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Key e-government issues in China: an empirical study based on the orientation-maturity framework

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Abstract The Chinese government has long been striving to promote the development of e-government by using information communication technologies (ICT) in the public sector for accelerating administrative transformation. e-Government projects in different sectors of Chinese governmental agencies, however, often start with multiple objectives and are performed in different ways. To understand the general characteristics of e-government in China, this paper investigates the key issues of e-government through a questionnaire survey, and proposes a specific analytical framework, the orientation-maturity framework for better explaining the key issues. Based on data collected from Chinese government employees, this paper ranks the key issues related to e-government and discusses the implications of the results based on the proposed framework. The findings provide a helpful reference for both practitioners and scholars to better understand the current state of e-government in China and to respond to the forthcoming challenge of administrative transformation caused by the diffusion and utilization of ICT.

Keywords e-Government · Key issues · Orientation-maturity · ICT diffusion

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1 Introduction

As China shifts from an isolated, centrally controlled economy to a market that is open to the global economy [1, 2], both central and local government institutions are undergoing fundamental administrative reforms for the purpose of adapting to the new economic system [3]. The principal goal of the administrative transformation of China in the global economy is to change from a control style to a service style of government [4].

During the course of this transformation, the penetration of information communication technologies (ICT) and the development of e-government are bringing dramatic changes to various organizations and individuals in the Chinese government. As one of the driving forces of ICT application, the Chinese government has long strived to promote the use of ICT and has been rewarded with its e-government application (or readiness) receiving a continuously increasing global ranking [5, 6]. Partly motivated by its preparation for the Olympic Games and its accession to the World Trade Organization (WTO), the development speed of e-government implementation in China has continued to accelerate [7].

Because advances in ICT have provided many potential opportunities for cross-sector integration and administrative process reengineering that can improve public services and accelerate government efficiency, in 2005, the UK identified the transformational government as a novel e-government strategic plan based on three key themes: citizen-centric government, the development of shared services and ICT professionalism [8–10]. Several influential models of the developmental stages of e-government consider transformation or similar procedures to be either a senior or a final stage [11–13]. There is no doubt that ICT diffusion will lead to transaction integration, process reengineering and administrative transformation; then, it will finally create a more citizen-centric prefect government. The Chinese government also expects to foster administrative reforms by transforming government functions, streamlining procedures and enhancing administrative transparency through e-government applications [3].

One effective tool in describing the characteristics of e-government in the transforming China is the e-government key issues survey of chief information officers (CIOs) at different levels of the public administrative sector. Key issues in information technologies and information systems (IT/IS) management are generally defined as the primary set of challenges facing IT/IS managers over the next three to 5 years that deserve the most resources, time, and attention by IT/IS management [14]. Because today's government IT/IS departments are confronted with various challenges in a fast-changing environment, the key issues of e-government construction involve the government's main requirements, the primary focus and the challenges of e-government construction now and in the future. The research on the key issues aims to explore the government's cognition and attitude towards related problems and discusses the government's focus on the construction process to identify valuable e-government experiences by analyzing the rankings of those key issues [15].

This paper goes beyond the key issues studies, which simply report the top rankings and discuss the reasons for those rankings, to propose a specific analytical

framework—the orientation-maturity framework—for distinguishing key e-government issues in China. It also discusses managerial implications based on the proposed framework and the 2012 survey data from CIOs at various levels of the Chinese government sector. Related e-government development strategies in the transformational China are also discussed. The findings may be a helpful reference for both practitioners and scholars to better understand e-government development in China.

2 Literature review and theoretical framework

2.1 Key issues research on IS and e-government

In the early 1980s, the first study that surveyed IS executives and managers to identify the key issues in IS management appeared in the Society for Information Management (SIM) of the US [16]. In that study, a set of candidates for key issues was proposed by a group of experts from SIM and was later evaluated by 417 of the group's members. The result of the analysis indicated the most important IT/IS issues for US organizations at that time. Later, this method of gathering and reporting IT/IS issues was periodically replicated in the US [15, 17–19]. These surveys, which found that top issues evidently changed over time, were considered to reflect the evolutionary characteristics of IT/IS management in US organizations [20].

Since the early 1990s, studies of key IT/IS issues have been extended to other regions of the world [14, 21–26], including Hong Kong, Taiwan [27, 28], and mainland China [29, 30]. From an industrial perspective, since 1987, the CSC has continued its annual surveys of enterprises worldwide related to critical IT/IS issues, along with its incremental longitudinal analyses. By 2001, these surveys had been conducted 14 times, which resulted in an accumulation of rich historical data and the revelation of some trends in IT/IS management [31]. Some other researchers compared and contrasted the findings of such surveys in various nations or regions, seeking to identify and explain regional similarities and differences. In 1991 and 1997, Watson et al. reviewed the studies of key IT/IS issues twice [20, 32] and stated that the issue ranking would likely be influenced by four dominating factors: economic structure, national culture, political/legal environment, and technological status [20]. Until recently, key issues research has remained an important topic in the ICT field [33, 34].

The past two decades have witnessed the dramatic development of ICT applications in government organizations, and the topic of "e-government" has increased to become one of the central research issues in the field of information systems [35–37]. The adoption of ICT has made a significant impact on the relationships between governments (G2G), governments and citizens (G2C), governments and businesses (G2B), and governments and employees (G2E), and it has strongly pushed the transformation of governments [9, 38, 39]. Along with the development of e-government applications, policy makers and other practitioners have been confronted with emerging challenges introduced by the new systems. In

recent years, issues related to ICT evolution, adoption, and diffusion in government organizations have been widely addressed at international academic conferences and in major IT/IS journals [35, 40–42].

The early study of key IT/IS management issues in the public sector was conducted in the early 1990s, when some researchers attempted to survey and discuss the diversity of key issues between governments and corporations [43]. Since that time, empirical research on this topic has not continued. However, with the development of e-government, lessons have been learned from e-government practices, including the planning and implementation of numerous e-government initiatives worldwide. Scholars and practitioners have collected lessons about critical issues from case studies, surveys, and post-implementation audits that, if applied to future e-government initiatives, may increase the potential for success. Based on these studies and practical experience, some researchers have examined key or critical issues for e-government application through literature reviews [44, 45]. In this way, critical issues have been identified as having a significant impact on the success of e-government programs. These studies have used program management and aspects of marketing theory as frameworks to classify and analyze key issues [45]. Based on these efforts' insights into e-government application and management, the time is ripe to probe the key issues in e-government management. Furthermore, it is reasonable to expect that key issues in e-government management differ significantly differ from those of companies due to the special characteristics of government organizations.

In mainland China, studies of key issues have also been conducted during the past few years and have aimed to identify IT/IS managers' important concerns, to discover longitudinal changes over the years, and to compare these concerns and changes with those in other regions [29]. Although these studies are valuable for understanding the situation and challenge of IT/IS management in China, they have not yet been extended to the government context.

2.2 Orientation: technology, service and organization

Many scholars have conducted research on the relationship among the service, technological and organizational perspectives on ICT use. Such research has the potential to be very important because it will influence the way that people understand the relationship between a new technology and service, and in particular, it most likely will require the building of better user relationships and the restructuring of the service function, which will allow technology to better serve users [46]. In the e-government context, "providing more services and more convenience to citizens" has generally been considered to be the essential purpose of an e-government application [47]. When constructed, the model of e-government user satisfaction used by Scott et al. divided its quality evaluation into system quality and service quality and used this distinction to describe the difference between technology and service [48].

An e-government system can not only be viewed as a type of information technology to improve government management but can also be viewed as a service function to enhance the capacity of the government's service to the public. Concern

over the service function while abandoning information technology and concern over information technology while abandoning the service function both result in bias. Some IS literature has focused on users' adoption of e-government services [49–51]. Wixom and Todd have discussed user satisfaction instruments as occupying three categories: information quality, system quality and service quality [52]. Kang and Lee subsequently have validated the impact of information quality and system quality on user satisfaction in the online service context [53]. In a study by Susarla et al. [54], a conceptual model of satisfaction with an application for providing services, the authors attempt to divide the expectation concept into functional capability and technical performance guarantees. However, those two sub-factors are situation-specific. Moreover, in many e-government projects, organizational change should be considered beyond the technology and service perspectives [36, 38, 44]. Therefore, the view of information systems—especially e-government systems—from multiple perspectives is both necessary and supported by the previous literature.

Mirroring the connotative characteristics of e-government construction, the orientation dimension is an application carrier of such theories as information systems, customer relationship management (CRM), and administrative ecology in its construction. e-government's different goals would lead to different results and evaluations. Therefore, the orientation dimension in the study is divided into three types of factors, including technology, service and organization, whose definitions are shown in Table 1 as follows:

2.3 Maturity: inclusion, interaction and integration

The research on stage models of ICT adoption can be traced back to some classical theories that tend to describe the development process of ICT application and utilization in organizations as connected phases consisting of evolution and revolution [55, 56]. A few stage models also have been proposed for e-government [11–13]. Considering e-government from the perspective of the use of ICT to enhance access to and delivery of government information and service to citizens, Layne and Lee have provided a four-stage framework for understanding the

Table 1 Factors of the orientation dimension

Factor	Definition
Technology	The software and hardware basis for guaranteeing the smooth operation of an e-government system and the technological means to ensure the safe and steady management of information flow
Service	The government's service items offered to users by an e-government system and relevant measures to improve service value and efficiency
Organization	The government's improvements to organizational structure and management behavior so as to facilitate e-government construction of or innovation in the government's management mode

Table 2 Stages of maturity dimension

Stage	Description
Inclusion (I1)	To motivate e-government strategy, the government establishes internal departments and staff responsible for building e-government and installing base software and hardware facilities, which reflect a specific efficiency direction. This can improve efficiency inside the organization, reduce administrative costs and make online information inquiries very convenient for enterprises and individuals, which create the conditions for the construction of e-government to follow
Interaction (I2)	The government fully boosts an e-government and departmental cooperation development strategy and formulates a scheme for e-government construction and management. On the basis of the technological upgrading of an e-government system, the government's service function is gradually incorporated into the system so as to permit people to enjoy online administrative services and realize online interaction between government and the public
Integration (I3)	The government makes an overall plan for the development strategy and technological framework of e-government, establishes a service philosophy centered on users in the construction of e-government and takes the initiative to boost organizational recombinations and renovation of business processes. Thus, it provides the general public with one-stop and seamless online service and effectively constructs performance management mechanisms so as to improve the government's administrative capability, social democracy and management innovation

e-government development process, which includes the catalogue stage, the transaction stage, the vertical integration (local systems linked to higher levels) stage, and the horizontal integration (systems integrated across different functions) stage [12]. Siau and Long have conducted a meta-analysis on several e-government stage models and synthesized a new model that includes five stages, namely web presence, interaction, transaction, transformation, and e-democracy. Obviously, the transaction stage plays a very important role as a connecting link between the preceding and the following stages [13]. The follow-up studies have developed revised stage models of e-government maturity [57, 58]. Although stage concepts have been defined to explain some of the phenomena of e-government development, inclusion (presenting), interaction and integration have often been observed as three fundamental stages.

The maturity dimension reflects the influence of value on key issues. On the basis of e-government development, the promotion of maturity shows a change in e-government construction from simplicity to complexity and low to high value. This dimension passes through three stages, including inclusion (presenting), interaction and integration, in which the maturity of e-government is described as shown in Table 2.

2.4 The orientation-maturity framework

An appropriate analytical framework should increase differentiation among key issues and provide a better sense of their levels, while making it convenient for researchers to discuss their research results within the framework. By consulting the
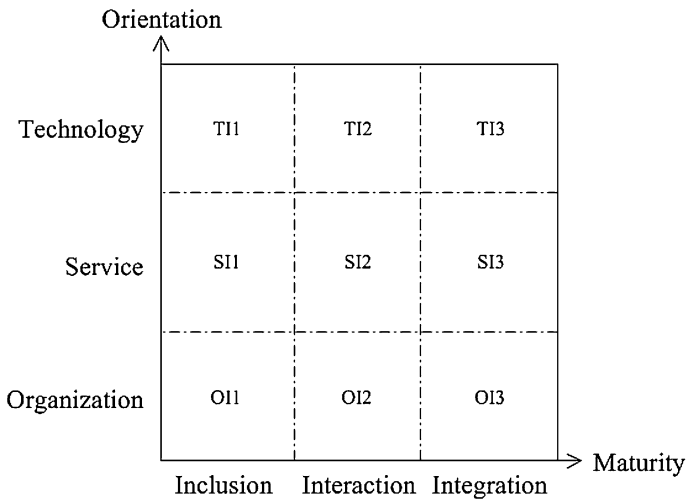
Fig. 1 The orientation-maturity framework

discussion of two dimensions—orientation and maturity, mentioned in the above two sections—this study attempts to propose a new framework for distinguishing key issues in e-government. Although the orientation dimension explores the connotative characteristics of the key issues related to e-government construction, the maturity dimension substitutes for different core functions in different development stages of e-government. Thus, in the research, orientation and maturity are used as two basic dimensions for supporting the analytical framework.

With the division of orientation and maturity, the key issues possessing specific connotative characteristics and value influence find their corresponding factors and stages from the two dimensions. Therefore, a projective relationship is established between the key issues and the two dimensions. Each key issue corresponds to one cell in the orientation-maturity matrix, as shown in Fig. 1.

3 Empirical study: method and data

3.1 Candidate key issues

In the first step, we selected candidate key issues based on the literature. In all 34 candidate items, 26 items inherited a key issues set from a former study conducted in the corporate context in 2005–2006 [30]; some expressions of the issues were slightly adjusted to be more consistent with the governmental context. The other eight items were collected from some recent related work in the field of e-government [42, 44, 45, 49, 59–62]. Table 3 shows the content and original literature of those eight additional items.

In the second step, following the Delphi method, we attempted to establish a connection between the candidate items and nine cells in the research framework.

Table 3 Additional candidate items

Additional items	Original literature
Testing, obtaining feedback and modifying the technical project before running the system	[42]
Adopting uniform technical standards and integrating technical architecture	[44]
Ensuring the timeliness and validity of information provided	[59]
Ensuring that the e-government system protects users' privacy	[42, 45, 60, 61]
Ensuring the ability of citizens to use the technologies	[59]
Promoting the scope and use of the e-government initiative to citizens	[42, 45]
Adopting a customer-centric approach to e-government design and operation	[62]
Promoting the value of e-government to the public	[49, 59]

The actual process of the Delphi method included three rounds of e-mail surveys sent to two expert groups (a practical group and an academic group). The first round of surveys was sent to seven IT-management experts who worked in the Beijing government and who did not participate in this study's formal questionnaire. The participating experts were requested to classify 34 items by categories set out in nine cells or to classify them by a category named "unable to distinguish". The second round of surveys was sent to eleven university faculties and doctoral students engaged in related research; they were requested to perform the same task as the first-round survey participants. The object of the third round was the same as the first round: the experts in the practice group were requested to make final judgments under the premise of fully considering the results of the former two rounds. After three survey rounds, the experts' opinions basically converged: 28 of 34 candidates' key issues were classified as nine cells, and the remaining six items were considered as difficult to place in any one single cell. This result does not mean that those six issues were unimportant but illustrates their importance either in continuous e-government affairs at different maturity stages or related to the intersection among the technology, services and organization perspectives. Because this research attempts to interpret differences in key issues of e-government based on the orientation-maturity framework, we eliminated six candidate items and retained the other 28, which were placed in nine cells (listed in Appendix 1) in the final questionnaire.

3.2 Survey

The survey sampled government employees who had participated in the training series "Information Technology and Government" at the author's university during the last 5 years. In total, the database included 1,854 people. We randomly selected 10 % of those people, or 185 candidates, to receive questionnaires. Our survey was conducted from January–March 2012. In our questionnaire, we asked public-sector employees to rate 28 candidate issues on a five-point scale. Aside from our inquiry

Table 4 Geographical distributions of the samples

Locations	Samples	Rates (%)	Provinces
Eastern	28	25.93	Jiangsu, Anhui, Zhejiang, Fujian, Shanghai
Southern	11	10.19	Guangdong, Guangxi, Hainan
Central	14	12.96	Henan, Jiangxi
Northern	21	19.44	Beijing, Hebei, Shanxi, Neimenggu
Northwestern	8	7.41	Xinjiang, Gansu
Southwestern	11	10.19	Yunnan, Xizang, Chongqing
Northeastern	15	13.89	Liaoning, Jilin
Total	108	100	

about respondents' basic information, the main contents of the questionnaire are shown in Appendix 2. The questionnaires were delivered via e-mail, online survey sites and face-to-face interviews. In total, we received 128 responses. After excluding incomplete responses, we were left with 108 usable questionnaires for our final analysis.

The study combined convenience sampling and random sampling. We recognize the fact that all respondents came from the same training program, which would lead to sample bias. However, direct random sampling surveys usually receive very low response rates. A survey based on alumni networking was the only viable option for obtaining a sufficient number of responses. Moreover, because the respondents came from 21 provinces of China, we are convinced that the results reveal key issues of e-government in China generally. The geographical distribution of the sample is shown in Table 4. Although the respondents worked at different administrative levels, they were either sector CIOs or high-level employees with important influence over the decision-making process related to e-government issues in their sectors.

3.3 Reliability and validity

Having carefully scanned the recent literature on key issues [33, 34], no other study is found to have used statistical methods to measure reliability. In this study, we can only discuss the reliability issues qualitatively. First, we verified the identity of all of the respondents to ensure that they had sufficient knowledge and ability to complete the questionnaire. Second, we clarified the pure research goals of the survey to all respondents to ensure that they reported their real attitudes and did not worry that the survey would affect their performance evaluations or promotions.

Following Chen et al. analysis of variance (ANOVA) was used to measure the validity of the instrument [29]. The results showed that with a significance level of 0.01, the 28 issues could be differentiated. Therefore, it was considered valid to rank the issues with their average scores. Moreover, we also used Fisher's Least Significant Difference (LSD) test for comparing the treatment group means among the nine cells. The results show that the key issues average scores of three

orientation factors—technology, service and organization—have significant differences among their three maturity stages.

3.4 Top e-government key issues in China

The reliability and validity tests mentioned above provided us with the top ten e-government key issues in China. Those key issues and their rankings and mean values are shown in Table 5.

4 Results and discussion

4.1 Comparison of orientation dimensions

A comparative analysis was conducted of the average scores of the issues in the cells. The construction subject's characteristics of maturity stages in the different orientation dimensions—technology, service and organizations—were revealed by comparing the scores of the cells.

Among the three cells corresponding to the technology factor, the technology-interaction (TI2) has the highest score; the next-highest scoring cell is technology-inclusion (TI1), and the technology-integration cell (TI3) is the lowest (see Fig. 2). It is clear that current government CIOs' value judgments about technology have surpassed the stage of simple information technology application; they attach importance to interaction and compatibility in e-government system adoption, and the main characteristic of the value judgment corresponds with the technology-interaction cell. Under these circumstances, the CIOs emphasize an efficient and high-quality operation and the interactive application of information through technology. However, this result also reveals that current CIOs fail to show much

Table 5 Top ten e-government issues in China

| Rankings	Key issues	Mean values
1	Acquisition, organization, and utilization of high-quality data	4.472
2	System integration among departments for one-stop service center usability	4.398
3	Ensuring the timeliness and validity of information provided	4.324
4	Long-term and consistent ICT development planning	4.278
5	Aligning ICT in strategic planning	4.167
6	Work flow re-designing and organizational restructuring	4.167
7	Connecting governments, enterprises, and citizens through ICT	4.130
8	Testing, obtaining feedback and modifying technical projects before system running	4.065
9	Ensuring citizens' ability of citizens to use the technologies	4.037
10	Internal managerial and organizational levels of IT/IS departments	4.000
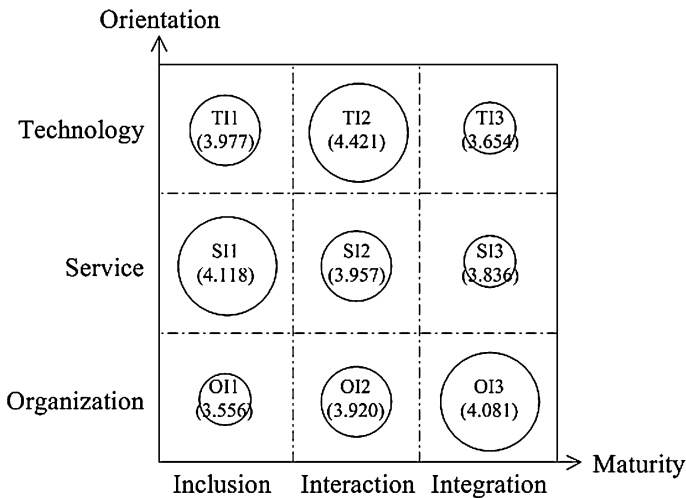
Fig. 2 Analysis results

concern for integrating technical norms and functions. Therefore, the technology-integration cell scores lowest among the technology factors.

Among the three cells corresponding to service factors, the cell service-inclusion (SI1) scores the highest; the next highest is service-interaction (SI2), and the service-integration (SI3) cell scores the lowest (see Fig. 2). It can be observed that the present CIOs' value judgments about service remain in the lowest level of inclusion or present in the value dimension. This means that with respect to service, the government's most important task is to offer basic services through its e-government system, including information services with a smooth approach, timeliness and effectiveness. With respect to service, some higher-level key issues, including interaction with citizens through an e-government system and a customer-oriented philosophy, are not yet an essential focus of attention for the Chinese government. In fact, compared to technology and organization, the differences among the means of the key issues related to service are small. The results show that when e-government enters into subsequent maturity stages, service itself, based on an e-government platform, still cannot be ignored.

Among the three cells corresponding to organization factors, organization-integration (OI3) scores the highest; the next-highest factor is organization-interaction (OI2), and the cell of organization-inclusion scores the lowest (see Fig. 2). It can be seen that with respect to organization, the current CIOs' value judgments are characterized by level of integration. The government focuses on the overall planning of e-government construction strategically, establishing sophisticated construction and management mechanism at the project level, formulating reasonable planning in the construction of e-government, reforming the existing organization structure and business process, and enhancing the internal innovation mechanism. Furthermore, our results also prove that the current CIOs' value judgments, in terms of organization, have exceeded the levels of inclusion and interaction. The government ultimately pays

the most attention to basic organizational support and cooperation for appropriate construction and management mechanisms.

4.2 Logical relation schemes among orientation and maturity

In the orientation-maturity framework, the feature of the cells with highest criticality equivalent to each factor in the orientation dimension shows the e-government builder's concern. In Fig. 2, the size of the circle represents the criticality of the cell. As that figure shows, the orientation-maturity relations of the current Chinese e-government can be featured as three logical relation schemes: organization-integration, technology-interaction, and service-inclusion. It can be perceived that in terms of influence on e-government construction, the construction subject's attitude towards and cognition about organization precedes technology and is far ahead of service. Consequently, in accordance with such value judgments, the government will make their greatest efforts in the area of organization when constructing e-government, with a lower level of effort in technology and the lowest in service. To analyze the orientation-maturity logical relation schemes in China's e-government construction by adding a related background analysis of the current e-government development in China, a deeper discussion follows.

(1)   *Organization-integration scheme* Three key issues in the organization-integration cell—"long-term and consistent ICT development planning", "aligning ICT in strategic planning", and "work flow re-designing and organizational restructuring"—rank from 4th to 6th in the top ten. The results not only show the value of ICT integration in achieving the goal of organizational restructuring but also show that in today's China, macro-planning is one of the most important means of fulfilling the goal of integration, as far as CIOs are concerned. As an area of great concern for governments at all levels, e-government construction occupies a high strategic position. In its 11th Five-year Plan (2006–2010), China proposed e-government to enhance administrative efficiency and reduce costs. Afterwards, a large number of provinces and cities, one after the other, introduced local 11th Five-year Plans related to e-government, in which the significance of top design and overall plan were emphasized. China's 12th Five-year Plan (2011–2015) demonstrated that central and local governments at all levels pay close attention to the development of e-government and regard e-government construction as assisting strategic restructuring of the economy, protection and improvement of people's livelihoods, enhancement and innovation of social management, and promotion of service-oriented government. The central government's focus on the development of e-government made its local counterparts at all levels pay more attention to the integration and overall planning of information construction, further rely on e-government to enhance internal innovation, plan initiatively inside their organizations and implement recombinations of workflow and organizational reform. It is equally noteworthy that the potential authority structure change involved the process of governmental workflow adjustment, which was the vital determinant of the implantation effects following that round of planning.

(2) *Technology-interaction scheme* Two key issues in the technology-interaction cell—"acquisition, organization, and utilization of high quality data" and "system integration between departments for one-stop service center usability"—rank in the top two of all key issues. Interaction and compatibility constitute the principal focus of the current government with respect to technology. The fundamental soft hardware facility essentially has been built. On the basis of that facility, to better realize the function of e-government in protecting people's livelihoods and innovating social management, the government must employ technical means of e-government construction that have greater interaction and compatibility. For example, in terms of protecting people's livelihoods, some functions, such as interdepartmental information sharing in the field of social security and multifunctional business cooperation in administrative services, require realization. With respect to social management, some roles in the field of safety supervision include overall cover, dynamic track, natural calamities and forecasts, and early warning, analysis and evaluation of public emergency event. The current government is willing to promote online work and strengthen its interaction with citizens, who are also the voice of the society. The achievement of all of these functions requires technical means with stronger interaction. In the meantime, the availability of compatibility also lays the foundation for further overall technological integration of e-government systems.

(3) *Service-inclusion scheme* Two key issues in the service-inclusion cell—"ensuring the timeliness, validity of information provided" and "connecting governments, enterprises, and citizens through ICT"—rank 3rd and 7th, respectively. The government is relatively backward in its service philosophy of e-government. Developing e-government activity is a strategic measure to build a service-oriented government with which people are satisfied. In recent years, although the development of e-government has played an important role in improving public service, the government has paid less attention to service philosophy and capability in e-government than it has to organization and technology. The process of offering related applications and services through e-government systems raises numerous issues, such as low integration of administrative and technological applications, large gaps between application effects and the requirements of service-oriented government construction and difficulty in implementing information sharing and related business. Moreover, it is particularly common that some leaders' mailboxes remain unresponsive over a long period of time. In spite of the government's great efforts to offer high-quality and efficient information services, even with a background in relatively mature technology the government's attitude towards and understanding of service are comparatively backward compared to the strategic goal of an overall improvement in public service quality and the construction of service-oriented government. The reasons for this are that, on the one hand, the government is short on propaganda, education and the supervision of service awareness among public servants, the development of service functions, and the effective evaluation of service quality. On the other hand, compared with advancement of strategic significance at the organizational level and adoption of new

technology in the system, it will take a longer time to enhance public servants' awareness and encourage them to accept and use information comprehensively, which constitutes the main approach to conducting administrative affairs.

5 Concluding remarks

This study proposes the analytical framework of orientation-maturity to differentiate China's key e-government issues. After conducting a questionnaire survey of employees in the public administration sector, we analyze the empirical data of key e-government issues in China. We then discuss the government's attitude towards technology, service and organization in the orientation-maturity framework. It is revealed that in the current e-government construction, the relations of technology-interaction, service-inclusion and organization-integration are important.

The proposed framework and related results have some practical implications, as follows. For academia, the novel framework provides a perspective for analyzing e-government development and trends based on key issues by going beyond the limitations of the discussions found in previous related research. For government IT/IS managers, the results not only help them to understand the basic level of local e-government development in China but also provide evidence to support the planning of future e-government construction.

By comprehensively analyzing the orientation toward and maturity of e-government by the current government, the internal promotion of e-government, in coordination with technological applications, constitutes a driving pattern and has an intrinsic logic. The logic essentially fits the behavioral characteristics of the current government. The reform and change of supervisory modes of government derive from its internal momentum. The management innovation tool represented by e-government can better coordinate the technological requirements of government reform. However, service, including renovating service ideas and enhancing service capabilities, requires internal organizational reform and appropriate techniques rather than simply being boosted by governmental documents and administrative orders. Additionally, service requires government to cultivate a service philosophy over a long period of time. Therefore, the advancement of service for e-government will lag behind that of organization and technology.

Many difficulties exposed in the current construction of e-government actually depend greatly on the current orientation-maturity relationship. For example, the e-government's improvements to public service are remarkably inferior to the government's service to itself. Technology is emphasized while service and democratic construction are ignored, the contents of websites depart from actual government affairs, and the government fails to encourage the public to use e-government systems. All of these problems are attributable to the fact that the Chinese government could pay more attention to the service perspective. According to orientation-maturity relations, our results prove that the government needs to further enhance its awareness, capability and quality of service.

Finally, the proposed framework is still preliminary and needs further related exploration. In follow-up studies, we will further enrich and improve the

orientation-maturity framework based on a more extensive literature review and more large-scale empirical surveys for better understanding e-government development in China.

Appendix 1

See Table 6.

Table 6 e-Government key issues items

	Inclusion (I1)	Interaction (I2)	Integration (I3)
Technology (T)	Developing responsive ICT infrastructure Testing, obtaining feedback and modifying the technical project before system running	Acquisition, organization, and utilization of high quality data System integration between departments for one-stop service center usability	Developing integrated internet-based systems Applying advanced ICT in organizations Adopting uniform technical standards and integrating technical architecture
Service (S)	Connecting governments, enterprises, and citizens through ICT Ensuring the timeliness and validity of information provided	Providing high-level e-government services Improving the usability of user interfaces Ensuring the ability of citizens to use the technologies Promoting the scope and use of e-government	Aligning the functions of ICT and the goals of government services Adopting a customer centric approach to e-government design and operations Promoting the value of e-government to the public
Organization (O)	IT/IS human resource policy ICT cost controls	Internal managerial and organizational level of IT/IS departments Coordination efficiency between IT/IS departments and others Improving the level of knowledge management IT/IS training for staff in other departments Effective IT/IS project sourcing	Aligning ICT to strategic planning Work flow re-design and organizational restructuring Long-term and consistent ICT development planning Organizational mechanisms that encourage innovations Correctly evaluating the effectiveness of ICT

Appendix 2

Please rate the following items regarding their importance to e-government development in your opinion: (Follow the scoring from 1 to 5, where 1 = unimportant, 3 = medium, 5 = very important).

See Table 7.

Table 7 Main contents of the questionnaire

No.	Items
01	Aligning ICT to strategic planning
02	Acquisition, organization, and utilization of high quality data
03	Work flow re-design and organizational restructuring
04	Connecting governments, enterprises, and citizens through ICT
05	Internal managerial and organizational level of IT/IS departments
06	Coordination efficiency between IT/IS departments and others
07	Providing high-level e-government services
08	System integration between departments for one-stop service center usability
09	Aligning the functions of ICT and the goals of government services
10	Long-term and consistent ICT development planning
11	Developing integrated Internet-based systems
12	Applying advanced ICT in organizations
13	Improving the level of knowledge management
14	IT/IS training for staff in other departments
15	Developing responsive ICT infrastructure
16	Effective IT/IS project sourcing
17	Improving the usability of user interfaces
18	IT/IS human resource policy
19	Organizational mechanisms that encourage innovations
20	ICT cost controls
21	Correctly evaluating the effectiveness of ICT
22	Testing, obtaining feedback and modifying the technical project before system running
23	Adopting uniform technical standards and integrating technical architecture
24	Ensuring the timeliness and validity of information provided
25	Ensuring the ability of citizens to use the technologies
26	Promoting the scope and use of e-government
27	Adopting a customer centric approach to e-government design and operations
28	Promoting the value of e-government to the public

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