Web Authoring Tool for Effective Content Management

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Abstract—Internet is the most popular medium to express our views and ideas. With the help of internet, the people publish their information or data in the form of web pages. Static web pages are quick and easy to put together all the pages, but maintenance is difficult when the site goes longer. Also, it is too difficult to maintain the document consistence. Dynamic web pages are created with the help of scripting languages, but it requires minimum knowledge of the programming language used for website creation. Therefore, a web content management system (WCMS) is a software system that provides website authoring and administration tools. It is designed in such a way that it allow users to create and manage websites with little knowledge of web programming languages or markup languages. It offers the users with the ability to manage the documents and output for multiple author editing and participation. It improves the performance by using the server-side caching technique.

So, in this paper, we presented that WCMS can be used for college to create their own web pages effectively and easily without much knowledge of programming languages. Also, we provide various measures to validate our work by comparing various methods of creating websites. The comparisons between the obtained charts and the validation results clearly explain that the WCMS we presented produces the better result.

Keywords—*Web CMS, CMS, database, Security, Upgrading*

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I. INTRODUCTION

A Website is very important for almost every non-profit organization, but creating a Website is not an easy task because it can take a lot of time and money which are often in short supply. A Web Content Management System (WCMS) [4] is the best technique that must be employed to create the website for the college or universities in a short period. Generally speaking, a WCMS is a software system that allows the web masters to build a website that can be quickly and easily updated by the non-technical staff members in the institution. Content management [4] is defined as maintaining, organizing, and searching data across information sources, both structured (databases) and unstructured documents. The CMSs are broadly classified into two categories, Web and the enterprise. Historically, the content management concept originated from organizations efforts to manage Web content. The enterprise content management (ECM) involves not only technical systems, but also "the plans, tools, methods and skills an organization needs to manage its data over their lifecycle. In contrast, according to current understanding, a CMS supports generating and publishing content structured in Web formats, such as HTML [1], XHTML and XML. A WCMS also allows users review, approve, and archive content, and offers version control. Using such functions, users can implement an editorial process that comprises several user roles with different privileges, including administrators, authors, reviewers, and consumers.

An organization might, for example, use a WCMS to build websites, online blogs, forums, or community portals.

The major advantage of a WCMS is that it allows site creators to modify the content and layout without having to edit the code or possess other programming knowledge [8]. Organizations usually store the content in databases and publish, edit, and remove it using graphical user interfaces. A WCMS can be divided into two functionalities such as front end and back end functionality [9]. The front end presents the content to visitors, who typically don't have permission to change or edit the content. However, front-end users are sometimes granted special permissions, such as to submit comments for the articles. Publishing and editing the content is done via the application's back end, which is the workplace for administrators, authors and reviewers. Authors typically type their content using a rich text editor, which creates HTML, XHTML [1], or XML markup. They render this markup by applying style sheets—such as CSS or XSL—which authors can adapt to suit their design needs.

At its most basic, a web content management system (WCMS) is a software program [5] that makes building and maintaining Web sites faster and easier. Let us imagine that we are building a Web site without a CMS. If we have a keen interest to post the content and have that content show up in separate places on the site, we have to perform the same activity for the separate pages. With a WCMS, we only have to post the content only once. Basically, Web Content management systems store the actual content (text and images) in a relational database [4]. The system can then automatically extract the content from the database and show it on the appropriate pages based upon the rules that we set up in

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advance. This setup makes it easy for all our content administrators, authors and the staff members who are writing and publishing the actual information on the site to create content without worrying about programming errors, or even knowing all the places where the content should go. Web Content management systems also split the graphic design from the content itself. This is accomplished with the help of "themes" which is defined as the graphic design layers that control images, style sheets, and page layouts for each page on the site. We simply choose a pre-packaged theme for the college site, or create a theme that's completely customized to our own look and needs.

This paper clearly defines two goals: first, it explains a clear cut idea about the web content management systems, their ideas and principles. Secondly, it draws the methods for creating the websites using WCMS. Our research paper is organized in the following manner. In Section II, we discussed about the Threats of web application. In Section III, we described about the content management system. In Section IV, we explained our experimental results and discussions. Finally, we ended our paper with conclusion in Section V.

II.   THREATS OF WEB APPLICATION

In software systems, security defects may occur from the initial phase of the software development lifecycle. Gary McGraw [6] defines a bug as an implementation level software problem and a flaw as a problem that's "certainly instantiated in software code, but is also present on the design level or in other phases of software development." So, the programmatic errors [6] create risks, which are the probability that a flaw or a bug will impact the software's purpose:

$$risk = probability \times impact \qquad (1)$$

Networking applications especially those exposed to the Internet are much more vulnerable to threats than conventional standalone desktop applications because many users access these applications and it is very hard to control. Often, the Internet attacks [6] are almost fully automated, and many tools allow people with even minor technical knowledge exploit vulnerabilities. As a Web application, a WCMS is an attractive target for attackers and a major source of security vulnerabilities. Threats affect one or more security aspects. According to several technical experts, Web application threats include

Phishing: This attack gathers confidential data such as bank account information, credit card numbers, or passwords by contacting users under fake method via email and luring them to Web sites where they are encouraged to enter their personal data.

Automatic Code execution: Attackers can exploit WCMS vulnerabilities to load script files or programs containing

defective code onto a Web server. They can do this by using even simple graphic files. The WCMS [4] must carefully verify this type of inputs because such an attack can harm not only the WCMS itself, but also other applications are running on the same server.

Spam: Here, Web crawlers and search engines [8] scan the Internet for valid email addresses and send spam [2] accordingly. Attackers can also use a malicious application vulnerability to send spam through the application's server.

SQL injection: This type of attack violates data integrity and it results in data loss. Common attack techniques here include parameter manipulation and SQL injection [4]. The attackers access the record data using techniques such as structured Query Language (SQL) injection and cross-site scripting (XSS).The Web applications in general, and WCMSs in particular, operate in a hostile environment.

A.   Attacks and Countermeasures

Attackers use various attack patterns. Each attack pattern consists of several phases of discovery and exploitation. Attack patterns can include many dimensions, such as resources required, techniques and timing. Because of a WCMS's wide application area, the damage caused by the attack is really huge. If a WCMS is used as an e-commerce site, hackers might obtain confidential customer data, such as credit-card information, password, etc. If the site's owner had failed to secure the WCMS, an attack disclosure could lead to a huge damage, as well as a general loss of customer confidence.

In other cases, hackers might gather user information, such as addresses and personal profiles, and sell the private information to the site's competitors. A WCMS can also be sabotaged and rendered inaccessible. This could lead to a decline in sales. On corporate WCMS Web sites, attackers might utilize security leaks to upload malicious program code and harm a company's IT infrastructure. Attackers might also alter the company's Web site content by adding dubious and suspect content to damage the company's reputation.

To be considered secure, a Web application must ensure the policies such as

- ❖ *Authentication:* by checking the people's identity that they are the true users.
- ❖ *Confidentiality:* by hiding data from unauthorized persons.
- ❖ *Integrity:* by preventing unauthorized persons from editing, updating, and deleting information; and
- ❖ *Availability:* by performing manipulations according to their purpose over time.

To achieve these goals, the application developers can use several methods, including sophisticated authentication, access control for the users, and mechanisms

that decide when to maintain data confidentiality, such as not to show credit card numbers while verifying a person's financial status.

B. Challenges in developing and managing web sites

Because of the threats, developing the website is not an easy task. So, we selected and employed the appropriate framework to develop the website for the college. It was responsible for both the creation of the website and its content, and for keeping the website content as updated one. This approach gives the web site a consistent in look and feel. But, the web master is forced to choose: concentrate on site development to meet the demands of the site owner and replace some out-of-date content [7], or build the site more slowly and steadily and try to ensure that content is always up-to-date. As a result, the web master [8] faces a lot of problems in the development of website and he is criticized not only for being slow to meet the needs of colleges/universities demanding a web presence but also for not keeping the website current. Consequently, web development began to decentralize. Individual departments in the college began to hire their own programmers for web development, often students majoring in computer science or who had already acquired web-development skills elsewhere.

If the website grows continuously by updating the content, then it is difficult to maintain a consistent form with its look and feel. So, the web master resisted this trend. But, the college embraced this change, however as it met the institutional desire for a web presence. This decentralized solution produced its own problems. The departments usually could afford the help of a web developer for limited periods of time, but not permanently. Additionally, each department has unique ideas about the design of several pages, which resulted in the site loss of visual cohesion. Each area of the website became as distinct as the department culture from which it was developed, and visitors were often unclear if they were still on the college's website. Navigating to other pages in the website became nearly impossible, as there were no rules enforcing a common navigation scheme. Moving from one page of the site to another and with no way of navigating back to the previous page will cause a huge irritation to the visitors. The pieces of the puzzle and that they were followed no clear structure, which left visitors confused about the website and about the institution itself. This decentralized approach from individual departmental perspectives, was clearly ineffective and a waste of resources at the institutional level.

The departments with sufficient funds can able to hire their own developers for their website development. But, it is tedious for the departments having insufficient funds and depends upon the schedule of the web masters. Nearly the entire college community had grown weary of the ever worsening appearance of the site. So, the college management wants to identify possible solutions for the standard website

development. After some review and discussions, web content management system (WCMS) [4] is the best solution for their needs. Such systems separate the construction and display of web pages from their content. WCMSs allow for controlling the look and feel of web pages centrally while disturbing responsibility for the content. They permit department control of their area of the sites, including the ability to create, delete and update pages. Most WCMSs also separate the creation of content from the design and include some level of workflow control. The actual layout of the page and its overall look and feel are controlled centrally by the web administrator. The web administrator can also ensure a consistent system of navigation in all areas of the site.

III. THE RESEARCH WORK

Almost all web CMSs help the organization to achieve the following goals:

Automatic content administration: Historically, the web content has consisted of static pages or files of HTML. The web administrator needs HTML programming [1] experience for updating their content and the design layout. It is clearly a time-consuming process and a labor-intensive one. In contrast, WCMSs significantly reduce this drawback by hiding the complexities of HTML markup tags and automate the management of content and the design of the college web site.

Content administration based upon the web-forms: In a supreme WCMS, all the content administrative tasks are performed through web-forms with the help of web browser. Specialized software is not required for the web administrators. Also, the web administrator need not be expert in the implemented WCMS programming language. Visitors simply copy and paste the already existing content or fill in the blanks on a form.

Distribute the content management and user control: The web master has high responsibility in maintaining the web page because the content must be published in the right time and also the web content must be current and updated one. The web administrator must be busy in his profession because he would have to browse more web pages each day just to review all the web content on the site. But, the WCMSs remove this bottleneck by distributing the content management responsibilities to individual persons throughout the organization. Those individuals acquire the authority to modify, edit, and update and delete the contents. Also, they can do all these works without acquiring any programming knowledge in HTML [1] graphic design, or web content publishing.

Web contents are separated from the layout of the page and the graphic design: In a WCMS, contents are separately stored from its publication format. Usually, the college's mission and vision statements could be stored in a raw or text format, and then it is formatted as needed to reflect the graphic designs for

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both desktop applications and personal digital assistant (PDA) devices. The web administrators enter the content only once, but it must appear in many places, and it is formatted using different graphic designs [9] and layouts. All the web pages reflect the approved content changes immediately.

Reuse web content: The web contents are reused with the help of WCMS. The web contents are created and entered only once and then reused through the web site when needed.

Implement the graphic design management as the central console: In WCMS, the graphic design is managed as the central console and the layouts can be easily changed through the available templates. Templates are the procedures that format and display the web content in a particular fashion based upon the request received from the visitor for a particular web page. Templates provide a consistent, professional look and feel for all the web pages on the site. They also allow for simultaneous and easy modification of entire website's graphic design.

Automatic workflow management: Good WCMSs enable proper workflow processes. In the complex workflow system, the different individuals are employed to create, approve and publish a piece of content. They must work individually and independently. A good workflow system accelerates the next person to publish the web content in the right time. It also verifies that the web content is adequately reviewed and approved before publication.

High Security: The WCMSs provides the sophisticated content access control and high security [8] to the websites. The web administrators, who create the content, can only be able to edit the content. Other users can view and use it but the editing activity is prohibited. Web administrators should be able to assign the role for users who have access to different types of data and what type of access each user has.

Database driven content administration: The database is crucial tool to WCMSs. In standard WCMS [4], static or flat HTML pages do not exist. The system usually places all the web contents in a relational database which is capable to store all the data type contents. The database soon becomes as the central repository for web content, graphics, and metadata.

Collect the metadata: The data is stored in the database which is separated from the layout and design. The database stores the metadata [4] which describes and defines the data, including author, date of creation, date of publication, description of the content and indexing information, information about the categories, revision history, and a range of other content-related data.

Integration with legacy systems: Through advanced programming, the WCMSs can be easily customized. With the help of application programming interface (API) [9], the functionality of the system can be exposed easily. The WCMSs also coexist and integrate with legacy systems.

Version control: The systems must provide mechanisms for storing and managing revisions to content. When the changes are made, the system must store the records of web content and allow reversion of any web page to the earliest versions. The system must also provide the ability to prune recorded web content periodically, preferably based on a variety of criteria, including location and versions.

In addition, quality WCMSs must provide scalability in terms of performance and the available data volume, flexibility in designing the workflow process based upon the needs of the college,. Also it provides history tracking, version control and tools to manage the web content in multiple languages.

A. Choosing a WCMS

Choosing a WCMS for the college can be a complex and difficult task. Institutions with a large development staff like to create a custom and unique solution in their own style. Some others like to explore the development frameworks for building the website. Many will want to consider commercial and packaged solutions. At the same time, others want to go for open-source solutions [9]. Based upon the feedback, the college recognized the importance of web presence and identified two major problems. First, the system wants to meet all the requirements, including automatic workflow management, content reusability, version control, metadata structures, high security and user access control, integration with legacy systems and enterprise scalability. Second, the system required adequate resources for maintenance and even greater resources for improvement and extendibility.

Fortunately, as we defined our scope, we found various kinds of moderate software packages with the required functionality. The important job of the web administrator is to find the appropriate software modules for the college's website and present his own idea to the college committee members. The college committee viewed the available selection and recommends the best WCMS to the web administrators. Before making the final decision, each institution will need to find the merits and de-merits of WCMS because some institution will like to buy high priced software packages, while some others are interested in custom built and some others are interested in open source. Due to staffing concerns also, colleges are shifting their attention to WCMS. Mainly, the WCMS are well defined and provides search engine optimization. For this purpose also, the college committee will give more importance for WCMS.

B. Site Design and CMS Implementation

The college identified the key concepts to be met by the redesign process:

❖ The content management control is distributed to all users in the college. The individual user is responsible for posting and editing the web content on the web site.

❖ The graphic design, layout and the navigation menus must be properly restructured. Therefore the target

audiences can easily browse and find information without any complexity or without any help from the expertise.
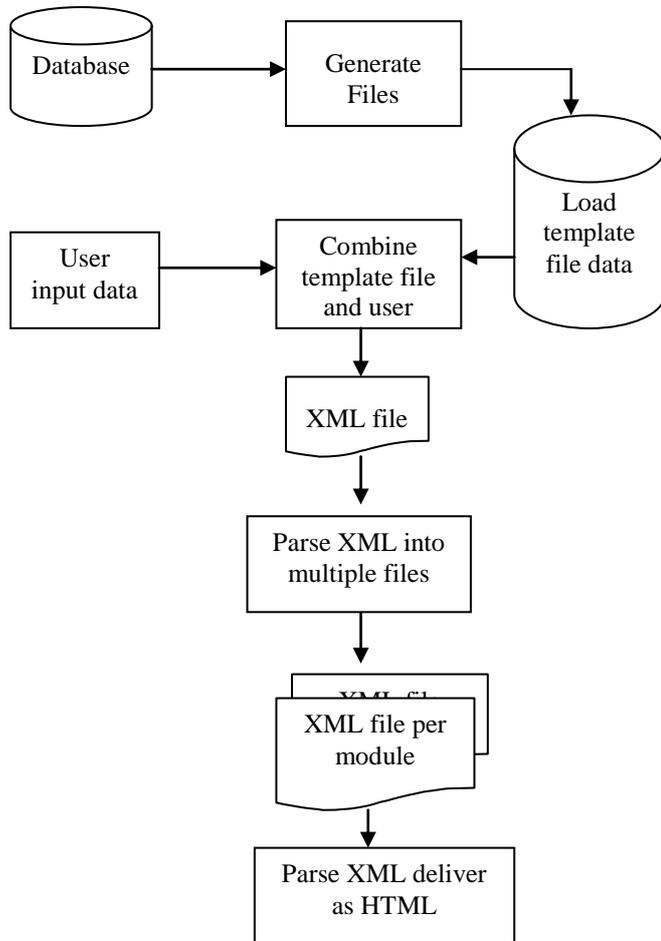

Fig 1. Flow Chart of WCMS Implementation

❖ Provide user-friendly appearance to the target audiences and also the content need not be static all the times.

The college sought the help of educational marketing firm to assist with the development of architecture, layout, and graphic design for the website. The team spent several months and gathered information from stakeholders, academic students, technical and non-technical staff, and other interested groups and applied the gathered results to develop a web site structure that would best meet the needs of our targeted audiences. The firm then framed a targeted look for the website. The flowchart for WCMS is shown in Fig.1

The college also turned into implementation consulting firm for assistance with the configuration, customization, installation and implementation of the WCMS. They were instrumental in helping to imagine and to describe the variety of graphical templates that must be required within

the web site [1], and to customize the system based upon the requirements of college. Also, they wrote the custom program code to perform the identified extra functions.

The web redesign committee from the college, a group of decision makers throughout the college, was important to the success of project and oversaw the events and the announcements from the beginning to end. By consistently monitoring the job of both the educational marketing firm and the implementation firm, the college committee verified that the project stayed focused, on budget and on the schedule. The committee also linked regularly with the college community and helped to achieve the various range of expectations. In addition, the committee established initial steps for implementation of the project and helped to ensure a smooth migration to content management distribution.

Two important organizational factors were also critical to the success of the redesign and restructuring effort. First, the design and structure of the previous website had not changed significantly in more than three years. The college community generally recognized that the website needed significant changes, both in design and in content management. They were prepared for and welcomed the shift in responsibility for content from a centralized to a decentralized content management approach.

Second, colleges in general, made a CMS [4] attractive. Most colleges are defined by decentralized and independent academic and administrative units, yet face a need to present a coherent, effective marketing presence to their current and prospective customers. WCMSs present the best of both worlds, they give the people who know the content control over it, but retain the university's ability as an enterprise to define a look and feel consistent throughout all or parts of an entire site.

The web redesign committee continues to function today as a steering committee. One of its primary functions is to develop and enforce policies regarding the website. For example, all programs should receive recognition on the home page. The committee has developed a policy for what should appear on the home page, evaluates requests, and determines inclusion. This process takes the current web manager out of the line of fire. With the weight of presidential appointment behind them, members of the committee are perceived as the true decision makers. This committee has also assumed responsibility for future changes and enhancements to the site, including the development of an intranet website and portal.

Although a full and complete return on investment has not been calculated, we are confident that it is positive. The part-time web developers hired by individual departments have all disappeared the WCMS application, renders them obsolete. Staff members in each department have taken over content creation and management. Most of the content is already available in one form or another and is easily transferred to the web. Staff training time has been minimal,

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lasting only an hour, with occasional refresher courses. The web administrator advises staff on more complex problems.

The college still has only one full-time web administrator, but there has been a shift in job focus. Most of the web administrator's time is now spent developing more specialized web applications, such as online directories [8] and bulletin boards [9], and managing the application. Before the CMS implementation, most of his time was spent on site development and content management. Moreover, he is no longer the target of frustration and anger over delays in web page development or deployment.

IV.   RESULTS AND DISCUSSION

The coding was done in PHP; as we shift from building simple sites to more complex websites, the learning curve becomes crucial, if we're going to create our own Website. The following measures must be taken into account while developing the CMS.

(i) Flexibility in Graphical Design

Usually, the graphic design for the website is very critical. It conveys a lot of information about the organization. So, the graphical flexibility is an important factor to consider. The WCMS allows the web administrators to create a custom theme, which controls the design, style-sheets and layouts of the pages. Creating a theme isn't an easy process in any of the WCMS; it requires a lot of HTML/CSS [1] skills. But the WCMS allow extreme control over the layout and design, which means they can support any graphical design and layout that are possible using standard Web site scripting languages.

(ii) Ease of Use

When it comes to updating text and images in a Websites, simplicity plays the key role for many organizations. Can the non-technical staff members search and modify the web pages quickly? How difficult is it to add a new web page, or even a new category? How easy is it to add a picture or navigation link to a document? Can they copy and paste text in from Microsoft Word, or does that result in a big problem? Can visually impaired persons use the administrative tools?

WCMSs are quite easy for the web administrators to learn, and provide enough support for pasting text in from Microsoft Word. It is the simplest for page editing, but some more advanced updating and editing tasks may require web administrators to venture into WCMS's formidable website setup interface which is a training challenge.

(iii) Structural Flexibility

When the systems are properly structured, they offer the ability to display some information or data like a news flash, or a description of an upcoming event in various ways in various positions on the website. For example, we could display the titles of the very next two upcoming events on the home page; a full description for the whole month is displayed on the events page, and the financial events in the finance section or financial category page.

WCMS allows us to create the content types related to the category and site structures, and then it determines what content goes to which part on the page and on the website. It offers some flexibility, but is not as strong in determining what is shown on which part of the website, or in creating content types. Usually, it is limited to two content types, blog posts and web pages. The web pages can be divided into parent and child hierarchies, and the blog posts can be categorized and tagged. Some additional content types can be created by specialized modules and later it can be added with plug-ins. Hence, it helps to create new content types which determine how and where they display on web pages require substantial custom coding.

(iv) Average Budget Comparison

The survey has been conducted by web administrators for WCMS professionals to compare their opinion regarding various methods for creating websites. Out of 200 respondents 88 said that they are satisfied with WCMS, 70 with dynamic websites and 42 with other static websites. Another survey has taken regarding the average budget of building website on corresponding platform. Below table.1 shows some of the survey data.

The dynamic website is offering more functionality of large website handling for multi user. It provides the web content in multi language. It also provides complex website management comparing to WCMS. That is why its average budget cost is almost 250 % higher than WCMS. WCMS is for simple site which didn't require much more complex facility. If we have small business, it didn't require more complex facility and if there is low chance to extend or update the site in future then WCMS is the best choice as far as budget is concern. WCMS is also very user friendly compared to other methods

Table1.Budget Comparison

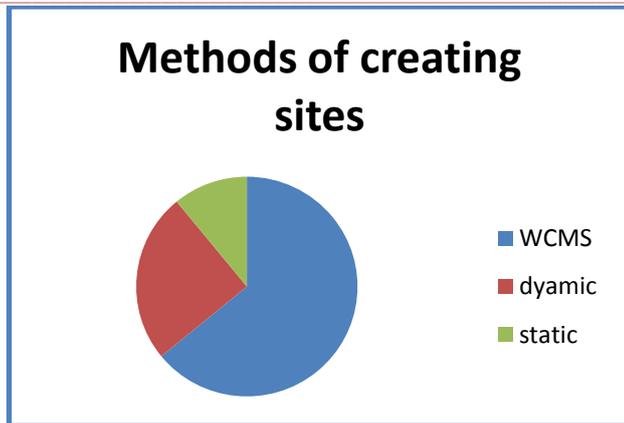| Methods	Respondents	Average Budget
Dynamic	71	$45,184
WCMS	88	$19,847
Other	41	$31,063

Fig 2 Chart for popularity comparison between various methods

(v)   Popularity Comparison
In this we will see which methods for creating the websites are the most popular methods for creating websites among the users as well as provide more documentation and guidelines for their user queries. It means that those WCMS provide better documentation and have more users and have good communities. The Fig.2 shows that WCMS gets full popularity while dynamic sites have somewhat popularity but the static website gets the lowest ranking.

(vi) Web 2.0 functionality
WCMSs offer many options to interact with individual persons in the college. Visitors can comment on articles or site content and even publish blog posts. They can subscribe the site content through RSS feeds, or allow us to extract the web content from other sites via RSS and display it on individual to another. But if the website is very complex, categorized content that was handled by many people, a WCMS can assign user permissions to add or modify, the editor publish the web content by site-specific condition which will be useful. For example, we might want to say that any people from the department can edit the pages in their own categories, but a central person with high authority must approve everything before it can be published. Similarly, it is often useful to be able to control the viewers and visitors, who can view what on the site.

It can be helpful to the web authors to be easily find out what needs to be done by whom and when. For more advanced network/community building, social networking features like the ability for to create their own profiles on the website, and then link to other persons or groups—can be useful. A good Spam filter [2] is important to keep blogs and comments useful.

(vii) Security and Scalability
Scalability isn't going to be a problem for most websites. It is unlikely that traffic to the Website will ever exceed the capacity of any of these platforms. That said, all the

systems handle caching (keeping site content on the disk drive instead of keeping in a database so the web pages can be created more quickly) well. While we might want to scrutinize further if we expect our site to get tens of thousands of visits per day or more

All software systems has vulnerabilities by nature, so when we are shopping by using WCMS, it's not a simple question of a secure versus an unsecure system—the best CMS is the one with the fewest identified, and fastest resolved, vulnerabilities. Websites can suffer with four different types of attacks: SQL injections, which are designed to extract sensitive data like usernames and password, credit card information; link hacks, which insert links to spam; Denials of Service, which prohibit visitors from viewing site content; this makes it important to fix vulnerabilities immediately. And the more popular the WCMS, the more important it is to fix those vulnerabilities immediately.

(viii)   Maintenance and Community Strength
Unfortunately, WCMSs are not "set and forget" kinds of things. The systems must be backed up periodically, so there's a copy on hand in case we go for older version when failure or system crash occurs. Without a backup, if the Web server were to suddenly go down, the entire website could be permanently lost. Many WCMS recently introduced automatic one-click upgrades. It issues more frequent feature upgrades, but both also support "legacy" versions with necessary bug fixes and security releases.

In the past, support for open source software has come mainly from the community of web developers and users of that software. More recently, for profit keeping up with system updates, address security issues and fix bugs is another important task. When choosing a WCMS, the strength of the community is the important factor.

According one survey from 1200 people responded regarding which methods for creating the websites, they preferred first. WCMS is on the 1st position with more than 1100 response. Dynamic websites are on 2nd position respectively with very big difference compare to WCMS. The maintenance and community strength is displayed in Fig.3
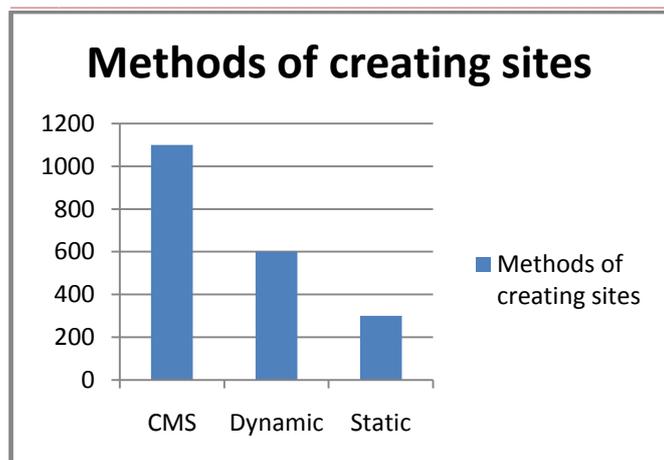
Fig 3. Easier Maintenance of Websites using various methods

V. CONCLUSION

In this paper, the web content management system provides a user-friendly interface to edit and publish the webpage immediately. But in static pages, website editors require training and skills, and the staff members must make the web site compatible with multiple browsers. This is time consuming, expensive and never ending process. In case of dynamic pages, personalized pages are not very cache friendly. It requires a basic minimum knowledge of the language being used. The Scripts need more consideration when uploading and installing, particularly to Unix-related servers.

A WCMS allows non-technical users to make changes to a website with little training. A WCMS typically requires a system administrator and/or a web developer to set up and add features, but it is primarily a website maintenance tool for non-technical staff. Search Engine Optimization is very important for web site. If we optimize the keywords properly, then only our webpage comes first while searching in the search engine. But the WCMS provides better SEO. Freshness of content is one factor that helps, as it is believed that some search engines give preference to website with new and updated content than websites with stale and outdated content. Usage of social media plug-ins help in weaving a community around the blog. RSS feeds which are automatically generated by blogs or CMS websites can increase the number of subscribers and readers to the website. URL rewriting can be implemented easily which produces clean URLs without parameters which further help in SEO. There are plug-ins available that specifically help with website SEO.

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