Chapter 43
ANGEL Mining

Tyler Swanger
Yahoo! & The College at Brockport: State University of New York, USA

Kaitlyn Whitlock
Yahoo!, USA

Anthony Scime
The College at Brockport: State University of New York, USA

Brendan P. Post
The College at Brockport: State University of New York, USA

ABSTRACT

This chapter data mines the usage patterns of the ANGEL Learning Management System (LMS) at a comprehensive college. The data includes counts of all the features ANGEL offers its users for the Fall and Spring semesters of the academic years beginning in 2007 and 2008. Data mining techniques are applied to evaluate which LMS features are used most commonly and most effectively by instructors and students. Classification produces a decision tree which predicts the courses that will use the ANGEL system based on course specific attributes. The dataset undergoes association mining to discover the usage of one feature's effect on the usage of another set of features. Finally, clustering the data identifies messages and files as the features most commonly used. These results can be used by this institution, as well as similar institutions, for decision making concerning feature selection and overall usefulness of LMS design, selection and implementation.

INTRODUCTION

A Learning Management System (LMS) is a course independent framework that provides, delivers, and manages instructional content, identifies and assesses learning, and tracks and records progress towards those goals. It may also provide course registration and administration, as well as skills gap analysis, tracking, and reporting (Sclater, 2008; Watson & Watson, 2007; Paulsen, 2003). A Learning Management System generally has the same interface and features for all courses at a given school. Typically they have discussion forums, calendars, quiz capability, group work and chat spaces, and gradebooks, and perhaps some customization capability for the instructor or individual student (Feldstein & Masson, 2006).

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Learning Management Systems undergo evaluation for a number of reasons. Evaluations of LMS data may be conducted to assist instructors in understanding how to enhance student learning (García, Romero, Ventura, & Calders, 2007, Romero, Ventura, & García, 2008). Schools may evaluate existing LMS options to select a particular initial choice (Sclater 2008), or when a decision is being considered on whether to replace or not the current LMS; replacement may be due to the current system no longer being supported (Sturgess & Nouwens, 2004).

An investigative analysis of the usage of A New Global Environment for Learning (ANGEL), learning management system was conducted at a comprehensive 4-year college. This implementation of ANGEL has been used by the college's faculty, staff, and students for eight years. The ANGEL Learning Management System "enables efficient and effective development, delivery and management of courses, course content and learning outcomes. Engaging communication and collaboration capabilities, enhance instruction to deliver leading edge teaching and learning" (ANGEL Learning, 2008).

This investigation was prompted by the merger of the ANGEL company with a competitor, Blackboard, Inc; and Blackboard's decision to stop support of the college's version of ANGEL in 2012 (Blackboard, 2010). These changes present the college with the opportunity and need to assess the usage of the system. These events have forced the college to examine the need for a LMS, and if so what features are necessary in the event a new product needs to be purchased.

Given these circumstances, data mining techniques were applied to evaluate which LMS features are used most commonly and most effectively by instructors and students. Data mining techniques are applicable to situations where large amounts of data exist, and the data may contain internal relationships and patterns that characterize the data set as a whole. In the case of this study, the usage of ANGEL by students and instructors is described by the ANGEL data. This study clearly demonstrated that data mining techniques can be applied to find unknown patterns, interesting patterns, confirm assumptions, and consider statistical results for making decisions on the future of ANGEL or another LMS at a college. The data mining methods of classification, association, and clustering were applied to analyze the data. Classification produces a decision tree which predicts which courses will use the LMS system in the future, based on course specific attributes such as course type, discipline, and the number of students enrolled. Association mining discovers the usage of one feature's effect on the usage of all other sets of features. Grouping features with similar values is the process of clustering. From the results of these analyses, metrics are formed to indicate usage of features in the LMS.

BACKGROUND

There is a similarity between LMS and Knowledge Management Systems (KMS); both provide a repository for knowledge which is valuable for the user. In a KMS the knowledge is kept and used by an organization's employees. In a LMS the purpose is to disseminate knowledge from instructors to students and to share knowledge in a way to enhance student learning (Haldane, 1998). There are also similarities between Learning Management Systems and distance learning. Distance learning uses LMS like software to provide students with learning materials and activities while tracking student activity (Falvo & Johnson, 2007).

Whether the system is an LMS, a KMS, or a distance learning system the organization needs to select and implement the system best suited to their needs. Studies have been done to compare different Learning Management Systems (LMS) prior to installation or to evaluate effectiveness (Beatty & Ulasewicz, 2006). There have been many approaches to system evaluation and selection.