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Possible uses of web 3.0 in websites of Libraries of Academic Institutions of Pakistan.

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ABSTRACT

Since the invention of World Wide Web, the technology has got strong developments. The web of documents has emerged into different databases. This development is a result of three phases of web evolution. The first phase is termed as web 1.0 which was a read only or a one-way communication between user and website. The second phase is termed as web 2.0 which initiated in the start of 2003. This generation provides facility to read and write or two-way communication. Now users are enable to participate in websites. The current and third phase of web i.e. web 3.0, is a concept of intelligent web. This allow user to read, write and execute web. This third generation of web entails an integrated web experience. This will facilitate towards an international data warehouse in which any kind of data can be shared at any network.

This study aims to discuss the concepts of third generation of web related to Library and information science. The study identifies different advantages of ultra-advanced web technology which can be used in websites of libraries of academic institutions of Pakistan.

The study discusses core information about technologies of web 3.0 and its applications in library and information science. The research describes the characteristics of third generation of web, identifies its technologies and then provides brief discussions about the possible applications of web 3.0 in different library websites of academic institutions.

The study identify the powers of intelligent web in order to provide different advanced services such as, use of virtual directories, ontologies, searching and browsing facilities, virtual reference services, social bookmarking etc.

Keywords: web 1.0, web 2.0, web 3.0, websites, academic institutions.

1. INTRODUCTION

The Internet has played vital role in the development of every aspect of our life. Internet has at once a world-wide broadcasting capability, and is serving as a most common medium of communication between individuals and computers. In 1991, a new technology was introduced which changed the internet. It revolutionized the transfer of information from one place to another without any geographical limitations. This technology

is known as World Wide Web or WWW. Since the invention of WWW, every field got enormous strength. It is the fastest growing medium of communication. It directs all the disciplines towards new and advanced technologies. These technologies are used to provide new development in every discipline.

The World Wide Web, (WWW) got developed in three phases. The 1st phase is known as web 1.0. This generation of web only had single way communication

between user and website. Since 2003, the 2nd phase is termed as web 2.0. User has the facility to provide his feedback in this generation of web. Now the 3rd phase of web i.e. web 3.0 is emerging.

This generation of web i.e. web 3.0 is also termed as semantic web or intelligent web. Users are now allowed to read, write and execute web. It offers an integrated web experience. It enables the machine to understand and catalogue the data in human manner. It facilitates towards world wide data warehouse where different formats of information are shared. It has the ability to understand the actual meaning of searching query rather than its HTML descriptions. This generation of web offers immense connectivity options. Metadata of any information can be shared and acquired easily through semantic metadata. It offers an experience of personalized web which analyzes the interests of its users and then responds accordingly. Three dimensional (3D) environments is also a key component in web 3.0. This generation of web also offers the facilities of mobile web. It is understandable in any device, over any network.

Web 3.0 is explained in different researches. Santos, 2015 acknowledges that machines can work with users in the production of contents and in the process of decision making. The use of web 3.0 technology transforms the traditional role of internet infrastructure into a protagonist entity in content/process generation. The services of Web 3.0 can unite the users and the computers for problem-solving and intensive knowledge creation tasks.

Bawab, 2014 identified the importance of web 3.0 that it enables the consumers to search the data of application from anywhere. It has become an adopted trend which offers maximum solutions of browsing.

It is understood that advancement of web 3.0 revolutionizes the internet. Different organizations and academic institutes use the technology of web 3.0 for their business and academic & research purposes. Different institutions have

gained the ability to provide efficient strategy through the use of integrated intelligent data.

The institutions which are dedicated to educational and research purpose are known as academic institutions. All the advanced higher education schools that grant degrees in graduation or post-graduation are examples of academic institutions. These institutions identify new resources of information. A library in an academic institute provides the services to their students according to their academic needs. Internet is playing a massive role in library services. World Wide Web provides different features of library to its users through common user interface. Bhandarkar, 2013 discusses that the technologies of internet will provide features of a massive library system. People can use the electric equivalents of books and take assistance from electronic equivalents of reference librarians through library websites.

The technology of web 3.0 and its application in library websites will provide a platform to utilize intelligent web for provision of different advanced services. It enables the use of virtual directories. These directories are accessed online in different interfaces and on different systems. The use of web 3.0 search engine retrieves automatically tagged micro context and provides precise results. It also offers the facility of personalization.

Semantic web provides the recommendations and searching results in accordance with personal preferences. Web 3.0 is a web with high speed quality bandwidths and high-end 3D graphics which can be utilized for virtualization.

Europeana Library website (<http://www.europeana.eu/portal/en>) is web 3.0 library website which offers 53,203,777 artworks, artifacts, books, video & sounds from across the Europe. It enables to explore digital resources of Europe's galleries, museums, libraries, archives, and audiovisual collections. It provides materials from galleries, archives, and museums from all over the Europe that want to share their collection with wider audience. Search engine of

Wolfram

Alpha

(<http://www.wolframalpha.com/>) is also a most common web 3.0 computational knowledge engine which provides the results of queries understanding the actual meaning of the query rather than its HTML descriptions.

This study is conducted to highlight the possible uses of web 3.0 in websites of libraries of academic institutions of Pakistan. The use of web 3.0 would be beneficial for library websites. The study briefly describes the characteristics of third generation of web. It identifies the technologies in web 3.0. These technologies and applications will transform the library services on the next phase in the country.

2. LITERATURE REVIEW

Kadyan and Singroha, 2014 explain the features, technologies and applications of web 3.0 in the library systems. Web 3.0 refers to a semantic web in which information is given well defined meaning. Artificial intelligence to use knowledge over web, Interoperability to use that knowledge in an interface over any communication device, personalized preferences & virtualization are features of web 3.0. Applications of web 3.0 will work intelligently with the use of human-computer intelligence. It enable to work through natural language. They are easy to customize and can independently work on different devices. It is a web with high speed internet bandwidths and high-end 3D graphics which are utilize for virtualization. The search engine in third generation of web retrieve automatically tagged micro contexts and provides precise results without ambiguity of homonyms and synonyms. It provides access to personal bookmarks. Offer remote access to virtual directories through internet on different interfaces.

Teaching-learning process is also benefitted from this modernization in web.

Semantic digital library offers Hyperbooks that have hypertext with some characteristics of printed books. It automatically enriches itself by connecting with other books and provides semantic interconnection among them.

The study explains Library 3.0 as the ability to share, unite, search and organize web information through semantic web. Include use of ontologies which provide semantic relationship to knowledge. It offers access to OPAC of different libraries, searching facilities and virtual reference services to help the users at any point of time.

3. PURPOSE OF THE STUDY

The purpose of this study is to explore the possible uses of web 3.0 among academic library websites of Pakistan. Its aim is to provide possible assistance in the development of library websites by using different features and application of the Semantic web i.e. web 3.0.

4. METHODOLOGY

The study is conducted by doing secondary analysis and evaluating results of past research studies on web 3.0 across the world. Study is based on features of web 3.0 which are identified by different research articles. Bhattacharya, 2106; Kadyan and Singroha, 2014; Zhang, 2013 and Zhang, 2015 identified the features of web 3.0 in their researches which are considered as a primary source for identification of features of web 3.0. Applications of web 3.0 are identified by Bhattacharya, 2016; Kadyan and Singroha, 2014; Kamila, 2014; Prabhu, 2016; Rudman and Bruwer, 2016; Zhang, 2013 and Zhang, 2015. The above stated articles are available on different international recognized databases.

All the above stated research articles are studied and deeply analyzed to identify the most appropriate possible uses of web 3.0 for the websites of libraries of academic institutions of Pakistan.

5. SCOPE & LIMITATIONS

The study is confined to suggest the possible implementations of web 3.0 features in the academic library websites of Pakistan. The study is limited to the websites of academic libraries rather than the other type of library websites. The Academic library websites are considered for verifying the validity, reliability and usefulness of identified uses of web 3.0. It can be considered as broad-based criteria for identifying possible uses of web 3.0

applications and technologies in other type of library websites of Pakistan.

6. UTILITY OF STUDY

The need for this study was great and appropriate since no one has ever given any suggestions for the improvement of web based library services in the country. It was a great need to do so, for the improvement of libraries, librarians, library services, and for the students of this Profession. This study will serve as a milestone for the improvement of library websites of academic institutions of Pakistan by applying the identified features of web 3.0 features in them. This paper will contribute in better understanding of third generation of web, and therefore, will contribute towards:

1. Discovering new ideas for development of library websites.
2. Enabling the web developers of library websites in academic institutes of Pakistan to acknowledge the advanced features of web 3.0 and using them.
3. Letting academic institutions to know latest innovations to use in their library websites.
4. Enhancing the professional status of librarianship as suggestions are meant to improve librarianship in general.

7. DEFINING TERMS FOR STUDY

7.1 World Wide Web

World Wide Web is a system of connected documents, pictures or videos which are accessible over internet with a web browser. Sir Tim Berners-Lee invented the World Wide Web in 1991 while working for CERN (the European organization for nuclear research) in Geneva Switzerland. It was originally developed to meet the demand of sharing information automatically among university scientists and institutes. Now World Wide Web has all the web pages pictures, videos, and any online content that can be accessed via a Web browser.

A concise definition of World Wide Web is:

“The World Wide Web is a computer system which links documents and

pictures into a database that is stored in computers in many different parts of the world and that people everywhere can use. The abbreviations WWW and the, web are often used”. Collins English Dictionary, 1994.

Since the invention of World Wide Web, it has evolved in different versions from web 1.0 to web 2.0 and now evolving to the next version i.e. web 3.0.

7.2 Web 1.0

Web 1.0 refers to the first stage of World Wide Web. it is also known as first generation of web in which all the webpages were connected by hyperlinks. Web 1.0 was a set of static websites that were not yet providing interactive content

Rudman, 2010 defined web 1.0 as:

“Web 1.0 was a platform through which information could be published in a static form, well designed with text and images. It portrayed an environment where information and data were static and displayed with no interaction between the information and the consumer and minimal content creators, also known as the read-only Web” Rudman, 2010.

7.3 Web 2.0

Web 2.0 is the second generation of World Wide Web. It is an era of web where static web pages are moved to more interactive and dynamic web experience. It focus on the ability for people to share information online by using different social media, blogs, and other web based applications.

Getting defined web 2.0 as:

“The greater collaboration between consumers, programmers, service providers and organizations, which enabled them to re-use and contribute information, thereby enriching the content distributed between the collaborative parties on the Web” Getting, 2017.

Rudman, 2010 summarized the salient features of Web 2.0 websites into three components:

1. **Community and social:** The web 2.0 generation has enabled its

users to create, view, share and edit the contents of the websites.

2. **Technology and architecture:** Web 2.0 has software and applications which are easily compatible on different devices and platforms.
3. **Business and process:** With the use of web 2.0, different web resources, software and other advanced technologies become available over a network which was utilized in business and process.

7.4 Web 3.0

A most common definition of Web 3.0 is: *“information in website can be directly interacted with the related information of other Web, integrate and use information in many websites at the same time through the third information platform, users have their own data on the Internet, and can be used on different websites, based entirely on the Web, it can realize the function that the complex system procedures have by using the browser.”* Feng, 2009.

Further researchers explain:

“Web 3.0 is where the computer, rather than humans, generates new information” Wolfram, 2010. *“Integration of data is the basic foundation of Web 3.0, and by using metadata (data within data that provide information about a data content) embedded in websites, data can be converted into useful information and be located, evaluated, stored or delivered by intelligent agents (IAs)”* Morris, 2011. *“For IAs to understand the information gathered, expressive languages that describe information in forms understandable by machines need to be developed”* Lu et al., 2002. *“With the development of expressive languages (such as Ontology Web Language, OWL), Web 3.0 has the capability to use unstructured information on the Web more intelligently by formulating meaning from the context in which the information is published”* Verizon, 2015.

Verizon, 2015 presented the key elements of web 3.0, which are:

Web 3.0 has new programming languages that have the ability to

categorize and manipulate data. It enables the machines to understand the data, and the phrases that are describing data.

Web 3.0 has the capability of retrieving contextual information while searching over the web. Moreover, it stores the information in a hierarchical manner, according to similar characteristics. It guarantees easy and specific retrieval at minimum time period. Web 3.0 has the ability to acquire information from wider variety of sources. It also includes previously walled applications.

Web 3.0 has an ability to create and share the all type of data over each network by various types of devices.

7.5 Differences between web 1.0, web 2.0 and web 3.0

7.5.1 Web 1.0

Web 1.0 generation was a read only web which can only be used for information sharing

Web 1.0 connects information through pushed web, text/graphics based flash

In web 1.0, Content is published by the companies that people consume (e.g. CNN)

The search engines of web 1.0 retrieves macro contents. These search engines enables to search with rapid fast speed but mostly they provide inaccurate, excessive results for its users

Web 1.0 consisted only on static content. It offers single-way publishing of content. It does not provide any interaction between readers or producers of the information

Citeseer & Project Gutenberg are some popular digital library websites of web 1.0 generation

7.5.2 Web 2.0

Web 2.0 generation is a read and write web which can be used for interaction among peoples

Web 2.0 connects people through two-way web pages, videos, wikis, 2D portals and personal publishing

Web 2.0 enables people to publish their content that can be consumed by other people over the internet. Different companies provide the platforms to people for publishing their content for other people (e.g. YouTube, Wikipedia, MySpace, RSS, Blogger, Digg etc.) The search engines of web 2.0 retrieve tags with micro contents. This tagging process is manual and covers negligible percent of the World Wide Web. The tags of Web 2.0 includes: news, events, links, Blogs, audio, video, pictures etc. It also retrieves micro content texts

Web 2.0 offers the advanced experience of two-way communication among its users. It provides the facilities of social networking websites, wikis, blogging, tagging and user generated videos

Google scholar & Book search are some examples of digital libraries of web 2.0 generation

7.5.3 Web 3.0

Web 3.0 is a semantic web which enable read, write and execution of the web which involves process of immersion

Web 3.0 connects the knowledge through 3D portals, multi-user virtual environments (MUVES) avatar representations, integrated games and by different media that flows in and out of virtual web worlds

Web 3.0 empowers its users to build applications through which other people can be interacted. Different companies provide a platform that enables the users to publish services (Google Maps, My Yahoo!)

The search engines of web 3.0 generation will hopefully retrieve micro content texts which were tagged automatically. It will be translating billions of macro contents of Web 1.0 into micro contents. These search engines will retrieve more precise results, as the function of tagging will

decrease the ambiguous homonyms and synonyms from the process

Web 3.0 is an undefined emerging technology. It offers opportunities for all the web learners for delivering a personalized web experience

JeromDI, BRICKS, Longwell are some examples of digital libraries of web 3.0 generation

8. FEATURES OF WEB 3.0

Web 3.0 is an advancement of current generation of web in which computers and people are enabled to work in cooperation. Semantic web describes the things in manner which are more understandable to the computers.

The distinctive features of web 3.0 are:

1. Intelligent searching
2. Terminal platform compatibility
3. Personalized experience for users
4. Virtualization

8.1 Intelligent searching

Web 3.0 offers the intelligent semantic search to its users. Zhang, 2013 presented that it has complex logical judgement ability. It has a background intelligent translation engine function. Zhang, 2015; identifies that users can communicate with each other using their own language. In web 3.0, users only express their query in natural language, and then web 3.0 application will intelligently analyze the query and provide optimal results. Search engine of web 3.0 will analyze, sort and unearth the query and search habits of user. Web 3.0 application adjusts the search results according to identity and requirements of users and then provides more humanized and intelligent search results. It helps users to find informative content over the internet according to their needs and requirements. It provides quick and accurate results. Also avoids fatigue of identification of relevant information from such a lot of information provided.

8.2 Terminal platform compatibility

Zhang, 2015 expressed that web 3.0 will break all the terminal limitations for its users. Together, it combines the services of internet and communication. It enables

information to appear on diversified terminals. The applications of web 3.0 can run on different intelligent terminals such as many microwave devices, mobile phones, computers, tablets, T.V, automobiles etc. Users can enjoy timely interaction services by using different terminals.

8.3 Personalized experience for users

Personalization is another feature of third generation of web. Zhang, 2015 informs that web 3.0 environments offer the users to create their personalized platform according to their needs. The results of personalized platform are more accurate and personalized and can intelligently deal with internet information. These platforms browse the personalized needs of users. It enables the user to freely set the display effect, visiting authorities and publishing authorities. The internet browsers of web 3.0 will only display information according to personal preferences. Users have their personal data over the internet which can be use in different sites and can be stored over the network server.

8.4 Virtualization

The multimedia technology has been applied over the internet in different fields such as online video games, movies etc. Kadyan and Singroha, 2014 informed that the web 3.0 era offers the multi-dimensional information to its users. It offers high speed internet bandwidths with high end 3-dimensional graphics. Use of these graphics and animations provides more comprehensive information to its users. Second Life (<http://secondlife.com/>) is a most popular 3D web application of web 3.0.

9. APPLICATIONS OF WEB 3.0

Web 3.0 is a future of World Wide Web. it is believed that different emerging technologies of 3rd generation of web such as Semantic web or artificial intelligence will transform the use of internet. Semantic web will make it possible for the web to understand the requests of people. The machines will use the data from web content and then intelligently analyze it to satisfy the needs

of users. Advanced 3D graphics and modular web applications will evaluate a newer version of World Wide Web. High speed internet will also contribute towards instant access to required information.

Applications of web 3.0 will be beneficial to:

1. **The provision of Web spaces:** In web 3.0, different web spaces will be available for users to save their personal data over the web. it will allow users to bookmark or tag their field of interests for future. These bookmarks and tags will be browser independent which can be accessed from anywhere, anytime. Web spaces will serve as a virtual personal computer.
2. **Accessibility of web over different devices:** The technology of internet is accessible from different interfaces, such as computers mobile, tablets, I pads, and other communication devices. Therefore, it cannot be limited to any specific device or any operating systems. Web 3.0 has a feature of interoperability which will make the web independent from any operating system. The applications of web 3.0 will be simultaneously used on different operating systems such as android, blackberry, OVI, Apple etc.
3. **Remote Control accessibility:** Personal computers, laptops, can be remotely access through web 3.0 application just by using internet from anywhere in world.
4. **Supportive to Surface Computers:** Web 3.0 will support Personal computers, desktops, laptops, mobile devices as well as Surface Computers. Surface computers can interact with people through any object. Microsoft introduced the first surface computer PixelSense in 2007 which can be interact by users through touching and dragging fingertips or other materials.

10. POSSIBLE USES OF WEB 3.0 IN WEBSITES OF LIBRARIES OF ACADEMIC INSTITUTES OF PAKISTAN.

The profession of library and information science in Pakistan has evolved dramatically with the use of technical changes. It has become an important task for librarians to meet the users need with these changes. Different libraries across the world has advanced to electronic offerings to their user by subscribing top quality databases, instant messaging reference services and by providing access to downloadable audio books. Web 3.0 has emerged as a great opportunity to transform the primary functions of library websites to the next generation.

Key features of next generation of Library websites are:

1. Knowledge and information should always be accessible over the web by every individual at anytime, anywhere.
2. Effective ways should be available for the users to access the multimodal user-friendly interface.
3. Information should be accessible over interconnected devices.

Following are the few elaborations which will provide the better understanding about the uses of Web 3.0 in library websites of academic institutions of Pakistan:

10.1 Semantic web

Semantic web offers the facilities of sharing, uniting, searching and organization of data over the web. With the help of web 3.0 technologies, it enables the librarians and information professionals to move beyond the physical or virtual document in their library. Semantic web provides the abilities of federated search engines. Using the semantic web, computer searches the required content of information from one web or database to another. It offers users of library website to interact with the huge amount of data on the web instead of interacting with individual repositories. It displays the search results in a single place in a single way which is more easily

understandable to students and researchers of any academic institute.

Use of Semantic web techniques in academic library websites of Pakistan will provide an ideal opportunity to the students. Federated searching abilities of semantic web will also assist the faculty members to acquire the most relevant and required information in minimum time.

10.2 Reference Services

Reference services are offered to the users of each library with aim to provide them the maximum and effective information services. It includes dissemination of documents and personal interaction with users. In advanced era of librarianship, reference services have transformed to e-mails, web forums, video conferencing, or text based chat. Web 3.0 will facilitate in the provision of these services to users at their end.

In Pakistan, students of academic institutes seek guidance from the reference librarian about the use, organization and retrieval of library resources. Reference services are essential for library of every academic institute in the country. Web 3.0 will provide maximum opportunities to users to access the resources with standard metadata formats to achieve their academic goals. This accessibility to standard metadata formats is possible through the application of semantic web with the help of metadata schemas.

10.3 Hyperbooks

Web 3.0 transforms the traditional e-books in PDF or in HTML formats to Hyperbooks. Hyperbook is term which refers to hypertext with some qualities of printed book. While Hyperbooks are included, it automatically enriches itself by connecting to parts of other books in the library website. It disappears the monolithic nature of book. A library of hyperbooks does not only provide books but also offer meaningful interconnection among them.

In Pakistan, these hyperbooks can become an essential tool for the students and researchers to achieve their academic desires. The students and researchers of

any discipline can use them to get the maximum information at a single time related to their field of interest.

10.4 Metadata

The metadata is data about data. Metadata schemas can be regarded as a transformed shape of cataloguing codes which provides the detail information of web resources. Various metadata schemas are available for different digital resources. With the use of web 3.0, Web OPAC's of different libraries can be brought together. Metadata of content of any nature can be easily access and search from single user-friendly interface.

Research is a developing trend in academic institutes of Pakistan. Students and faculty members of academic institutes are always involved in the process of research to further expand their knowledge and learning abilities. It is a primary duty of library to support the research in any academic institute. Web 3.0 will work as a portal of one stop shop for the students and researchers in provision of descriptive information about the information sources. It will provide easy access to metadata to researchers and to students. This access to metadata will expand the new horizons of research in the country.

10.5 Information accessibility over mobile phones, tablets etc.

Use of Smartphones in Pakistan is increasing at a very fast pace. It is expected that Pakistan had 40 million smartphone users by the end of 2016. Launch of 3G and 4G technology is considered as a main factor of growth of smartphone usage in the country. These technologies facilitate easy access of internet over mobile devices.

Web 3.0 is an interoperable web experience. It can be automatically adjusted in different interfaces. Use of web 3.0 in library websites can provide better experiences on mobile devices because of its interoperable quality. It provides opportunities to students, researchers, and faculty members to access the information from library websites in mobile devices without any

discrimination of operating systems. Moreover, web 3.0 is based on Cascading Style Sheet (CSS) Standard which reduces the size of webpage to less than 20kb. This standard will decrease the data usage. Use of web 3.0 will offer students to acquire their required information easily at very affordable rates.

10.6 Personalized Cloud computing

Cloud computing refers to the state of maintaining data over the web and on central remote servers. It is a technology that provides data access and storage devices that do not require any physical location. Web 3.0 provides the facility of cloud computing to its users in a most advanced passion. Users of web 3.0 can save their personalized contents according to their ubiquitous personal preferences.

The ability to save the personalized content over the web with their personalized preferences will prevent the storage problems for the students, researchers and faculty members in academic institutes of Pakistan. It enables all the users of library to establish a personal library portal in which they can add news, weather, forum, blogs or can add the content of their liking or professional field. The intelligent platform of library website will automatically determine each user's field of interest and will link the new informational contents to the specific users according to their personalized preferences. These contents can be easily shared, transferred and are easily accessible through all modes of communication. It allows the students and researchers in academic institutes of Pakistan to save and access their required files on the internet anytime.

11. CONCLUSIOINS

World Wide Web has evolved in different versions in different times. Web 3.0 is now a developing trend over the web. It offers a unique web experience of read, write and execution of web. it has different features which develops the quality of any website over internet. Applications of web 3.0 in websites of libraries in academic

institutes of Pakistan will offer a new advanced approach to its users. It will support the learning objectives of academic institutes in the country. It creates an innovation in current state of art in Library websites. The functions of web 3.0 will improve and accelerate the services provided by libraries. It transforms the libraries to their next generation i.e. library 3.0. Libraries can remain invincible in the fast-developing tide and can satisfy the needs of its users. It will boost the sustainable development among the libraries websites in Pakistan. Understanding and implementations of web 3.0 are required to develop the services of libraries in Pakistan.

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