational level. These limitations have, to a large extent, restricted existing research from providing more in-depth analyses on the IT/IS adoption and penetration mechanism in organizations.

In this context, we incorporate Structuration Theory from the sociology realm and propose a “structure-pattern” conceptual model for analyzing the adoption and application practice of e-Government systems from an organizational level perspective. Based on this model, a case study with regard to the practice of an e-Government application in Chaoyang District of Beijing City is conducted, so as to validate the interpretive ability of the model, as well as to reveal the evolution process of typical e-Government applications. Results from this case study may provide helpful insights for related practice. Meanwhile, as a classical theories in sociology, Structuration Theory has already been successfully applied in some research in the IS area (e.g. Orlikowski and Robey, 1991). In light of the study presented in this paper, we believe that this process-oriented theory and its corresponding qualitative research methodology are promising for tackling the long existing difficulties in the traditional IT/IS research.

BRIEF REVIEW ON THE STRUCTURATION THEORY

In 1970s, Anthony Giddens successively elaborated on the important thoughts related to Structuration Theory in a series of books. *The Constitution of Society: Outline of the Theory of Structuration*, published in 1984, was deemed as a summarization of the thoughts and thus became the most classical literature for Structuration Theory (Giddens, 1986). The theory is aimed at explaining the tension between social structures and acting agents, and emphasizes the continuous reproduction of social structure (Giddens, 1986). Through its notion of duality of structure, it attempts to overcome the classical dichotomy between structure and action characteristic of broad swathes of the social science literature (Reimers and Johnston, 2008a). Duality of structure means that, while structure constrains but also enables action, it is at the same time reproduced through the very actions that it enables and constrains (Giddens, 1986). As a consequence, structures cease to exist if they are not continuously reproduced through action. In other words, structures and actions are interdependent in such duality, forming a practice system of continuously dynamic evolution (Rose, 1998, Giddens, 1986).

As a classical theory in modern sociology, Structuration Theory has been frequently adopted in the IS field ever since the establishment of its theoretical system. According to the review by Jones & Karsten, by the end of 2002, relevant literatures in IS field have amounted to 200, including those published in leading journals such as *MIS Quarterly*, *Information Systems Research*, *Information Systems Journal*, and *European Journal of Information Systems* (Jones and Karsten, 2006). Generally speaking, literatures based on Structuration Theory in the IS field can be classified into four directions: (I) Reconstructing the theoretical system in accordance with the characteristics of IT, the most representative of which is the Adapting Structuration Theory (AST) proposed by Orlikowski & Robey (1991), etc.; (II) Using Structuration Theory as an analytical tool; (III) Using Structuration Theory as the meta-theory of other theories; and (IV) Defining objects in IS researches with concepts in Structuration Theory. As related efforts accumulated, there are also signs showing that the above directions may converge in the future (Orlikowski and Robey, 1991, Rose, 2001, Rose, 1998). The theory has also been applied to e-Government research, such as examining the organizational learning process during the project implementation (Phang et al., 2008), as well as analyzing the dynamic of system procurement and development (Devadoss et al., 2002).

In a recent research, Reimers and Johnston (2008b, 2008a) integrated the Structuration Model with the Practice Theory (Wenger, 2002) and proposed a Model of Reproduction and Reinforcement of Structure (MRRS), so as to analyze the adoption of inter-organizational information systems (IOIS) in particular industry sectors, which has produced encouraging results. This model divides the structures in IT/IS application practice into ideational structure, normative structure, and material structure, and defines different behavior “patterns”, so as to reinforce and extend the concept of duality.

THE STRUCTURE-PATTERN MODEL FOR E-GOVERNMENT ADOPTION

Based on the model proposed by Reimers and Johnston (2008a), and adapting it with specific adjustments in terms of the e-Government application environment, this paper proposes a structural model for e-Government systems adoption and penetration. With this model, a case study was conducted to analyze the application process of an e-Government system in Chaoyang District, Beijing, China. From a Structural perspective, the adoption and penetration practice of an e-Government system can be interpreted as a continuous and dynamic process in which social structures of an organization ceaselessly gives rise to the agents’ actions at the same time as it is produced and reproduced by such actions. Furthermore, Reimers and Johnston introduced the concept of “pattern”, which is borrowed from Practice Theory to indicate routine behaviors in a practice. Therefore, the backbone of this extended structural model can be described as such a image: social structures enable or constrain behaviors and/or perceptions, which in turn produce patterns; at the same time, patterns shape behaviors/perceptions, which further reproduce structures (Reimers and Johnston, 2008a). Consequently, the practice of IT/IS application in an organization can be explained as dynamic equilibrium in this “production-reproduction” cycle, which is continuously evolving.

Furthermore, structures in an organization can be divided into three aspects: ideational structure, normative structure and material structure. According to Reimers and Johnston (2008a), structures of those three aspects will usually trigger and produce three types of behavioral patterns correspondingly. In view of IT/IS application in governmental organizations, we crystallize the three types of structures into conceptions, institutions and processes (corresponding to ideational structure, normative structure and material structure). Conceptions represent the wills, attitudes and viewpoints of practice participants of the target e-Government system application. Institutions are norms and regulations (either explicit or implicit) related to the system application. Processes refer to the systematic and conventional utilization of the system. Corresponding to these three practical structures, three patterns of system adoption behavior are formed respectively, namely discursive patterns (spontaneous actions led by individual agents’ perceptions), sanctioning patterns (actions of judging the choices under explicit or implicit institutional sanctioning terms), and movement patterns (stable, conventional, habitual actions). Thereby, a “Structure-Pattern” conceptual model for analyzing the practice of e-Government system adoption and penetration is established, as shown in Figure 1.

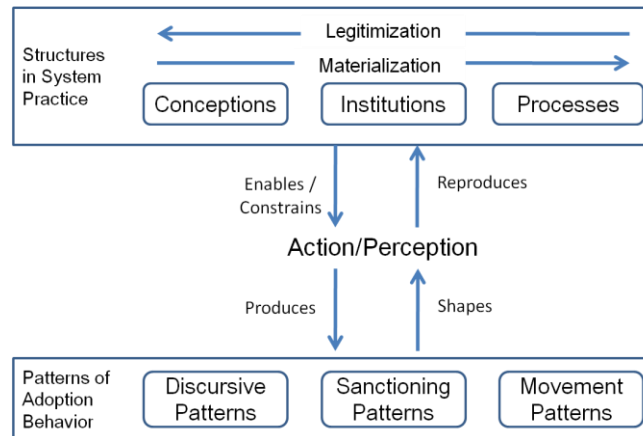


Figure 1. “Structure-Pattern” conceptual model

The evolution of an IT/IS application practice can often be traced back to the original ideational structure or material structure. With regard to e-Government systems, the origin is usually a specific conception structure. On the one hand, a discursive pattern of system adoption behavior is created under the dominance of the conception structure, and it then further triggers a series of structure reproduction and behavioral pattern evolution, which gradually materialize the conception structure into institutions and processes. On the other hand, within specific processes structures there can also emerge new movement patterns of behavior, and it also induces structure reproduction and behavioral pattern evolution, which gradually conceptualizes the material structure into institutions and conceptions.

Based on this model, it can be concluded that a successful e-Government system application practice should embody a healthy and balanced evolution of practice structures and adoption behavior patterns. In the materialization direction, the conceptions of system application give rise to relevant agents' actions and cognition, while these conceptions themselves are amended and even improved through continuous reproduction, as well as consolidated into institutions and processes. In the legitimization direction, new system use actions emerge in process activities, while the process structures themselves are reinforced and even optimized by repeatedly reproduction, as well as abstracted into institutions and conceptions. On the contrary, an unsuccessful e-Government system application practice usually embodies a structural imbalance in the above-mentioned evolution. Therefore, issues that emerge during the implementation and promotion of the system can often be interpreted and understood through analyzing the interactions between practice structure and behavioral patterns.

In the rest of this paper, we will use this "structure-pattern" conceptual model to examine an e-Government application practice in Chaoyang District, Beijing, China, so as to validate the model's interpretative ability and to analyze the issues and lessons that can be drawn from the implementation and promotion of this system, which we believe would provide helpful insights for the management of similar application practices in governmental contexts.

RESEARCH METHOD

The research is conducted in compliance with a normative case study methodology. The target system is the "Quan Chen Dai Ban" (meaning "one-stop service" in Chinese) system, which is developed and implemented by the government agency of Chaoyang District, Beijing China, in 2005. The system was defined as a workflow management system, with users being government employees working in the service halls of the district's subordinate areas. Through the implementation and application of this customized e-Government system, this project was aimed at standardizing workflows of daily public services in Chaoyang's subordinate areas, as well as facilitating superior authorities' supervision and assessment. As an ordinary e-Government project of a local government, the case of this project may, to some extent, reflect some general characteristics of similar projects.

In the research process, we laid much emphasis on the diversity of data sources during the collection of evidence and materials. Current evidence for analysis include: responses to the open questionnaires distributed in May, 2006; observation records of the project and part of the system usage records collected by one of the authors in the IT Office of Chaoyang District from March 2006 to March 2007; records of two field interviews conducted in May 2007 and October 2008 respectively; documents such as announcements, reports, and regulations provided by the government agency during the promotion of the "Quan Cheng Dai Ban" system. In addition, in order to secure a better construct validity of this study, we paid special attention to the diversity of data sources during the interviews. We interviewed the person in charge of this project in the IT Office, as well as people in charge of relevant works in subordinate areas and end-users of this system, so as to construct an evidence triangulation to reduce the limitations caused by the choices of interviewees to the greatest extent (Yin, 2003).

In order to secure a better internal validity of the study, we conducted coding and scheme matching on the relevant qualitative research data collected. One problem that scholars in the IS field have long been faced with is how the above-mentioned methods are effectively employed in examining and exploring the high-level theories in sociological research. In our research, we methodologically refer to the top-down and bottom-up combined approach proposed by Reimers and Johnston (2008b). As shown in Figure 2, we first sorted the interview records and other raw materials and induced "rationales" from them, and then interpreted the case facts with the model deduced from the high-level theories.

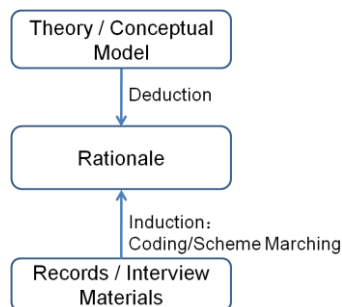


Figure 2 Research Method

Table 1 demonstrates an example of origin of a "rationale". Various materials related to the impacts of superior instructions or directions are concluded in the "government policy impact" rationale, which is then treated as an evidence for the

existence of institution structures. By this means, we created a logic link between the conceptual model and the empirical facts with rationales.

RATIONAL	ABBR.	CORRESPONDING RECORDS / MATERIALS
Government Policy Impact Rationale	GPIR	D122: unlike scientific research institutions, government mainly receives arrangements from higher authorities. Since the “Quan Cheng Dai Ban” is arranged by the higher authority, we all consider it as responsibility of our department.
		A 200: As the grass-root cadre who is better acquainted with the “Quan Cheng Dai Ban” system in her area, the interviewee cannot separate relevant work of the system from her daily routine work. In her point of view, whether to use the system or to receive orders from higher authorities makes no difference, and she and her subordinates will all follow the instructions (description.)
		Y203: It is rather troublesome to use the system as it requires repeated labor. It is just that higher authority requires us to use it.

Table 1. Government Policy Impact Rationale (As an example)

CASE ANALYSIS

Using the research method described above, we conducted coding and analysis on the related materials in the implementation and promotion of the “Quan Cheng Dai Ban” system since 2006 as well as records from the two rounds of interviews. The analysis results reveal significant mutuality that inhabits between system application practice structures and adoption behavioral patterns. Furthermore, various problems encountered during the implementation and promotion can also be effectively explained using our “structure-pattern” model. In this section, we will follow the logic of the conceptual model in recounting and discussing the evolution course of the application practice of this system.

This e-Government system application practice originated from an ideational structure in the organization. From 2005 to 2006, demands for the “Quan Cheng Dai Ban” system appeared along with the emergence of the idea of “one-stop service agent”, which has been the prime focus in all the promotion activities conducted by the city of Beijing and its subordinate counties and districts. During the field interview, interviewees from various departments all expressed a high level of recognition and consensus towards the idea of one-stop service and the original intention of improving public services quality, which is also a reflection of results from first-phase propaganda. However, system use in the corresponding period demonstrates significant cross-regional differences and abrupt fluctuations. According to the records automatically kept by the system from January to August 2006, the usage in some areas was satisfactory, but in 23 out of 43 subordinate areas, the system had never been used. In addition, a video training was conducted in May 2006. According to the system usage records, the training significantly promoted the application of this system, resulting in a doubled volume of usage within a few days. In the subsequent several months, however, the volume went on a downward trend, failing to maintain the high level. These phenomena reflect a typical discursive pattern of adoption behavior, which was aroused by the structural feature of conception-dominance in the early stage. Although the system was planned as a mandatory project, the implementation and promotion largely started with ideational structures and discursive adoption patterns. Existing research with regard to mandatory acceptance environments usually assumed that there is little variance in usage in such contexts (Venkatesh et al., 2003, Hartwick and Barki, 1994). Our investigation, however, reveals that at least in an ideationally mandatory environment, the adoption behavior can be discursive.

This discursive pattern of adoption behavior continuously reproduced the conception structures, which in consequence gradually transformed and transferred, and also started to shape some particular institutional structures. As the inadequate utilization of the “Quan Cheng Dai Ban” system remained, and the effects of measures such as training were proved not to be lasting, at the end of 2006, the IT Office of Chaoyang District decided to include the use of the “Quan Cheng Dai Ban” system into the annual performance evaluation, accounting for a weight of 15%. This decision was actually carried out in 2007 and also led to the establishment of corresponding regulations in many subordinate areas. Such a change highlights the materialization process from conception structure to institution structure. While the structural transformation emerged, behavioral patterns of system adoption also changed. In 2008, instructions and regulations with regard to the system were all well executed. According to the third interview in October 2008, the volume of system use had been secured at a certain level even though in subordinate areas there were still some doubts concerning the system design and usability. Such use actions secured by rules and regulations can be regarded as a typical sanctioning pattern.

However, in this case, conception structures and institution structures eventually failed to materialize into process structures, and the movement patterns of adoption behavior integrated in daily work failed to emerge either. Currently, the IT Office of Chaoyang District is not at all satisfied with the status of application and use of the “Quan Cheng Dai Ban” system. In fact, as early as in 2006, they already tried to integrate the “Quan Cheng Dai Ban” system with an internal “Online Approval” system, so as to enhance the alignment between information systems and operations. Should such integration succeed, it would be possible to result in a stable process structure from the practice dominated by conceptions and institutions. During the interview, the person in charge of the system mentioned this plan time and time again, but also conveyed the worries about huge obstacles. On the one hand, key governmental departments such as taxation and treasury all have their own “Golden” projects respectively, which all adopt a vertical management model from the central government to local agencies and run own independent systems with proprietary data formats. On the other hand, currently there is no power that can push government agencies on various levels to break the barriers and promote horizontal integration. In the case discussed here, these formidable difficulties restricted the application practice of the system in the sanctioning pattern of adoption behavior dominated by conceptions and institutions, without further evolution or development.

The analysis above validates the internal relationship between practice structure and adoption pattern during the implementation and utilization of an e-Government system. The paradox is that, on the one hand, local government agencies are keen to realize service integration, which may lead to stable process structures and movement patterns of adoption behavior; on the other hand, their actions repeatedly (and often unconsciously) reinforce the institution structures due to the constraints of environmental difficulties and institutional inertia. Such misplacement between practice structure and systems expectation may be the fundamental cause for the failures of many e-Government projects. This finding may be helpful for understanding the question why information systems use cannot last in many organizations.

CONCLUSION

This paper introduces the sociological Structuration Theory to the research of e-Government systems adoption and proposes a “structure-pattern” conceptual model based on the work by Reimers and Johnston (Reimers and Johnston, 2008a) for e-Government systems application practice, in an attempt to establish it as an effective framework for interpreting and analysing relevant practice cases. With a case study on the “Quan Cheng Dai Ban” system implemented in Chaoyang District, Beijing China, we illustrate a typical evolution course of practice structure in the implementation and promotion of e-Government projects Chinese governmental organizations, and reveal the interactions between structures and patterns in that discourse. Results from this case study may provide helpful insights for related practice. Meanwhile, this study also shows that the “structure-pattern” conceptual model possesses a strong empirical interpretive ability. Furthermore, it is reasonable to believe that Structuration Theory based concepts and the qualitative case study methodology are promising for tackling the long existing difficulties in the traditional IT/IS adoption research (Venkatesh et al., 2007, Benbasat and Barki, 2007), such as inadequate analysis on differences of specific settings and absence of interpretive ability toward the behavioral changes after adoption.

One limitation of the current study is that we were unable to define the individual and organizational levels distinctively in our dataset. Consequently, parts of the case analysis are not sufficiently in-depth to generate more meaningful explanations on the penetration and evolution process of e-Government systems. On-going research is aimed at extending the framework for multilevel study and conducting multiple case analyses.

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