Content Management System in Enhancing Web Management: A Case Study of Kulim Polytechnic's Website

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Abstract: Improving information management practices is a key focus for many organizations, across both the public and private sectors. This is being driven by many factors such as a need to improve the efficiency of business process, the demands of compliance regulation, and the desire to deliver new services (Robertson, 2005). Due to the needs, new technology solution such as Content Management System (CMS) can be adopted to handle the organization's business. Applying the CMS-based Web which manage an organization's content, ensures the efficiency of the information delivering. The CMS is believed has an ability to keep the management of Web become more efficient and effective.

1.0 INTRODUCTION

World Wide Web or Web for short is a software application that makes it easy and possible for nearly anyone to publish and browse hypertext documents on the Internet (Greenlaw and Hepp, 2002). Due to the increasing numbers of Internet users, as stated by World Internet Users and Population Stats Webpage (2005), the Web seems to be a new trend and the most chosen media today to disseminate information. Hence, the crucial element within Website is an ability to ensure an up-to-date content is delivered to user.

Web designing, content creation, Web publishing and Web updating or maintenance are several steps that need to be taken in Web management. Usually, updating the Web content is a nightmare especially to those who are business entrepreneurs that have less time to concentrate on it. More over, some of Web owners found that the whole processes involved in Web management were hard and causes such a large cost to be invested. In this case, Content Management System (CMS) is identified as one of the alternative to manage the Web within cost effective.

The focus in this research project is an open source CMS, which means no cost to acquire the software and technical support, is given by the Open Source community. There are lot products of this kind CMS and the CMS Made Simple (CMSMS) is chosen purposely to highlight its potential in enhancing Web management. CMSMS is a very basic Web Content Management System that provides a fast and easy way to create a website and manage its content. Several technologies that are very common involved here are PHP language, MySQL database, and Apache Web server.

To show the significances of CMSMS application in enhancing Web management, a Website of Kulim Polytechnic (PKU) is adopted as a case study. PKU has published their Website for about two years. The Website has been built from scratch without applying any concepts of CMS. Therefore, PKU's Website is suitable to be redesigned using CMSMS based on their current Website but with a little amendment if needed.

1.1 Problem Statement

The necessity for applying CMS in PKU's Website is due to the following reason:

a. Outdated content
Since PKU's Website has been online for two years, there are a lot of content that seems not being updated. Due to the tight duty of Webmaster who is a lecturer, updating the Website is very hard to be completed.

b. Inconsistent appearance
The appearance of Website looks not standardized especially when there are new pages added for certain special events. Some even left to be default settings.

c. Hard to gather information
The core business of PKU is giving a lecture to student. Therefore it is very hard for Webmaster to gather required information from all the departments or units. Thus, the processes of updating the Website have to be postponed.

d. No user level access
The Website only can be accessed by one or two staff authorized. If other staffs have new information that need to be published instantly within Website, they need to go to Webmaster first and submit the information. This can causes the outdated information if the updating processes is failed to be done by the Webmaster.

e. Lack of technical knowledge
Most of PKU's staffs are lack of technical knowledge in term of Web publishing. But they have an intention to help Webmaster to update the Website content. Since they only can be the author, current Website could not support their skill. They should have at least the HTML basic knowledge.

1.2 Project's Objectives

a. To develop a prototype that deliver the Web content using the CMS Made Simple application, the ready-made WCMS with open source style (this includes the use of Apache Web Server, MySQL database and PHP technology).

b. To identify the advantages of Content Management System implementation towards Web management.

1.3 Scope

CMS can have a different meaning to different people. It is a wide area of study and can be categorized into several types. Therefore, this project focuses on developing the prototype of Web Content Management System (WCMS) for the uses of Kulim Polytechnic, Kedah. The effort within this project is to identify the CMS significances in enhancing the Web management compared to their current Website. Current Web content of Kulim Polytechnic will be shifted to the new WCMS along with the appropriate additional components.

2.0 LITERATURE REVIEW

This literature review covers the overview of Web and Content Management System (CMS). It will also review on the open source software, existing open source CMS and related work for this study.

2.1 Overview of the World Wide Web

The Web was designed in 1989 by Tim Berners-Lee at the European Organization for Nuclear Research (CERN) in Geneva. He proposed that the Web should have the following components (Berners-Lee, 1989):

a. A consistent user interface.
b. The ability to incorporate a wide range of technologies and document type.
c. "universal readership", that means anyone sitting anywhere on the network could read the same document as anyone else and could do so easily.

According to Noruzzi (2004), the Web has a great impact on communications and society than any other technologies. It is now widely used as one of the primary means of disseminating many kinds of information. Thus, no wonder the Web development has greatly increased in popularity over the last five years, as mentioned by Lemieux (2005) the expert author of Web design. In Berners-Lee (1996) prediction, he listed some possibilities of future directions in Web development. These include:

a. To provide more functional, robust, efficient and available service.
b. To enhance the Web as a means of communication and interaction between people.
c. To contain rich data in a form of understandable by machines, thus allowing machines take a stronger part in analyzing the Web, and solving problem.

However, the process of deployment the good Website is too subjective. Most current Web development and management practices rely on the developer's knowledge and expertise. Without well-defined process and lack suitable tool supported, understanding the conceptual structure of a complex website and managing its evolution are complex and difficult tasks.

2.2 Introduction to Content Management System (CMS)

A Content Management System (CMS) can be defined as a database of information and a way to change and display that information, without spending a lot of time dealing with the technical details of presentation (Simpson, 2005). In other words, CMS is a set of processes, applications and databases that help an organization to create, store, coordinate, and publish information in a useful format, in a timely fashion, and within consistent method.

Prideaux (2004) categorized CMS into several different types of products and several different styles of each as illustrated in Table 1 and Table 2. According to Maison (2003), CMS is a sophisticated tool that can be used to make the whole process of Web publishing much easier.

Table 1: Types of CMS (Prideaux, 2004)

Types of CMS	Description
Web Content Management System (WCMS)	Emphasizes only on managing only Web content.
Enterprise Content Management System (ECMS)	Manages all the aspects of an organization's publication content processes.
Document Management System (DMS)	Focuses on managing internal documents within an organization.
Digital Right Management System (DRMS)	Purposely used to manage an organization's intellectual property rights such as music or video.
Asset Management System (AMS)	Manages so-called content "assets" such as images, videos, audio, and other binary, non-textual content.

Table 2: Styles of CMS (Prideaux, 2004)

Styles of CMS	Description
Hosted	A vendor hosts and maintains the CMS, which frees clients from much of administrative responsibilities.
Commercial	A vendor builds a CMS application and sells it to the client, who is responsible for maintenance
Nonprofit	The CMS is built for nonprofit and even built by nonprofit as well.
Open Source	The client has a lot of control and responsibility on his CMS and its free.

Free or Libre Open Source Software is a broad term used to embrace software developed and released under an open source licence that allowing inspection, modification and redistribution of the software's source (Crowston et. al, 2004). It is generally available without charge. According to Crowston, due to their size, success and implementation, the Linux operating system and the Apache Web server are the most well known and used.

2.3 Comparison between Open Source CMS: CMSMS, Mambo and PHP-Nuke

There are hundreds of CMS products in the market nowadays. Therefore, a specific tool is required to compare their performance before they can be adopted as the official use to the organization. This tool is available at the http://www.cmsmatrix.org. Certainly, a lot of open source CMS are available to be compared as well. The comparisons between three products have been made, and the result is as shown in Table 3.

There are a lot of measurement factors that provided by the tool. The focus for this product is the management factor. Based on Table 3, Mambo seems to have an advance of management features compared to the CMS Made Simple (CMSMS) and PHP-Nuke. As for CMSMS and PHP-Nuke, they almost have an equal features. Referring to Mambo, one of the finest open source CMS, it provides too advances features that is not really suitable to be implemented in PKU's Website. PHP-Nuke is more focus to news automated system. Therefore, CMSMS is selected to be applied in PKU's Website due to its simplicity.

Table 3: Comparison between Three Selected Open Source CMS Adapted from The CMS Comparison Tool (2006).

Management	CMS Made Simple	Mambo	PHP Nuke
Advertising Management	Free Add On	Yes	Yes
Asset Management	Yes	Yes	No
Clipboard	No	No	No
Content Scheduling	No	Yes	No
Content Staging	No	No	No
Inline Administration	No	Yes	No
Online Administration	Yes	Yes	Yes
Package Deployment	No	Yes	No
Sub-sites / Roots	No	No	No
Themes / Skins	Limited	Yes	Yes
Trash	No	Yes	No
Web Statistics	No	Yes	Yes
Web-based Style/Template Management	Yes	Yes	Limited
Web-based Translation Management	No	Yes	No
Workflow Engine	No	No	No

2.4 Related Work

According to Dudek and Wieczorek (2003), a simple Web CMS tool is the most suitable solution to a Web redesign. They have redesigned the Web of Computing and Information Technology (CIT) for the University at Buffallo which can be reached at this address, http://www.cit.buffalo.edu/ . The separation of content and presentation of the site help them to successfully implement the site within three months. It contributes a lot of benefits as well to the ibm.com in their transforming CMS process using Franklin CMS (Weitzman et al., 2002). The benefits are as following:

a. Easy maintenance of content.
b. Easy maintenance of design.
c. Easy delivery of content to new device.

Cranor et al. (2003) have implemented the Spectrum CMS which deal with rich media content. Keeping track of the live continuous media content such as TV or Radio content is really a hard task. Therefore the Spectrum CMS is applied due to the increasing of capacity of and decreasing in the cost of storage.

The adaptive reuse of Plone CMS in the British Computer Society Open Source Specialist Group has contributed to several advantages such as (Adams et al., 2005):

a. Increased reliability.
b. Reduced Process Risk.
c. Effective Use of Specialist.
d. Standard Compliance.
e. Accelerated Development.

CMS development and implementation by Step Two Design Pty Limited, the expert consultant of knowledge management, content management, intranet, usability and information architecture, had contributed a lot to both

of their clients, NRMA Insurance Limited and Roads and Authority of Australia. These have been explained through their case studies (Robertson, 2001a, 2001b) which highlighted several contributions to the organization's benefit such as:

a. High accuracy of content delivering.
b. Standardization of content appearance due to the using of cascading style sheet.
c. Productivity improvement among staffs due to the ease of use of the system.

3.0 METHODOLOGY

The main effort in this study is to develop a working prototype of CMS-based Web. Hence, to accomplish this task, Component-based software development (CBSD) recommended by Haines et al. (1997) is customized and utilized. CBSD is concerned with the assembly of pre-existing software components into larger pieces of software ("Component-based," 2004). In a simple word, this methodology allows the creation of a new system from modifying the existing system. Following are the activities that have been followed:

3.1 Preliminary Web Investigation

The preliminary Web investigation in PKU is conducted by using an inquiry approach. It is apart from usability evaluation methods which aim to obtain information about users' likes, dislikes, needs, and understanding of the Web (Zhang, 2003). The method that has been used within this approach was a contextual inquiry, which is almost like a field observation or interviews. An interview session which look alike a discussion was setting among Webmaster and other technical staff. The main topics that have been discussed included the problems, performance and the future idea that related to PKU's Website. In this method, PKU's Website is being observed through navigated the whole site. The elements that have been observed are the menus available, the functionality of each menus, the appearance of every pages, and the continuity from one page to another. All the observation has been recorded into well-designed form for future reference. Figure 1 depicts an overview of the methodology of this project:

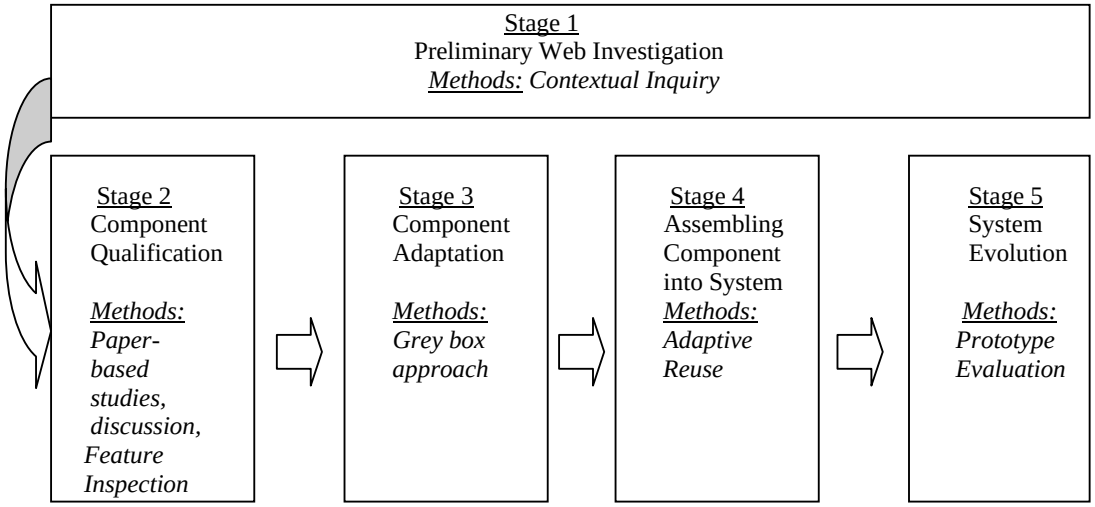

Figure 1: An Overview of Project Methodology (Modified from Haines et al., 1997)

3.2 Component Qualification

Component qualification is a process to determine the suitable components within the existing system, so that it can be used to be applied in a new system. The PKU's Website has been analyzed to achieve the above purposes. There are two phases of component qualification:

a. Discovery

The existing Website has been analyzed using feature inspection which adopted from inspection approach. All the components or features within the Website will be listed and analyzed for its availability, understandability, and general usefulness (Hom, 1998).

b. Evaluation

All the components discovered in previous phase have been evaluated according to organization's requirement. This evaluation used combination approaches which are paper-based studies of the components, and discussion with other users of those components.

3.3 Component Adaptation

Those components which have been qualified in the previous were adapted with a new system to avoid any conflict among them. This must be done because individual components are written to meet different requirements and are based on different assumptions about their context. This adaptation process has been done using the grey box approach. It is an approach where source code of components is not modified but the component provides its own extension language or application programming interface (API).

3.4 Assembling Component into System (Prototype Development)

In assembling components into system, a prototype has been developed to enhance Web management in PKU. In this case, the adaptive reuse is utilized, which means the entire of selected software system is reuse through adaptation (Adams et al., 2005). This has been implemented via customization, with a few modifications to its parameter according to PKU's requirement. The particular software system reused has been CMS Made Simple (CMSMS): an open source content management system. Below are the software tools that have been used in order to develop the prototype.

Table 3: Software Tools

No.	Type of Software	Description
1.	CMS Made Simple version 0.11.2	An open source content management system
2.	Apache	Local machine server
3.	MySQL	Database Management System (DBMS)
4.	PHP 5.1.2.2	PHP script interpreter
5.	PHPDev5	Apache, PHP and MySQL handler
6.	PHP Designer 2005	Script editing
7.	Microsoft Paint	Image editing
8.	Microsoft Photo Editor	Image editing
9.	Microsoft Word	Text editing

3.5 System Evolution

This activity aims to repair an error, to replace the defective component with the correct and the updated ones, and to add a new component if the additional functionality is required. The prototype that has been developed is presented to a group of users. Their opinions were considered to enhance the prototype.

4.0 FINDINGS

Based on the prototype development of PKU's Website, several findings have been found which is categorized into two categories as the following:

a. The prototype development of PKU's Website and its management functionality.
b. The advantages of the CMS-based Web towards Web management.

4.1 The Prototype Development of PKU's Website and its Management Functionality

4.1.1 Prototype Architecture

The overall prototype architecture has been defined as in Figure 2. Based on the architecture designed, PKU's Website with CMS-based is the main prototype of this study. The prototype considered two types of users which are:

i. Public User

Able to view information on Website, download files and send a message to Webmaster.

ii. Authorized Staffs

View the Website as well as manage it online. They can be divided into several access levels which are the admin, editor, and designer. Website can be managed using the CMS Made Simple Admin Panel which underlying behind the PKU's Website.

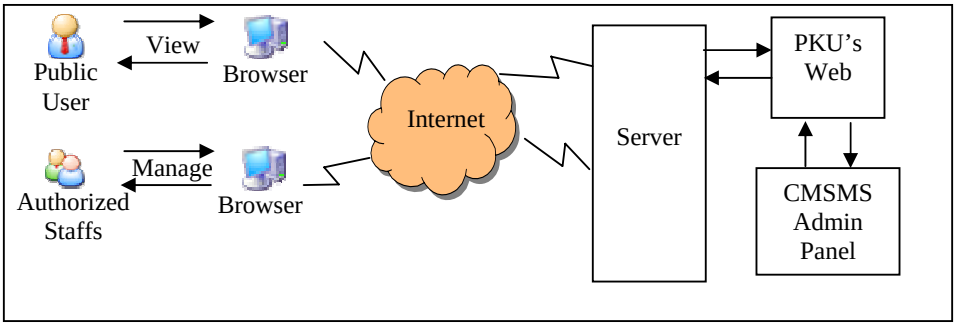

Figure 2: Overall Prototype Architecture

4.1.2 Workflow of Website Creation

Creating a CMS-based Web using the CMS Made Simple for Kulim Polytechnic became easier and faster as it consists the simple workflow as the following:

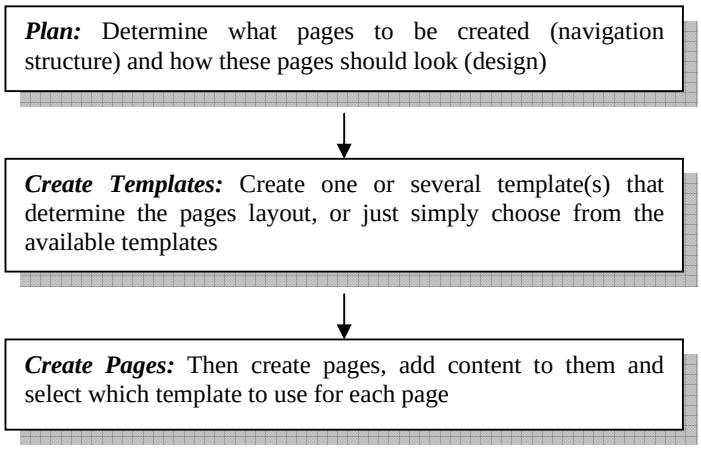

Figure 3: Workflow of creating a Website using CMSMS

4.1.3 Public Users View

i. The Main Page of PKU's Website

The main page of PKU's Website is as following:

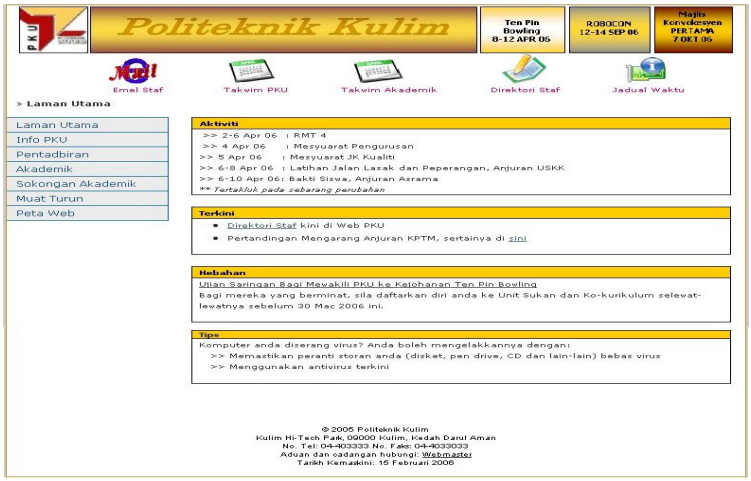

Figure 4: The Main Page of PKU's Website

ii. Main Page Layout

The main page layout of the main page is as shown in Figure 5. The layout is split into six sections, which are:

a. Header – Main title which describes about the organization.
b. Special Event Ads – provides external links to highlighted events of PKU.
c. Most Visited Links – provides the most visited links especially by PKU's community.
d. Main Menu – Displays the main menu of the Website.
e. Content – An essential elements to the Website that will be provided by the staffs authorized.
f. Header – Provides contact information of PKU.

Basically, there are seven main menus available within this Website. This is shown in Figure 6.

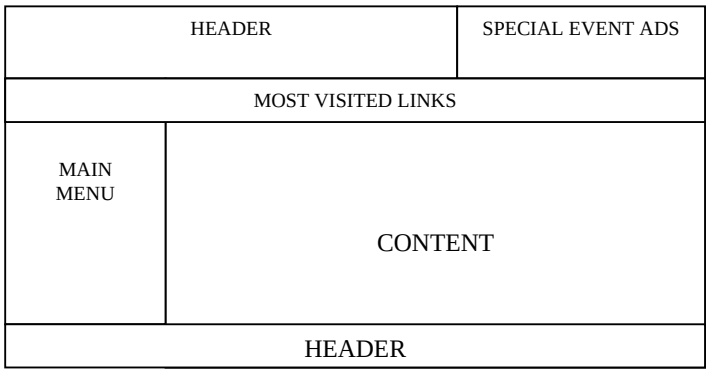

Figure 5: Main Page Layout Design

Figure 6: Main Menus of PKU's Website

4.1.4 Administration / Authorized Staff View

i. The Admin Panel

According to Lerner (2003), a CMS usually is a toolkit that provides several functions to manage the Website. As for CMSMS, the Admin Panel is a place where authorized staff will work from. It is the heart of the Website that will determines the final looks of PKU's Website. Here, the authorized staffs add pages and fill them with content, choose the layout and style of pages, install extensions for extra functionality, permissions for users and group and many more. The Admin Panel page is as shown in Figure 7:

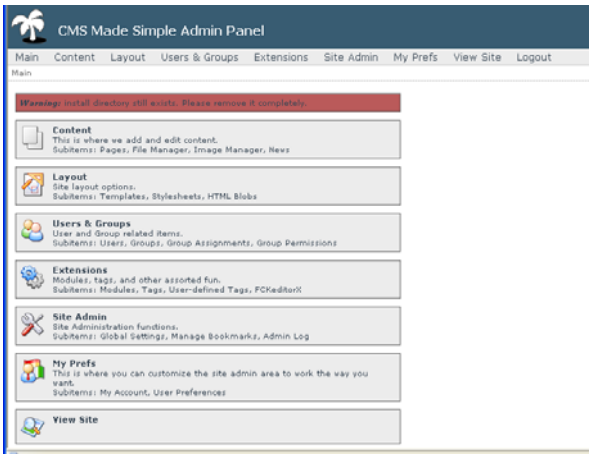

Figure 7: Main Page of CMS Made Simple Admin Panel

ii. The Management Functionality Offered within CMS-based Web

Managing the Web using the CMSMS became available to the authorized users as it offers three core functions, which are:

a. Content
Manage the content of the Website.

b. Layout
Manage the Website layout without affecting the content.

c. Users and Groups
llow multiple users to access whether as the admin, editor or the designer.

Web management of PKU can be enhanced by exploring and implementing other support functions offered by CMSMS, such as:

***a.* Extensions**
Extra functionality that can be add-on to the Website, such as {current_date},{search},{contact} and so on.

b. Site Admin
The global setting allow the admin to set the Website into down message in case there are a lot of maintenance tasks need to be done. Also provides, is the admin log to see what changes have been made to the Website.

c. My Preferences
The place for the admin to change setting and preferences of the Website.

4.2 The Advantages of the CMS-based Web

Applying the CMS-based in Web design gave several advantages to the organization such as:

a. Multiple-person Web
The management tasks especially updating the Web content can be distributed to many users, instead of leaving to admin to do everything.

b. Separating structure and presentation
The structure of the pages or in other word the content, can be written without afraid of affecting the whole design of the Website.

c. Web-based editing
Let the authorized users to manage the Website through their local computer via online.

d. Chances of Web performance Increasing
The chances to upgrade the Website are big due to the technical support that is given by the open source communities. The Website performance can be increased from time to time as the latest release module of the CMSMS can be downloaded if available.

e. Cost effective
The open source CMS usually is free and Web development using it takes very less time.

5.0 SIGNIFICANCE

This project is expected to give an alternative to those who are disseminating their information through Website. It offers several advantages to PKU regarding web management as listed below:

a. Ease the user in creating the webpage with less skill or knowledge of (Hypertext Markup Language (HTML).
b. Help user to manage the Web content in efficient and easy way.
c. Increase the efficiency of Website within a minimal cost.

6.0 CONCLUSION

CMS has become the most chosen Web application among Web designer to create a Web. It can comes into two forms which are the commercial CMS or the open source CMS. Most commercial CMS are expensive and proprietary. Therefore, the increasing numbers of open source options are available for those who want a greater freedom and lower cost.

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