# Organizational Hypermedia Document Management Through Metadata

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## INTRODUCTION

Web business systems, the most popular application of hypermedia, typically include a lot of hypermedia documents (hyperdocuments), which are also called Web pages. These systems have been conceived as an essential instrument in obtaining various beneficial opportunities for CRM (customer relationship management), SCM (supply chain management), e-banking or e-stock trading, and so forth (Turban et al., 2004). Most companies have made a continuous effort to build such systems. As a result, today the hyperdocuments in the organizations are growing explosively.

The hyperdocuments employed for business tasks in the Web business systems may be referred to as organizational hyperdocuments (OHDs). The OHDs typically play a critical role in business, including the forms of invoices, checks, orders, and so forth. The organization's ability to adapt the OHDs rapidly to ever-changing business requirements may impact on business performance. However, the maintenance of the OHDs increasing continuously is becoming a burdensome task to many organizations; managing them is as important to economic success as is software maintenance (Brereton et al., 1998).

An approach to solve the challenge of managing OHDs is to use metadata. Metadata are generally known as data about data (or information about information). Concerning this approach, this article first reviews the previous studies and discusses perspectives desirable to manage the OHSs and then provides metadata classification and elements. Finally, this article discusses future trends and makes a conclusion.

## BACKGROUND

The hyperdocument is a special type of digital document based on the interlinking of nodes such as multimedia components and sets of data elements derived from data-bases. For digital document, metadata have typically been employed for the access to media- and application-specific documents, such as for information discovery (Anderson & Stonebraker, 1994; Glavitsch et al., 1994; Hunter & Armstrong, 1999). Also, most of the previous studies on metadata for hyperdocuments have also been interested in information discovery from a content-oriented perspective (Lang & Burnett, 2000; Li et al., 1999; Karvounarakis & Kapidakis, 2000). Especially, a set of hyperdocument metadata, the Dublin Core (Dublin Metadata Core Element Set) (Weibel et al., 1995; Weibel & Koch, 2000), has been paid attention to as a standard for Web information resources and also focuses on the information discovery. However, besides this perspective, for the OHDs metadata, the organizational perspectives also need to be considered to satisfy various managerial needs of organizations.

First, a process-oriented perspective needs to be considered. It is also pointed out that the perspective needs to be reflected on defining metadata of corporate digital documents (Murphy, 1998). OHDs as corporate digital documents are closely related to business tasks and information for them in an organization. Generally, corporate documents are produced in undertaking an organizational process (Uijlenbroek & Sol, 1997); furthermore, most businesses are based on, or driven by, document flow (Sprague, 1995). Thus, documents and business processes may be considered simultaneously in the analysis of a corporate information system (Frank, 1997). In this context, the OHDs may affect the speed of communications to perform business process. Accordingly, the OHDs should be designed to support collaboration among workers in business processes. Also, the OHDs can be rapidly improved to fit ever-changing business requirements.

Second, the metadata for OHDs are to be considered from a technical perspective. The system resources linked to the OHDs, such as program files and data components dynamically cooperated, are a considerable part of the

organizational assets. The links between such resources and OHDs are very complex. Accordingly, managing the resources and the links through metadata can result in the efficient use of the organizational asset; the metadata related to the technical components can help developers change and improve the OHDs more efficiently.

Third, in the long term, the metadata role of OHDs should be extended toward organizational memory (OM), because organizational digital documents are a major source of OM (Murphy, 1998; Sprague, 1995). The OM techniques concentrate on managing an organization's information or knowledge of the past (Stein & Zwass, 1995; Wijnhoven, 1998). The metadata for OHDs need to play a critical role in managing a variety of histories in terms of business functions, communication mechanisms, technical artifacts, and contents. The memory may provide knowledge to support various decisions for controlling communication mechanisms in a business process, linking to the previous responsible workers, or maintaining the hypermedia applications.

Considering all the perspectives discussed previously, metadata roles for OHDs can be summarized in three levels--operation, system, and organization--as shown in Table 1. In fact, we believe that these roles can also be applied to other kinds of corporate digital documents.

## METADATA CLASSIFICATION AND ELEMENTS FOR OHDS

Metadata classification can be perceived as a fundamental framework for providing metadata elements. According to the our perspective on the metadata for OHDs described in the previous section, the following catego-

ries of metadata need to be considered:

- *Content-dependent Metadata***:** These metadata are used to enable understanding of the content of documents. The metadata include information that depends on (i) the content directly, and (ii) semantic meanings based on the content of the document indirectly.
- *Workflow-dependent Metadata***:** These metadata provide information about workflow related to an organizational hyperdocument. These metadata are concerned with process-related factors such as workers, tasks, or business rules.
- *Format-dependent Metadata***:** These metadata describe information on formats related to organizational hyperdocuments as well as hypermedia components such as nodes, anchors, interface sources, and database attributes.
- *System-dependent Metadata***:** These metadata provide information concerned with storage- and software-related information on system resources such as hyperdocuments, interface sources, and databases.
- *Log-dependent Metadata***:** These metadata describe information on the history and the status of organizational hyperdocuments.

Content-dependent metadata are essential for discovering information in OHDs. Workflow-dependent metadata can contribute to increasing the ability to control business processes through the efficient adaptation of OHDs to ever-changing organizational requirements. Format-dependent metadata can provide an understanding of the hypermedia features in terms of structures and operational mechanisms, so that they can be useful in the technical maintenance of OHDs. System-dependent

*Table 1. Metadata roles for OHDs*

| Level | Metadata Roles |
|---|---|
| Operation | • Easy and fast access<br>• Increased accuracy |
| System | • Interoperability under heterogeneous environment<br>• Document maintenance<br>• Document distribution |
| Organization | • Increased reusability of information and knowledge resources<br>• Increased capacity of business management<br>• Increased organizational memory |

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