Ontologies for a University Web Portal

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ABSTRACT

The advancement of Web technologies provide diverse means to support learning in a flexible and a personalized manner. Semantic Web is an extension of the current web in which information is given in a well-defined meaning, enabling computers and people to work closely. One of the standard components in Semantic Web is Ontology, which is the center of focus in this study. List of phrases were gathered from the university's web portals and then examined and content-analyzed before being categorized. The study uncovers phrases commonly used by web designers other than the portal's information infrastructure used in Malaysian universities' web portals. It is hoped that findings from this study will contribute to the standard ontology used to update university's web sites in Malaysia.

Keywords

Semantic Web, Ontology, Education, On-Line Learning

1.0 INTRODUCTION

Many educational institutions today invest in the design and implementation of Internet based learning that is considered a potentially effective learning platform. This online environment helps in the development of course curricula, collection of educational material and delivery of the material as well as facilitating interactions among the users. In addition, significant progress has also been achieved in the development of web-based learning systems. During a short span of time, the technology has moved from simple hypertext documents known as the World Wide Web (WWW) to an educational portal integrating all instructional resources in different educational organizations as one. However, the traditional web-based technologies on a syntactical markup of information do not provide the semantic search and navigation within a distributed knowledge environment. This restriction narrows the ability of a distributed educational environment to adapt specific instructional services that caters to a wide range of users. To implement such services, Stojanovic & Studer (1999) stated that the creation of an open intelligent educational environment based on the Semantic Web is required.

This study explores, identifies and determines some of the ontologies, which are expected to contribute to the standard ontologies used by web developers to develop or design Semantic Web Technologies in the area of higher education in Malaysia.

1.1 Semantic Web Ontology

The stated goal of the Semantic Web is to enable machine understanding of web resources. In fact, most resource descriptions today are meaningful to human reader. Several efforts are directed towards designing efficient ways to improve the processing of data on the web. Semantic Web Technologies is an example of such efforts. In addition, Bray (1998) stated that using the Semantic Web Technologies to format and describes the meaning of the web documents make the processing of web data easier.

Ontology is one of the conceptual structures that define an underlying ontology and provide the key for a machine to process a data on Semantic Web. Mohan *et. al* (2003) believed that an ontology is a specification of a conceptualization. For instance, it describes the concepts and relationships of some phenomenon in the world. Ontology also serves as metadata schemas, providing controlled vocabulary concepts, where they are explicitly defined in machine processing language. Staab (2001) stated that ontology usually includes axioms and definitions of terms and relations from the discourse domain. Furthermore, Maedche *et. al,* (2001) stated that ontology of particular domains provide a common understanding of topics that can be communicated between people and application systems. Indeed,

ontology helps people and machines to communicate concisely by supporting semantics exchange and not just the syntax. Thus, the Semantic Web's success and creation depends on quick and cheap construction of specific ontologies. By using well-defined ontology on the web, it is possible for computers to process data since there is a common understanding of terms used and the relationship between these terms. In order to reuse the content from one system to another, it is important for learning objects to be standardized.

Recently the IEEE 1484.12.1-2002 Standard for Learning of Object Metadata (LOM) was released. This was the first accredited standard for learning technology. It is expected that LOM metadata will simplify the discovery, management and exchange of learning objects over the web. Learning objects were developed and stored in many different places on the web and has tremendous potentials to benefit the e-Learning domain. However, Panteleyev *et al.* (2002) stated that ontology helps in easy recognition of content, context and the structure of the instructional materials.

2.0 METHODOLOGY

It is the basic aim of this study to identify, determine and share the common phrases used by web designers to design their university web portals. Common phrases that may contribute to the ontology standard were identified using the content analysis method (Robinson, 1993).

2.1 Content Analysis

Krippendorff (1980) define content analysis as a research technique for making replicable and valid inferences from data to their context. Content analysis method is used in this study to identify the common content or phrases used in Malaysian public universities' web portals. Certain words, concepts, themes, phrases, characters or sentences within texts or sets of texts were identified. The process of quantification of some of the common terms used were also performed based on certain hierarchy of words (refer to table 1). This process is known as coding. It manifests the content of the texts. MCBurney (2001) claimed that the coding of the content is reliable and useful. Latent Content is another alternative to analyse the content of a text. Using this method, there is a need to read a passage of the text and interpret the presence of a particular theme. However, only the result of the content that were analyzed will be discussed in this paper.

Looking at the findings of the study there is evidence that a specific standard was used to develop specific contents for the universities' web portals. Identifying standard ontology is very important to enhance and facilitate knowledge sharing among users. This is especially true when users try to access or communicate with their intended contact person online (for example teachers, parents, friends and people from the educational or affiliated institutions).

2.2 Sampling

Eighteen public universities' web portals in Malaysia were chosen as samples for this study (KPT, 2008). These universities (from all over Malaysia) were chosen based on the number of hits to their websites. Visitors were expected to be students, potential students, academicians, researchers and also other stakeholders. The use of university web sites is enormous. For instance, school leavers search the university web portal in order to find out more about the university that they want to enroll into. Also, web browsers visit the website for job vacancies, conferences, journal links as well as faculties and programs offered in the university. Generally, most of the information required about the university is available in the web portal.

2.3 Data Collection

The data collection was done by recording the number of frequencies (either presence or absence) of a phrase used in a website. The phrases to look for were determined earlier before the actual data collection. The scores were recorded based on the number of hits. A "1" is for "Yes" and a "0" is for "No" and "NA" for "Not Applicable" were assigned to the websites. Selections of ontologies for university web portals depend on the number of times the words or phrases were used.

2.4 Category for Analysis

The categorical definitions are divided into two parts. First is the context unit and second is the coding unit. The context unit consisted of Malaysian public university web portals and the coding unit covered the structural features of the

web design. Web design consists of page design, content design and overall website architecture (Jakob, 2000).

Basic categories used in this study were based on web pages between 1st to *n* hierarchies in the public university web portals (refer to table 1).

Table 1: Categories based on hierarchies in Malaysian public universities web portal.

Hierarchy / Content	1st	2nd	3rd	*n*
Home				
The University	About Us	History		
	Admin	Faculty		
Management	Offices			
	Division/ Unit/ Centres/			
Others				

2.5 Data Analysis

The public university web portals were examined and the data collected were recorded based on the categories identified earlier such as: words, phrases, concept, themes, characters or sentences in the web portals. These data were analyzed using Microsoft Excel and a statistical analysis software (SPSS).

3.0 RESULT

Nine universities used "Home" as a common phrase for the main page and eleven universities used "The University" phrase instead of "Home" in their universities web portals. These phrases were used to represent an introductory page to the universities web portals. "Campus Map" and "Campus Location" were used by thirteen universities to provide information on their university locations and how to reach their universities from remote locations. This is an important feature in a website especially to new students or visitors (to guide and familiarize them with the university area). Other phrases that are also commonly used are the University's "Vision and Mission statements", "University's Logo" and "Vice Chancellor's Message" pharases which hit 12, 8 and 7 frequencies.

In terms of the "University's Organizational Structure", ten universities used "The Chancellor", "The Pro Chancellor" and "Staff" to provide information on the management structure. Phrases that scored lower than five were "Executive Committee", "Directors of Campus" and "Head of Centers". This may be due to inconsistencies in the use of terms.

Under the "Student" structure, eleven universities used "Undergraduate" and thirteen used "Postgraduate" instead. Some universities use the term "Masters" or "PhD" students instead of "Postgraduate" students.

The terms "Faculty", "Centre" and "Institutes" were used by all eighteen universities. This indicates that this is a common phrase used consistently by all the universities to structure the major division based on discipline and area of concentration or field within the university. "Program" is used by ten universities and "Admission" by nine. "Research" is another common phrase and is used by fourteen universities. Other phrases commonly used are: "Publication", "Library", "Alumni" "Sport Centre" and "News and Events".

3.1 Proposed university web portal

From the results, the proposed university web portal ontologies or phrases that were commonly used in Malaysian university web portals were as follows:

Home/The University
- Background/History
- Vision & Mission
- University Logo
- Vice Chancellor/Vice Chancellor's Message
- Campus Map/ Campus Location

Management
- Faculty/Centres/Intitutes
- Staff
- Students
  - Admission
    - Undergraduates
    - Postgraduate

Research
- Publications

Services

Library
Sports Centre
Gallerry

Others

Contact Us/ Directory
News and Event
Alumni

4.0 CONCLUSION

From the results, a standard ontology for a university web portal content design was developed. It is hoped that this will be a common standard that could enhance greater knowledge sharing among users. This Ontology design will help contribute useful guidelines for web designers when designing their university's web portals and at the same time simplifies and facilitates the searching of materials on the web. Koper (2004) stated that using the Semantic Web technologies to describe the meaning of the web documents makes the processing of web data easier.

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