USE OF WIKI SOFTWARE FOR THE KNOWLEDGE MANAGEMENT AT THE IEN

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ABSTRACT

Thanks to the broad availability of internet access and the development of browser-based web applications known as "wikis" (Hawaiian word for "quick, fast"), it became possible for internet users to participate on big collaborative encyclopedic projects. The best example is Wikipedia, an online encyclopedia based on MediaWiki that receives contributions from internet users around the world. In this context, the word "wiki" usually refers to the wiki software itself, and/or the collection of hypertext documents managed by it. Wiki software allows creating, editing and managing online-shared documents, which become available immediately after they are created/edited. With such capabilities, wikis can also be used within organizations as tools to allow its employees to collaborate in the construction of a common knowledge base containing information relevant to the organization. In such context, the wiki becomes a tool for knowledge management. This article describes the implementation of the WikiIEN, which is based on MediaWiki, as a tool for knowledge management at the IEN – Instituto de Engenharia Nuclear. This tool aims to improve the sharing of information among institute researchers, thorough a dynamic common knowledge base that can be on-line updated. In the article are presented the logical and computational structure of the wiki created for deposit of the knowledge generated at the IEN.

1. INTRODUCTION

The process of dissemination of knowledge can happen through various means. The primordial means were the oral process and the manuscript. With the creation of the printing press, the dissemination of knowledge has expanded to books, articles, newspapers etc. Later, with the advent of electronics, this process also expanded to radio and television broadcasting. From the end of last century, with the advent and massification of computers and computer networks, this process of dissemination could expand to a global scope. However, this process has gone through a gradual and relevant change that redefined precisely who creates the knowledge that is disseminated. People are no longer passive "consumers" of content; they began to participate in content generation. Thanks to new devices, such as computers, tablets and smartphones, and facilities and services such as the internet, sites like Wikipedia, Instagram, YouTube, and wiki hosting sites, it became possible for anyone to become a creator and disseminator of knowledge, information and content.

In this new scenario, use of wiki web software has expanded. In this context, wiki [1] is a type of web application that allows people to create articles on hypertext and edit its content
collectively and collaboratively, adding, modifying, correcting and/or excluding its content. Wikis can be used for several purposes, individual or collective, private or public, such as notetaking, knowledge management, intranets and communities websites. By having no implicit structure, structures can be established according to the needs of users. The content of the article is created without a defined "owner" or "leader", that is, the content does not "belong" to a specific user. However, editions on a wiki can be tracked on a per-user basis, and users can be assigned to groups with different privileges. Administrators can configure wikis as they see fit. For example, a wiki may require its users to log in to allow them to edit any article.

This article describes the implementation of the WikiIEN, which is based on MediaWiki, as a tool for knowledge management at the IEN. This tool aims to improve the sharing of information among institute researchers, thorough a dynamic common knowledge base that can be on-line updated. In the article are presented the logical and computational structure of the wiki created for deposit of the knowledge generated at the IEN.

2. WIKIIEN FRAMEWORK

2.1. Hardware

The hardware that supports the software required to run the WikiIEN is shown in Fig. 1, and consists of:
- a server computer on which is installed the software required for the WikiIEN to function;
- a local area network, which allows the use of the HTTP protocol between the server computer and client computers;
- computers or client devices (tablets, and smartphones), in which users can, via a web browser with JavaScript support, access WikiIEN.

![Diagram of Hardware Infrastructure](image)

**Figure 1: Hardware infrastructure.**
2.2. Server Software Solution Stack

In computing, a solution stack [2] is a set of software subsystems or components needed to create a complete platform such that no additional software is needed to support applications. Applications are said to "run on" or "run on top of" the resulting platform. Some definitions of a platform overlap with what is known as system software.

The server software solution stack, as illustrated in Fig. 2, is composed of:
- Apache web server with PHP module;
- MySQL database server;
- MediaWiki web application and extensions.

![Diagram of the server software solution stack.](image)
2.2.1. Apache web server with PHP module

Apache [3] is the most popular web server on the internet since 1996. He is responsible for serving web pages to client computers. The PHP module for Apache [4] is one of the elements responsible for enabling web pages to function as web applications.

One of the main functions of the sections of code written in PHP is database access. When a client requests a web page to Apache, the PHP module modifies the page so that Apache can send it to the client. The function of the PHP module is to search on web pages for sections written in the PHP language, run them and return corresponding sections of HTML code that replace the original sections. In this way, the client receives web pages with HTML code only.

2.2.2. MySQL database server

MySQL database server [5] is a software database that contains all the information entered by users of the WikiIEN.

2.2.3. MediaWiki web application

MediaWiki [6] is a free, open-source wiki-type web application widely used [7], optimized to handle large-scale projects, with terabytes of content and hundreds of thousands of hits per second, more than 700 configuration options and more than 1800 extensions. Wikipedia is the most famous website that uses MediaWiki. It was originally developed in 2002 by the Wikimedia Foundation [8] to meet the needs of Wikipedia, that has been used by a hundred companies as an internal knowledge management system, including Intel, Novell, and the corporate university of Banco do Brasil. Fig. 3 shows the MediaWiki home page [9], which employs an instance of MediaWiki itself, and it has appearance very similar to the ones used in the WikiIEN.
The WikiIEN project uses the following extensions of MediaWiki: Confirm User Accounts, User Merge and Delete, WYSIWYG editor, SimpleMathJax, and HTML5video as described below.

2.2.3.1. Confirm User Accounts extension

Through Confirm User Account [10], MediaWiki allows its administrators to accept or reject requests for new user accounts. Once a request is accepted, the account become active, and only logged users are able to create, change and delete articles. For the purposes of administering, this type of control is important considering that the application is used in a research institute.

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2.2.3.2. User Merge and Delete extension

Through User Merge and Delete [11], MediaWiki administrators are able to merge and delete user accounts, a function necessary to delete user accounts safely, without corrupting the database.

2.2.3.3. WYSIWYG editor extension

MediaWiki and several other wiki software have their articles written and stored in wiki markup languages [12], also known as wikitext languages. For example, the same way the tags <b> and </b> are used in HTML to denote bold text snippets, the tag "" is used in MediaWiki wikitext language for the same purpose. Therefore, to write an article on a wiki that uses wikitext, it is necessary to learn the tags supported by the wiki software. Fig. 4 illustrates the default MediaWiki article editor, which, although aiming to provide some editing assistance to users, still requires that they deal with wikitext.

![Figure 4: Original editor.](image)

The default editor discourages users from participating and collaborating because most users are familiar to write text in computers using friendly word processing software, which use the WYSIWYG – What You See Is What You Get – paradigm. Therefore, an article editor using the WYSIWYG paradigm was sought to be used in the WikiIEN. The WYSIWYG editor [13] was chosen to integrate the WikiIEN. Fig. 5 illustrates the WYSIWYG editor editing the same text edited in Fig. 4.
2.2.3.4. SimpleMathJax extension

SimpleMathJax [14] allows Mediawiki to render mathematical formulae in articles. This extension is required, since mathematical equations are widely present in the nuclear field. It adds to MediaWiki the `<math>` and `</math>` tags and a syntax for the expression of mathematical formulae. For example, the formula shown in Fig. 6, rendered by SimpleMathJax, is written using the following syntax

\[
1 + \frac{q^2}{(1-q)} + \frac{q^6}{(1-q)(1-q^2)} + \cdots = \prod_{j=0}^{\infty} \frac{1}{(1-q^{5j+2})(1-q^{5j+3})}, \quad \text{for } |q| < 1.
\]

Figure 6: SimpleMathJax rendered formula.
2.2.3.5. HTML5video extension

HTML5video [15] allows the insertion of videos in articles, by adding to MediaWiki the `<HTML5video>` and `</HTML5video>` tags. The syntax used for inserting video is as follows:

```html
<HTML5video width="x" height="y" autoplay="true|false">video_name</HTML5video>
```

2.3. Client Software

To navigate and edit articles on WikiIEN on the user's computer or device, it is required a web browser supporting JavaScript technology. Examples of such web browsers are Google Chrome and Mozilla Firefox.

3. WIKIIEN HOMEPAGE

3.1. How to Log in

To log into the WikiIEN, the user must click on the link "Log in / create account", located at the top right corner of the page. By clicking on the link, the log in page will be presented to the user, as illustrated in Fig. 7, where the user must enter its user name and password.

![WikiIEN log in page](image)

Figure 7: WikiIEN log in page.

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3.2. Page Layout

MediaWiki has a skin feature, which enables the user to choose one of several profiles that modify the appearance and layout of the page, such as presence/absence, positioning, dimension and color of page elements. The skin used in the WikiIEN is the default skin of MediaWiki and Wikipedia. Fig. 8 presents the WikiIEN main page screen. To ease the understanding of the content of the main page, its elements were grouped by functionality in rectangular regions and described below.

![WikiIEN main page](image)

**Figure 8: WikiIEN main page.**

The region A features the logo and main links, such as "Main page", "Special pages" etc. The region B features information and links related to the user, such as user name and "Preferences". The region C features links related to the article currently displayed, such as "Edit" for editing the article and "View history" for its history of changes. The region D features the "sitenotice", a place reserved for public messages from administrators to users, used in WikiIEN to display the institutional banner. The region E features the article title and content. And the region F features some additional information about the article, the website and credits.
4. RESULTS

After the configuration and installation of the WikiIEN it became available to researchers at the IEN. News disclosing its availability where published on the IEN intranet homepage to enhance its awareness. Fig. 9 shows an example of an article with content uploaded by researchers from one of the thematic areas of the IEN.

Figure 9: WikiIEN article.
The WikiIEN is currently in its early stages of adoption by the scientific community of the IEN. Some of the potential benefits of its use by researchers are the remote access to the knowledge, sharing of information by several researchers at the same time, and flexibility for inclusion, change and correction of information.

The WYSIWYG editor is considered to have a vital role in the usability and success of WikiIEN. The current editor is considered to meet the minimal needs for article editing by researchers, but it presents problems for integration with the tags introduced by the SimpleMathJax and HTML5video extensions. To solve these problems, two alternatives are being considered: to follow the development of the WYSIWYG editor, hoping for its features to mature over time; to replace the WYSIWYG editor in the future for a better editor, possibly the VisualEditor [16], currently in beta stage of development by the Wikimedia Foundation.

5. CONCLUSIONS

In this article was described the implementation of the WikiIEN as a tool for knowledge management in the IEN. This tool aims to improve the sharing of information among institute researchers, thorough a dynamic common knowledge base that can be on-line updated.

With the inclusion of extensions for improved user account administration (Confirm User Accounts, and User Merge and Delete), friendly editing of articles (WYSIWYG editor) and additional features like mathematical formulae and video (SimpleMathJax and HTML5 Video), the WikiIEN has become more manageable for administrators and more user-friendly for authors of articles. All these extensions were added due to feedback received from users.

In the near future are planned the implementation of content-indexing for a better organization of the articles in WikiIEN. The replacement of the current WYSIWYG editor by an improved article editor, a more user-friendly way for insertion and edition of mathematical formulae and insertion of videos, and article control access through the classification of information and security access level: external public, internal public, restricted.

ACKNOWLEDGMENTS

This project is part of the knowledge management policy of the IEN and is supported by CNEN.

REFERENCES