Growth Model of Local Government Web Sites

HO Sho, IJJIMA Junichi
(Graduate School of Decision Science and Technology, Tokyo Institute of Technology, Tokyo 152-8552, Japan)

Abstract To clarify the concept framework to assess WIS evolution from an information perspective instead of the usual systems perspective, and to seek for in-depth understanding of maturing patterns of WISs based on the framework, several central concepts related to the information aspect of WIS are firstly discussed, then a growth model of local government Web sites based on a survey study is proposed.

Keywords growth model; information space; local government; Web site

Information systems based on Web technology, which have been termed web based information systems (WISs) by Tomas Isakowitz et al[1], are becoming an indispensable foundation for activities of organizations in various sectors. Conventional software engineering has focused on the development, operation, and maintenance of computer programs and data structures, as well as the documents that describe them[2]. In WISs, the software mentioned above is integrated with hypermedia content. Combinations of data, text, pictures, sound, animation, motion video, and graphics could be interconnected in a complex way in a WIS to form a very complicated information space. Thus, not only information processing systems but also contents stored in those systems are of great importance in WIS design, development and maintenance. In that sense, the information perspective promises to offer significant insight in WIS development methodology research.

Today, the WWW platform has become one of the most important infrastructures for sharing information. Governance of information spaces in corporate Web sites and Intranet portals has become more and more important for organizations though there is still a lack of methodologies for managing information in the “Web era”. To establish the information governance methodology for the “Web era”, understanding of the mechanism of growth and maturing patterns of information spaces in Web sites would be indispensable. However, although a large number of studies on the information aspect of WISs have been made since early 1990's (for example, studies on information retrieval in WISs and Web site information architecture[3-6]), there are few discussions on maturing patterns of Web sites form the information perspective. The motivation of our research is to clarify the concept framework to assess WIS evolution from an information perspective instead of the usual systems perspective, and to seek for in-depth understanding of maturing patterns of WISs based on the framework. In this paper, we first discuss several central concepts related to the information aspect of WIS, then propose a growth model of local government Web sites based on a survey study.

1 Maturity Models of Information Systems and WISs

Stages-of-growth models, which describe the maturing of information systems in organizations, have been wildly used in information system strategy development. Nolan's stage hypothesis on the growth of data processing, which was later extended to a more comprehensive, six-stage model (Initiation, Contagion, Control, Integration, Data administration and Maturity), provides a popular framework for describing the typical development patterns of organizational information systems[7,8]. Since the inception of Nolan’s stages of growth theory, a number of studies on the maturity of IS implementation within organizations including Earl (1989) and Galliers & Sutherland (1991)
have been made[9,10].

Over the past few years, several studies on maturity models of WISs have also been made. Powell, Jones & Cutts (1998) figure web sites as a software continuum, which ranges from complex to simple form, and describe the progression of web sites with five degrees: static Web sites, static with form-based interactivity, sites with dynamic data access, dynamically generated sites, and Web-based software applications[11]. Lowe & Hall (1999) identify two major dimensions and two associative dimensions of hypermedia applications, which was later extended by Deshpande & Ginige (2000) to 8 dimensions (focus, size, lifespan, development, approach, developers, user analysis, scalability, and maintainability) in order to better understand the maturity levels attained and exhibited by different groups in pursuing Web projects[12,13]. The first model perceives the growth of WISs from the technology point of view, while the second model put the focus on the maturity of Web project team instead WIS itself.

However, in these efforts to capture the process of utilizing ICT in organizations or implementation of IS/WIS, much more attention is paid to maturity levels of information processing systems rather than to maturity levels of information stored in those systems. So far, little is known about the evolving pattern of information stored in a Web site and there is a lack of maturity benchmarks and growth models, which provide guidance, direction, and milestones that are easy to understand to managers in organizations.

2 The Information Aspect of WISs

Before it is possible to enter into a detailed discussion on the growth model of WISs, we must clarify several concepts related to the topic. The term Web site and content have been loosely used in various contexts. In this paper, we use the term Web site to refer to a group of related hyper-media documents and applications, which use the WWW platform as a common infrastructure, and the term content to refer to component of Web sites such as hypermedia documents and applications. In other words, Web site is considered as the informational part of a WIS in our research.

2.1 Information Space

Information space is a word with many shades of meaning. It is often used informally as a spatial metaphor to information in various contexts. McKnight (2000) give a boarder definition of information space as “the objects (real or virtual) to which the individual turns to acquire information”[14]. On the other hand, Andrew Treloar (1994) perceives information space as a location rather then the sum of information, and define the term as “the location where the human mind interacts with information or communicates it to another”, which “facilitate the storage and retrieval of data and information, processing of data into information, communication of information, navigation through structured information and the linking of different pieces of information”[15]. Newby (2001) define information space from another angle as “the set of objects and relations among them held by a system” and argue that the long-term goal of exosomatic memory systems for information retrieval is “to develop information spaces that are consistent with cognitive spaces of particular users, user groups, situations or processes” (Note: a exosomatic memory system is a computerized system that operates as an extension to human memory)[16]. Newby’s definition separated information from the system where it is held and excluded information processing system from information space. In that sense, Newby’s definition of information space is suited for our research, which concentrates on management of information rather than management of the whole WIS.

2.2 Dimensions to Assess Maturity of WIS Form an Information Perspective

Web sites, which are often used as information dissemination tools, interfaces of applications, and gateways, usually require frequent maintenance and continuous enhancement after their initial development. The evolutionary nature of WISs should be taken into concern when attempting to capture the status of information aspect of a WIS. Thus, both static and dynamic view of information space would be necessary to measure the maturity of a WIS from an information perspective. As for static view, the amount and quality of object in an information space, as well
as the way that objects are organized, are important points to measure. As for dynamic view, the mechanism of change is considered to be an important aspect to observe. In that sense, the following 3 dimensions are essential in assessing the maturity of WISs from an information perspective: 1) Richness of content; 2) Sophistication of the information structure; 3) Sophistication of the operation process.

3 Features of Local Government Web Sites

3.1 A Survey Study on Japanese Local Government Web Sites

Among numerous WIS types, Web sites which service as an Internet presence of certain organization are of the most familiar. In our research, we focus on local government Web sites, which would play an important role in realizing electronic government in Japan and conducted a survey to Japanese local government Web sites in order to gain better understanding to growth patterns of publicity Web sites.

In our survey study, we first thoroughly reviewed 20 local government Web sites from the viewpoint of richness of contents and how the information is organized, then interviewed managers and staffs in 4 of the 20 local governments (A city, B ward, C ward and D city) to investigate operation processes of Web site enhancement in their organizations as well as the growth path of the Web sites. The Internet archive [16], where contents of Web sites are sequentially archived, is also used to investigate the growth path of various Web sites.

In order to ensure that local government Web sites of various levels are included in our sample, we followed the procedure described below to select sample Web sites:

1) Categorize Web sites of local governments in Kanto area of Japan into 5 groups by scores they got in e-city ranking Japan 2003 [18].

2) Sort local government Web sites in each group by population of the region and choose Web site of local government that has the smallest, middle and largest population in each group.

3) Add Web sites of the 4 local governments, which are willing to cooperate with us to conduct interviews, to sample Web sites.

Through the survey, we found several typical information structure types of local government Web sites and were able to grasp several characteristics of local government Web sites from the viewpoint of “richness of content”, “sophistication of the information structure” and “sophistication of the operation process”.

3.2 Maturity Benchmarks of Local Government Web Sites

Based on knowledge gained from the survey, we developed a detailed description of benchmarks for the growth model of local government Web sites.

3.2.1 Richness of Content

Low: The Web site includes no more than 100 documents, in which only limited information such as address and map of the local government office is presented.

Medium: Basic information on public services is provided. Frequently updated contents such as announcements and event-timetables are included in the Web site. Some detailed information on projects and efforts of the local government, though not much, could also be found in the Web site.

High: Both basic and detailed information on public services is provided. A large amount of contents presenting detailed information on projects and efforts of the local government, as well as contents that contribute to local government services (questionnaires, online application forms) are included in the Web site.

3.2.2 Sophistication of the Information Structure

Low: The Web site has a very simple structure, in which, most contents are directly linked to the top page. Fig.1 a) shows the image of the information structure of this level.

Medium: Fig.1 b) shows the image of the information structure of medium level, in which, different shapes of blocks indicate different visual presence of contents. In a Web site of this level, some series of contents are well organized and have highly-unified visual presences (for example, FAQs and online ordinance libraries), while most contents
have less-unified interface. Contents are simply classified into several categories instead of being put into a carefully designed architecture. As a result, one could find a large number of hyperlinks in top pages of Web sites of this kind. Also, in many cases, there is a large diversity of content richness on different topics. Although links to contents on different topics all look alike in the top page, one would find out that the richness of information is extremely different after clicking on links.

High: Most contents of the Web site have highly-unified visual presences except for contents that provide in-depth information on certain government projects/efforts, which could be seen as sub-sites included in the whole Web site. A mechanism that supports users in information retrieval, which include both organization based navigation (for example, index pages in which one could browse through a organization map of the local government to find necessary information) and usage based navigation (for example, index pages in which one could browse through topics like “Learning in the area” or “Working in the area” to find information), is installed. Fig.2a shows a typical information structure of this level, which is consist of “Top Page”, “General Information”, “In-depth Information”, “Navigation Pages” and “Sub-sites”. Fig.2b shows an advanced version of the information structure in Fig.2a, in which, a new component “Pages of Each Bureau” is added. In a Web site that has this advanced information structure, one could find a clear signature and a hyperlink on each page indicating the bureau that is responsible for the content of the page. These signatures and links enable the page of each bureau, which contains hyper links to information related to the bureau, to play an important role as a hub of information.

3.2.3 Sophistication of the Operation Process

Low: Design, development and maintenance of all contents are put in the charge of certain section of the local government and/or certain content production agency.

Medium: The initial plans of contents are made in each section of the local government. Though the content development could be conducted either by each section, or by certain content production agency, the final release of the content is controlled by certain section, which is usually the IS or the publicity section.

High: Each section is in charge of developing and maintaining its own contents, the IS and/or the publicity section manages the Web site in large and play the role of a supporter and adviser. Information literacy of local government staffs has been developed and there is a mutual understanding and consensus on policies/rules of both information dissemination and
content production. Also, infrastructure and applications that enable the online information dissemination of each section are also provided.

4 Stages of Local Government Web Site Evolution

Web sites of A city, C ward and D city started from medium level of all three dimensions while B ward constructed a Web site with a high level information structure from the very beginning. In A city, the Web site was first managed by the IS section. Contents was made in each bureau and sent to the IS section for check and upload. After establishing the Web site in 1998, staffs of A city first enriched contents of the Web site gradually and created a large but not well structured information space within two years. In 2000 a renewal project was conducted and a new information structure, which resembles the general model of high level information structure (Fig.2a) was created. In 2002, the administration responsibility of the Web site shifted from the IS section to the publicity section and another renewal project, which aimed at improving the usability of the Web site and the development of an effective contents management infrastructure, was conducted. The project finished in summer 2003. After the renewal, an information structure that resembles the advanced model of high level information structure (Fig.2b) was realized. Also, the sophistication of the operation process stepped up from medium level to high level after the project. Each bureau became able to create and upload highly standardized contents by themselves via the new contents management infrastructure.

The Web site of C ward is managed by the IS section. Content was made in each bureau and sent to the IS section for check and upload. The Web site was continuously enriched after its initial release and the sophistication level of information structure has stepped up from medium to high through a sequence of renewal projects.

Web sites of B ward and D city are also managed by the IS section. Contents are continuously enriched in both Web sites, but there is no noticeable change in operation processes or information structure after the initial release of the Web site.

Using the Internet achievement, we were able to review different era of our sample Web sites, through which, we were able to find the growth and maturing pattern of “richness of content” and “sophistication of the information structure”. On the other hand, through the interview to A city, B ward, C ward and D city, we were able to grasp some features of the growth pattern from the viewpoint of “sophistication of the operation process”. Based on knowledge gained from the review and interview, a four stage growth model of local government Web sites, which is shown in Fig.3, is proposed. The four cylinders in Fig 3 indicate the four stages and the arrows indicate the growth path of local government Web sites. Stage I is the very first stage of a local government Web site that only include several pages. The second stage comes when more contents are created and some operation processes are established to maintain and enhance those contents. The step up in sophistication level of information structure is the key point between Stage II and Stage III and the step up in sophistication level of operation process is the key point between Stage III and Stage IV. A local government Web site could start from any of these four stages and grow step by step from lower stages to higher ones.

5 Conclusion and Future Works

In this paper we discussed and clarified some concepts related to information space in WISs and
focused on the maturing patterns of information space in WISs instead of maturing patterns of information processing systems. Based on a survey study, we illustrated some characteristics of Japanese local government Web sites and proposed a four stage growth model for assessing the maturity of local government Web sites.

Our future works include the development of more detailed and easy to understand benchmarks and the examination of this growth model.

Acknowledgment

The authors wish to acknowledge the valuable contributions of that organizations and individuals that participated in the survey study. In particular, we want to thank Dr. Hirota Denjiro for his contributions in the interview of local governments.

References


Brief Introduction to Author(s)

IIJIMA Junichi Dr. Iijima Junichi is a professor, the head of the Department of Industrial Engineering and Management, Graduate School of Decision Science and Technology, Tokyo Institute of Technology, JAPAN. His major interests are Information Systems Integration, E-Business and Systems Theory. He is the author and coauthor of many papers, articles and books in Japanese and international journals as well. He organized the third e-Biz workshop in 2003 in Tokyo.

HO Sho is a research associate in Tokyo Institute of Technology (TITECH). She received her MS degree from the Graduate School of Decision Science and Technology, TITECH. Her research interests include Component Technology, Web Engineering, and Web Governance.