

# E-government maturity model and its evaluation

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**Abstract:** In order to ensure e-government construction healthily, rapidly and orderly develop, an e-government maturity model (EGMM) is proposed based on a software capability maturity model (CMM) and a project management maturity model (PMMM). Five levels of maturity in e-government development process are constructed, which include network infrastructure, information serving, information interactive, information sharing and comprehensive integrating. An index system of e-government maturity is put forward, and then an e-government maturity levels evaluation method is presented, which can provide clear, detailed and efficient decision information and investment directions of e-government for decision-makers. The EGMM and its maturity evaluation method are helpful for improving the construction of e-government.

**Key words:** e-government; maturity model; index system; evaluation

E-government has become a focus issue of government innovation and development recently. However, e-government construction is a complex and giant investment project of informationization. In order to break through technology bottlenecks, investors often focus on technology issues of e-government construction, while the project management issues in the development process, such as overlapping investment, wasting of resources, schedule control and quality control, are not much accounted for<sup>[1]</sup>. Now whether in IT or in the project management field, the maturity models are popular topics.

Now e-government construction still does not have a uniform development framework, and its development modes and processes of each country are also not complete the same, for example the FEA of the USA and the eGIF of the UK<sup>[2]</sup>. Presently Chinese e-government construction also has a general framework and a uniform standard. Review the development situation of Chinese government informationization. The e-government construction needs not only powerful technical force, but also mature management ability to ensure that it develops healthily, rapidly and orderly. So based on the exiting maturity models, we develop an e-government maturity model (EGMM) or a government informationization maturity model (GIMM) to assist Chinese e-government construction, which is an important value of re-

search and practicality.

## 1 Overview of Maturity Models

The purpose of establishing maturity models is to broadly appraise the capability of project implementation and management of all industries and enterprises. All kinds of maturity models are being developed in the world, of which the most authorized are the capability maturity model (CMM) and the project management maturity model (PMMM).

### 1.1 CMM

The CMM was proposed by SEI at Carnegie Mellon University, which is funded by the U. S. Department of Defense. The CMM has been broadly accepted by the software industries of most countries. It is widely used in North America, Europe and Japan, and it has become an actual industrial standard of software development processes. The CMM is a five-level model, and it proposes a framework for software development processes. Developing specific software of organizations in accordance with this framework can improve the capability of delivering software products to a large degree.

The five levels of the CMM are<sup>[3]</sup>:

- 1) Initial: At this maturity level, few processes are defined, and success often depends on individual effort.
- 2) Repeatable: Organizations at this maturity level establish basic project management processes to track cost, scheduling, and functionality for software projects.
- 3) Defined: At this level, the software processes for both management and software engineering activities are documented, standardized, and integrated into a standard software process for the organization.
- 4) Managed: At this maturity level, organizations collect detailed measures of the software process and product quality.
- 5) Optimizing: Operating at the highest level of the maturity model, organizations can effect continuous process improvement by using quantitative feedback from the processes.

### 1.2 PMMM

The PMMM is developed based on the CMM. Now 30 kinds of PMMM are proposed in the world, where several more influential PMMMs include K-PMMM of Harold Kerzner, PMS-PMMM of Project Management Solutions, Inc., and OPM3 of Project Management Institute (PMI). In this paper, we mainly introduce K-PMMM.

K-PMMM also includes five levels<sup>[4]</sup>:

- 1) Common language: Organizations have understood the importance of project management, and begin to understand the basic knowledge and correlative terminologies of project

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management within organizations.

2) Common processes: Organizations have defined and developed common processes, so that they can be repeatedly used in similar projects.

3) Single methodology: Organizations combine all their methods into a single methodology and produce an integrated effect, whose focus is on project management.

4) Benchmarking: Organizations are aware of the necessity that process improvement keeps the competitive edge, borrowing from the operations of excellent enterprises in the industry to improve on their own methods.

5) Continuous improvement: Organizations evaluate the information from benchmarking, and continuously improve on organizational processes.

According to the levels' name and the features of CMM and PMMM, we can find that the lowest level indicates immature management, the higher levels advocate management standardization, and the highest level reflects continuous improvement and optimization processes.

2 E-Government Maturity Model (EGMM)

E-government comes into being along with information technology (IT) development, and it acts as an effective means of improving government efficiency, transforming government functions, and closing the connection between government and its citizens, so many countries have accelerated constructing e-government or government informatization. However, the e-government or government informatization development is a long-term and dynamic development process, which always evolves from low levels to high levels, from the local to the whole, and from elements to systems. The development processes present obvious stages and levels. The developmental stages of e-government mainly include government office automation (OA), government information serving, government departments reconstruction, and government information sharing, etc.<sup>[5-6]</sup>. Reviewing every local government informatization development status of China, government development is still unbalanced and its multi-stages coexist. Considering the e-government development situation and borrowing ideas from CMM and PMMM, EGMM or GIMM can be divided into five levels, which include network infrastructure, information serving, information interactivity, information sharing and comprehensive integration. Fig. 1 depicts the framework of the EGMM.

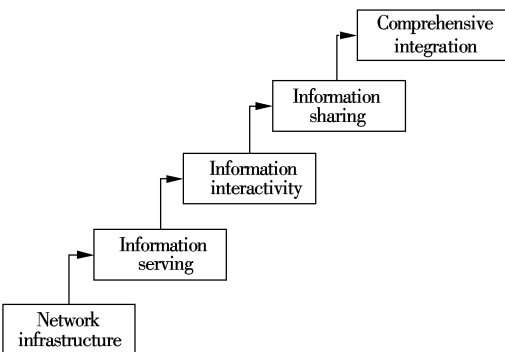


Fig. 1 E-government maturity model

1) Network infrastructure: At this maturity level, each government department actively develops its interior informationization construction, and carries out respective data collection, database construction and application system development. Because of different standards and norms of database construction and correlative information and data, many issues arise such as unbalanced informationization construction level among departments or industries, data overlapping investment and reconstruction, and data standards confusion. A mature network infrastructure is the basis of government informationization construction.

2) Information serving: At this level, the e-government has realized an interior office system of government and a steady publishing of governmental information. The main characteristics of this level are that all levels of government have established their own OA and portal sites, and offered information services to public and enterprises through their portals. This level is a unilateral interaction phase between governments and public or enterprises.

3) Information interactivity: At this maturity level, governmental information has realized dynamic publishing, and users can complete their daily affairs through government websites. Governments have carried out bidirectional interaction with each other and opened their government affairs to the public and enterprises. But the information systems of each government department are often isolated, and the phenomena of isolated information islands, isolated resource islands and each one doing things in its own way widely exist.

4) Information sharing: At this level, a uniform information exchanging and sharing platform has been established, which can implement the functions of data and information exchange and sharing; namely, the interdepartmental information and data exchange centers have been established via sorting and contrasting correlative information which is distributed in every governmental department. Achieving intercommunication and interconnection through interface standards and structure layers in the uniform information exchange platform can ensure interdepartmental information sharing and provide one stop shopping for the public.

5) Comprehensive integration: At this maturity level, the top design framework and the construction standards of the e-government have come into being, and a relatively stable e-government system has been set up, which can implement functions at all levels of government effectively. At the same time, e-government construction is a process of sustainable development and improvement, and it develops along with IT development.

3 E-Government Maturity Evaluation System and Its Application

3.1 E-government maturity evaluation index system

EGMM's functions of decision-making and direction in e-government construction are based upon the scientific evaluation of e-government maturity. According to the criteria of applicability, representation and efficiency, reference is made to the research findings concerning e-government evaluation systems at home and abroad<sup>[7-8]</sup>. The e-government maturity levels evaluation index system is proposed and shown in Tab. 1.

**Tab. 1** E-government maturity evaluation index system

E-government maturity levels	Evaluation index
Network infrastructure	Network connection mode
	The number of host computers per kilo-persons
	Network system reliability
	Network system maintainability
	Network system safety
Information serving	Data standard
	OA system maturity
	OA utilization rate
	Degreed of office synergy
	Quality of portal site
	Accessing channel
Information interactivity	QoS
	Depth of online service
	Efficiency of online service
	Extent of open the government affairs
	Information security
Information sharing	User satisfaction
	Vertical interconnection and interoperability
	Horizontal interconnection and interoperability
	Extent of information sharing
	Efficiency of information exchange
	Efficiency of office works
Comprehensive integration	Decision-making ability
	One stop shopping
	Reference consistency
	Standard compliance
	Business process stability

### 3.2 E-government maturity evaluation method and its application

An appraisal of e-government development processes and stages is often determined by comprehensive evaluation; for example, Accentuer pointed out that the Chinese e-government general maturity is 23%<sup>[9]</sup>. These methods of comprehensive evaluation only offer a macro comparison of intergovernmental general maturity, and conceal most of the detailed information which is available to assist the decision-making of government informationization. Aiming at that, a method of e-government maturity levels evaluation is proposed.

1) Solely evaluate every level's maturity in EGMM, or only evaluate a specific level's maturity, if needed.

2) Subdivide every index of a chosen level again, for example, the index "information service quality" at the information serving level can be subdivided into information accuracy, information positivism, information applicability, etc.

3) Collect the sub-indices data or mark them by experts, then compute the index scoring making use of relevant methods, such as AHP, fuzzy, neural network, evidential reasoning and so on, and let  $\alpha_{ij}$  be the scoring of the  $j$ -th index at the  $i$ -th level.

4) Let  $\omega_{ij}$  be the weight of the  $j$ -th index at the  $i$ -th level, then the maturity of the  $i$ -th level is

$$\alpha_i = \sum_{j=1}^n \omega_{ij} \alpha_{ij}$$

where  $n$  is the number of indices at levels,  $i = 1, 2, \dots, 5$ .

5) Confirm the maturity level of e-government. If  $\alpha_i \geq \beta$  ( $\beta$  is a pre-established threshold), then the construction stage of e-government exists at the  $i$ -th level; or else evaluate the  $(i - 1)$ -th level.

The e-government maturity level evaluation method can provide clear, detailed and efficient decision information and investment directions for the e-government for decision-makers. For example, if the e-government construction stage of a certain government or department is at the  $i$ -th level, then decision-makers can draw up the development direction of the e-government which is at the  $(i + 1)$ -th maturity level, and determine the priorities of investment by evaluating every index of  $(i + 1)$ -th level. At the same time, the development direction of government synergy can be determined by judging the e-government maturity levels of different departments.

## 4 Conclusion

E-government construction is a complex and giant investment project of informationization, the major principles of e-government construction is implemented step by step. This paper provides an e-government maturity model (EGMM), and describes the major contents of each level. An index system of e-government maturity is put forward, and then the e-government maturity levels evaluation method is presented, which can provide clear, detailed and efficient decision information and investment directions of the e-government for decision-makers. EGMM and its maturity evaluation method is in favor of improving the construction of an e-government.

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# 电子政务成熟度模型及其评价

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**摘要:**为了保证电子政务建设健康、快速、有序地发展,在软件能力成熟度模型和项目管理成熟度模型的基础上,提出了电子政务成熟度模型,构建了电子政务建设过程成熟度的 5 个层级:网络基础级、信息服务级、信息交互级、信息共享级和综合集成级. 然后,构建了电子政务成熟度评价的指标体系,提出电子政务成熟度层级评价方法,该方法能给决策者提供清晰、详细、高效的决策信息及电子政务投资方向. 电子政务成熟度模型及其成熟度评价方法有助于促进电子政务的建设水平.

**关键词:**电子政务;成熟度模型;指标体系;评价

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