

# Web Application Development

In computing, a [web application or web](#) app is a client-server computer program in which the client (including the user interface and client-side logic) runs in a web browser. Common web applications include [webmail](#),[online retail sales](#),[online auctions](#),[instant messaging services](#) and many other functions. The general distinction between a dynamic web page of any kind and a web application is unclear. Web sites most likely to be referred to as web applications are those which have similar functionality to a desktop software application, or to a mobile app.[Single page application](#) are more application-like because they reject the more typical web paradigm of moving between distinct pages with different URLs.

## Technologies

There are two main categories of coding, scripting and programming for creating Web Applications:

**I. Client Side Scripting / Coding** - Client Side Scripting is the type of code that is executed or interpreted by browsers.

Client Side Scripting is generally viewable by any visitor to a site (from the view menu click on "View Source" to view the source code).

Below are some common [Client Side Scripting technologies](#):

- HTML (HyperText Markup Language)
- CSS (Cascading Style Sheets)
- JavaScript
- Ajax (Asynchronous JavaScript and XML)
- jQuery (JavaScript Framework Library - commonly used in Ajax development)
- MooTools (JavaScript Framework Library - commonly used in Ajax development)
- Dojo Toolkit (JavaScript Framework Library - commonly used in Ajax development)

**II. Server Side Scripting / Coding** - Server Side Scripting is the type of code that is executed or interpreted by the web server.

Server Side Scripting is not viewable or accessible by any visitor or general public.

Below are the common Server [Side Scripting technologies](#):

- PHP (very common Server Side Scripting language - Linux / Unix based Open Source - free redistribution, usually combines with MySQL database)
- Zend Framework (PHP's Object Oriented Web Application Framework)
- ASP (Microsoft Web Server (IIS) Scripting language)
- ASP.NET (Microsoft's Web Application Framework - successor of ASP)
- Ruby on Rails (Ruby programming's Web Application Framework - free redistribution)
- Perl (general purpose high-level programming language and Server Side Scripting Language - free redistribution - lost its popularity to PHP)
- Python (general purpose high-level programming language and Server Side Scripting language - free redistribution)

### **Advantages of web application development:**

- Web apps are developed with programming languages such as HTML and CSS, which are well known among IT professionals.
- These apps run on the device's own web browser through a simple URL.
- They may also open websites. This means that they don't require to be updated in the way common apps do. In this sense, it's the website to which the application is linked that will be updated.
- On the other hand, a web app's development time is lower. Hence its lower price.

### **Disadvantages of web application development:**

- An Internet connection will be an absolute must to run it. Otherwise, you will not be able to browse the website and the web app will be of no use to you.
- It will also lose visibility as it will not be on display in the stores.
- In addition, there will be some access restrictions as to certain hardware features of the device it's running on.



## Social Networking

**Matthew N. O. Sadiku<sup>1</sup>, Adedamola A. Omotoso<sup>2</sup>, Sarhan M. Musa<sup>1</sup>**<sup>1</sup>Professor, <sup>2</sup>Student<sup>1,2</sup>Roy G. Perry College of Engineering, Prairie View A&M University, Prairie View

**How to cite this paper:** Matthew N. O. Sadiku | Adedamola A. Omotoso | Sarhan M. Musa "Social Networking" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-3 | Issue-3, April 2019, pp.126-128, URL: <http://www.ijtsrd.com/papers/ijtsrd21657.pdf>



IJTSRD21657

Copyright © 2019 by author(s) and International Journal of Trend in Scientific Research and Development Journal. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0) (<http://creativecommons.org/licenses/by/4.0/>)



### INTRODUCTION

The Internet has rapidly evolved from being merely an information sharing platform to being a social networking platform used by individuals to share content, opinions, and information. Social networking is a global phenomenon that has revolutionized how people interact with each other. It affects nearly every aspect of our life: education, communication, employment, politics, healthcare, social relationships, and personal productivity.

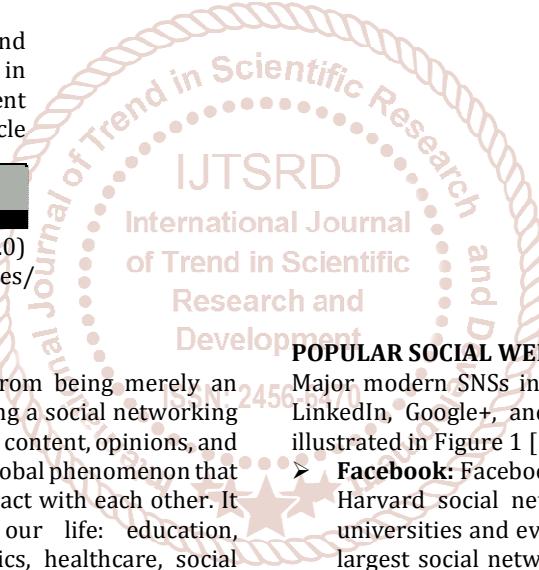
A social networking service (SNS) is an Internet-based platform used in building and developing social relations among people. It provides means by which users can interact online with people of similar interests, whether it be for romantic or social purpose. It allows users to share emails, instant messaging, online comments, wikis, digital photos and videos, and post blog entries. It also offers people with disabilities a chance to make their thoughts and opinions known in a virtual environment.

Social networks serve dual roles as both the suppliers and the consumers of content. They provide the user with a choice of who can view their profile. A profile is generated from answers to questions, such as age, location, interests, etc. Some sites allow users to upload pictures, add multimedia content or modify the look and feel of the profile, post blogs, comment on postings, compile and share list of contacts. To protect user privacy, social networks typically have controls that allow users to choose who can view their profile, contact them, add them to their list of contacts, and so on.

### ABSTRACT

Social networks constitute the greatest global information platform on the Internet today. They have become an indispensable part of our daily lives as people spend more time socializing on the Internet. They have witnessed their collective fortunes rise as they become ubiquitous in our lives. The penetration of these technologies into the popular culture has been pervasive. However, creating online social networks raises privacy concerns of possible misuse. This paper provides a brief introduction to social networking and its diverse applications.

**KEYWORDS:** *social networking, social networking sites, social media, social software*



### POPULAR SOCIAL WEBSITES

Major modern SNSs include Facebook, Twitter, YouTube, LinkedIn, Google+, and MySpace. These and others are illustrated in Figure 1 [1].

- **Facebook:** Facebook was first introduced in 2004 as a Harvard social networking site, expanding to other universities and eventually to everyone. It became the largest social networking site in 2009. It remains the largest photo sharing site. Marketing strategists have found Facebook to be useful because it covers a range of personal and organizational interests.
- **Twitter:** Twitter was founded in 2006 by Odeo, Inc and was originally only for Odeo Inc employees and family members. It became a public network in 2006. Twitter provides a real-time, Web-based service which enables users to post brief messages for other users and to comment on other user posts. Tweets are extracted from Twitter. A tweet is a small message of no more than 140 characters that users create in order to communicate thoughts. Microblogging is a newer blog option made popular by Twitter.
- **YouTube:** This is a video sharing platform where many people can discover, watch, and share user-generated videos. It is a website of participatory culture.
- It has become the most successful Internet website providing a short video sharing service since its establishment in early 2005. Since YouTube is a Google property, to sign up for a YouTube account requires a Google account.

- **LinkedIn:** This is a professional network that provides a platform for professionals to participate in networking with each other. By setting up an account on LinkedIn one can link with professional individuals of similar interests. LinkedIn remains the most popular social networking site for organizations to recruit new employees.
- **MySpace:** This social networking site bases its existence on advertisers who are paying for page views. It has a lot that users could do. There are MySpace sites in United Kingdom, Ireland, and Australia.
- These are just a few of the social networking options available on the Internet today. Others include Instagram, China-based Renren, Friendster, Vox. Bebo, LiveJournal, and flickr. The impact of these modern social networks on social, health, political, and economic arenas has far surpassed the expectations of many. Many experts see the future of social networking applications in smaller, tailored, or specialized private systems [2].

## APPLICATIONS

Social networking applications have become important services that provide Internet-based platforms for their users to interact socially. Common applications involve computer-mediated social interaction, education, business, finance, healthcare, politics, religion, and crowdsourcing.

- **Social Interaction:** Social networking sites facilitate computer-mediated social interaction and make it possible to connect people who share interests and activities across political, economic, and geographic borders. They provide a modern form of entertainment. People use them to meet new friends, find old friends, locate people with similar interests, and staying in touch with old acquaintances. They also provide an online environment for people to communicate and exchange personal information for dating purposes. Some job seekers use social networks in their job search increasing their chances of receiving job offers and finding gainful employment [3].
- **Education:** Social networks are impacting the way students and educators engage in learning. They are now used for learning, educator professional development, and content sharing. Scientific communities use social media to exchange knowledge. Researchers and librarians use social networks frequently to maintain professional relationships and share ideas. Social media can become research and learning networks. Social networking media such as Facebook, Twitter, and Instagram are widely used at many universities with each university having at least a page on a site [4]. Privacy, real friendship, time-consumption, and miscommunication are challenges facing education through the social networking. On the other hand, flexibility, repeatability, convenience, and accessibility are the key benefits [5].
- **Business:** Social networking between businesses is another great application. It can be an effective promotional tool for businesses, entrepreneurs, actors, musicians, or artists. Companies use social networking sites in five major ways: to create brand awareness, as an online reputation management tool, for recruiting, to learn about new technologies and competitors, and to intercept potential prospects [6]. Social networking sites help businesses to advertise their products, recognize consumer's needs, and gather opinions on diverse

viewpoints. New opportunities for global finance are created through the use of virtual currency in social networks. Social networks allow consumers to share their personal experience which help early adopters make informed purchase decision and reduce the risk of buying a new product.

- **Healthcare:** Social media enables different types of social connectivity among different stakeholders such as doctors, patients, and caregivers. Social networking is an effective tool for teaching and learning for doctors and nurses as SNS is used to provide new information from research and assist in providing quality care to their patients. Virtually all aspects of healthcare can be inherently affected by these technologies. Examples of health-related social networking sites include *healthchapter, Inspire, DailyStrength, ToolsToLife, Health Care 2.0, LiveStrong, Everydayhealth, revolutionhealth, MyCancerPlace, Planet Cancer, No Surrender, Prostate Cancer Infolink, Psych Central, sobercircle, diabetic connect, and DailyPlate* [7].
- **Politics:** Social networking seems to be impacting political life and political movements across the globe. It has influenced voting and induced social changes, unrest, uprisings and revolutions all over the world. Social networking will make government to be more accountable and enable citizens to exercise freedom of speech [8]. It also helps to engage people in the democratic process and to get the younger generations involved in politics. For example, Barack Obama successfully incorporated social media in his campaign in 2008, engaging people, empowering volunteers, and vastly increasing donors. Obama because the first US president to fully understand the power of social media.

## CHALLENGES AND ISSUES

As social media attempt to fulfill cognitive, affective, personal, and social needs, it is in turn affecting everyday life, including relationships, family, marriage, school, church, and entertainment. Like any other technology, the problematic use of social networking media and its adverse consequences have become prevalent. Although a minimum age is required for joining SNSs, many children/students misrepresent their real ages and join. These students learn about safety and privacy issues in a haphazard way and suffer from training deficiency [9].

Studies have shown that the use of social networks among students, particularly in Africa, constitutes distractions because students tend to spend a good deal of time on the networks. In the past, some regarded social networking as a distraction and offered no educational benefit for students in junior or high school. So blocking these social networks was considered a form of protection for students against wasting time, addiction, sexual predators, cyberbullying, and privacy theft. Others feel that the schools that block social networking services are preventing students from learning the skills the youths need in navigating the digital world with confidence and therefore regard blocking social networking sites as counterproductive.

Some have contended that social networking is an impoverished version of conventional face-to-face social interactions, and it produces negative outcomes such as loneliness and depression for users who use the technology heavily. Social networking services have been used for bullying purposes and child pornography. Since there are no

limitations as to what individuals can potentially post online, people can post offensive remarks or pictures.

Privacy on social networking sites is an important issue. For example, third parties often use information (such as personal information and profile) posted on social networks for a variety of purposes. Privacy may involve whether or not companies should have the right to look at employees' social network profiles. Privacy concerns differ between users according to their gender and personality. Some studies have indicated that women often have more privacy concerns than men.

Another dark side of SSN is that they are becoming increasingly popular tools for methods of ending relationships and friendships. We must ensure that SSN does not continue to be bastardized by bad influences that prey on the vulnerable.

Culture plays a major role on how people interact on SNS because it defines norms and rules on what is accepted and what is not accepted. Culture can limit the people to whom a person can interact if they want to withhold their identity. For example, a global culture has emerged in India as a result of the SNS; the technological changes have not only changed the quality of life but also the social architect of society [10].

## CONCLUSION

Social networking has changed the way people communicate, share information, and interact socially. It allows individuals to connect and socialize with others, regardless of location. As the popularity of social networking increases, new applications for the technology are often being observed. A new trend is the social internetworking of machines. The ultimate goal in this evolution is creating the Internet of Things (IoT) and social networks among machines [11].

## REFERENCES

- [1] G. Merchant, "Unravelling the social network: theory and research," *Learning, Media and Technology*, vol. 37, no. 1, 2012, pp. 4-19.
- [2] M. L. Rethlefsen, "Social Networking," *Medical Reference Services Quarterly*, vol. 26, no. S1, 2007, pp. 117-141.
- [3] G. V. Hoye, E. A. J. van Hooft, and F. Lievens, "Networking as a job search behaviour: a social network perspective," *Journal of Occupational and Organizational Psychology*, vol. 82, 2009, pp. 661-682.
- [4] E. Nini, "Private open source social networking media for education," *Proceedings of the Fifth International Conference on e-Learning*, 2015, pp. 220-224.
- [5] A. J. Y. Zaidieh, "The use of social networking in education: challenges and opportunities," *World of Computer Science and Information Technology Journal (WCSIT)*, vol. 2, no. 1, 2012, pp. 18-21.
- [6] "Social networking service," Wikipedia, the free encyclopedia  
[https://en.wikipedia.org/wiki/Social\\_networking\\_service](https://en.wikipedia.org/wiki/Social_networking_service)
- [7] J. E. Chung, "Benefits of social networking in online social support groups," *Doctoral Dissertation*, University of Southern California, August 2010.
- [8] A. M. Attia et al., "Commentary: the impact of social networking tools on political change in Egypt's 'Revolution 2.0,'" *Electronic Commerce Research and Applications*, vol. 10, 2011, pp. 369-374.
- [9] S. Weeden, B. Cooke, and M. McVey, "Underage children and social networking," *Journal of Research on Technology in Education*, vol. 45, no. 3, 2013, pp. 249-262.
- [10] P. Mahajan, "Use of social networking in a linguistically and culturally rich India," *The International Information & Library Review*, vol. 41, 2009, pp. 129-136.
- [11] M. Pticek, V. Podobnik, and G. Jezic, "Beyond the Internet of things: the social networking of machines," *International Journal of Distributed Sensor Networks*, 2016.

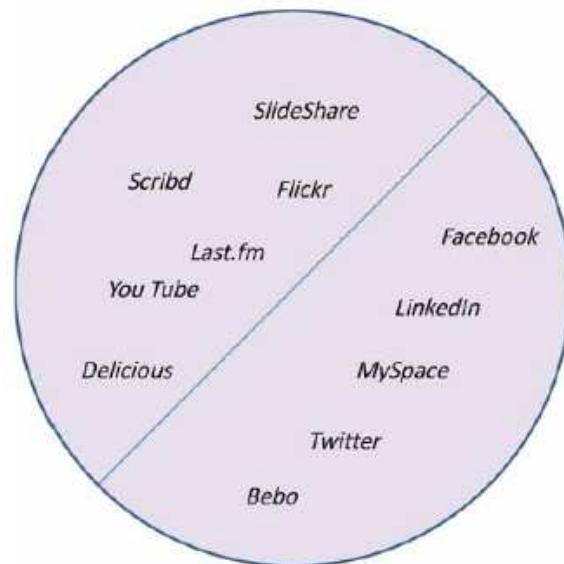


Figure 1 A map of some popular social networking sites [1].

Photo Blog Web Application Using Twitter Bootstrap

Daniel LeBlanc

Personal Website Development Project

June 06, 2015

### Abstract

Twitter Bootstrap comes with a wide range of templates for creating websites fast. Using these packaged templates a designer can quickly create a wide range of applications with these templates however they all appear to have a boiler plate look and feel. This project presents a hand-designed Bootstrap web application for the landing page of a photo blog about the city of San Diego, California. San Diego is my home and I have a multitude of high quality photographs I have taken to use for sample data. This code can be used as a template for designing the landing page for a wide variety of web applications. Bootstrap is a ‘responsive’ development environment (<http://getbootstrap.com/>). This is a popular term for compatibility among browser types. A bootstrap application works well from any popular computing device such as; desktop computers, tablets or smartphones. The ability of Bootstrap to collapse website data into useable and attractive formats for any computing device is the catalyst that propels Bootstrap as a popular website solution.

## Photo Blog Web Application Using Twitter Bootstrap

Before it became known as “Bootstrap”, Twitter called their early version of this development environment, “Blueprint” (<http://getbootstrap.com/about/>). The main design behind Bootstrap is a 12-column grid template that causes a browser to break along certain column-widths, depending on the screen size of the particular browser accessing the site. The columns are divided into pre-defined classes which include; 12 single columns, 8 x 4-column, 3 x 4-column, or 6 x 6-column formats ("CSS/Grid Options," n.d.).

### Example: Stacked-to-horizontal

Using a single set of `.col-md-*` grid classes, you can create a basic grid system that starts out stacked on mobile devices and tablet devices (the extra small to small range) before becoming horizontal on desktop (medium) devices. Place grid columns in any `.row`.

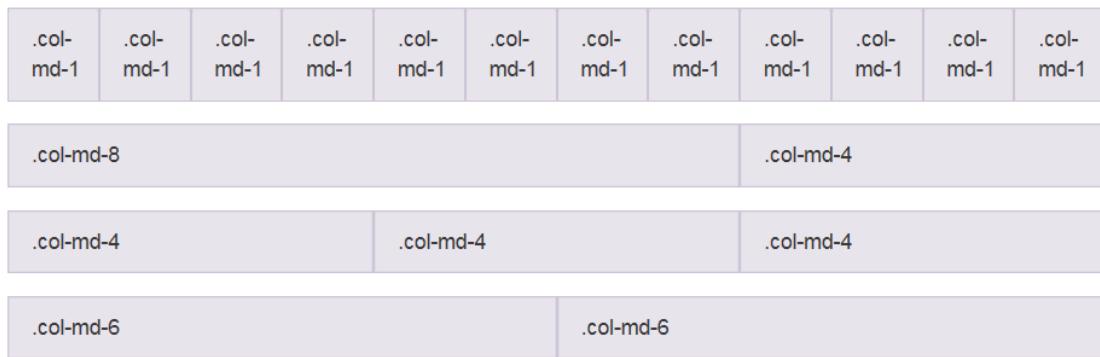


Figure 1: Bootstrap Grid Options (courtesy: ("CSS/Grid Options," n.d.))

Using preset screen sizes, Bootstrap causes website content to be wrapped to multiple lines in an organized fashion depending on the screen size a viewer uses to access a website. With the Bootstrap framework a web page is viewable and useful to end users regardless of the device they are using. With the ever increasing range of browsing devices it is imperative that designers utilize frameworks such as Bootstrap which are responsive to a wide range of browser types.

The grid options within Bootstrap are instantiated by including the class of the desired column type in the appropriate ‘`<div>`’ tags for the section on a page you are designing.

```
<div class="row">
  <div class="col-md-1">.col-md-1</div>
  <div class="col-md-1">.col-md-1</div>
</div>
<div class="row">
  <div class="col-md-8">.col-md-8</div>
  <div class="col-md-4">.col-md-4</div>
</div>
<div class="row">
  <div class="col-md-4">.col-md-4</div>
  <div class="col-md-4">.col-md-4</div>
  <div class="col-md-4">.col-md-4</div>
</div>
<div class="row">
  <div class="col-md-6">.col-md-6</div>
  <div class="col-md-6">.col-md-6</div>
</div>
```

Figure 2: Instantiating Bootstrap Grid Options ("CSS/Grid Options," n.d.)

These column designs can be nested allowing multiple column divisions to be used on the same page. This ability helps to add individuality to Bootstrap applications which could otherwise appear too blocky. Bootstrap refers to these as “nesting” or “nested” columns and again, designations by class within the “`<div>`” tags enables this feature within the code.

Level 1: .col-sm-9

Level 2: .col-xs-8 .col-sm-6	Level 2: .col-xs-4 .col-sm-6
------------------------------	------------------------------

```
<div class="row">
  <div class="col-sm-9">
    Level 1: .col-sm-9
    <div class="row">
      <div class="col-xs-8 col-sm-6">
        Level 2: .col-xs-8 .col-sm-6
      </div>
      <div class="col-xs-4 col-sm-6">
        Level 2: .col-xs-4 .col-sm-6
      </div>
    </div>
  </div>
</div>
```

Figure 3: Nesting Column Types ("CSS/Grid Options," n.d.)

## Application Screen Shots

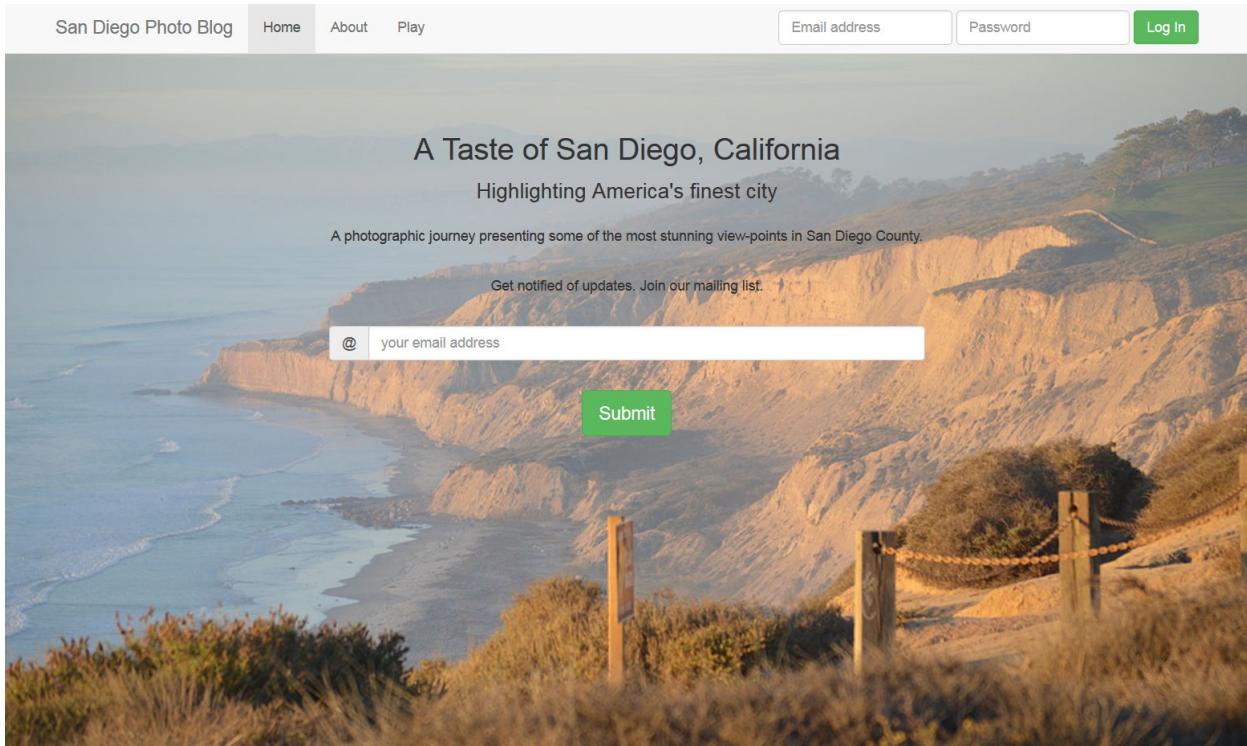


Figure 4: Full Screen Desktop View of Landing Page

In full screen view from a desktop, you can see that all of the elements of the page lay out nicely on the background photograph. At the top of the screen in the “navbar” you have the option to come back to this landing page, read the about page or play the slideshow. On the right side of the navbar a user has the option to login if they have an existing account on the site.

The top container displays the title of the website, provides a short explanation of the website contents and presents the user with the option to join the mailing list.

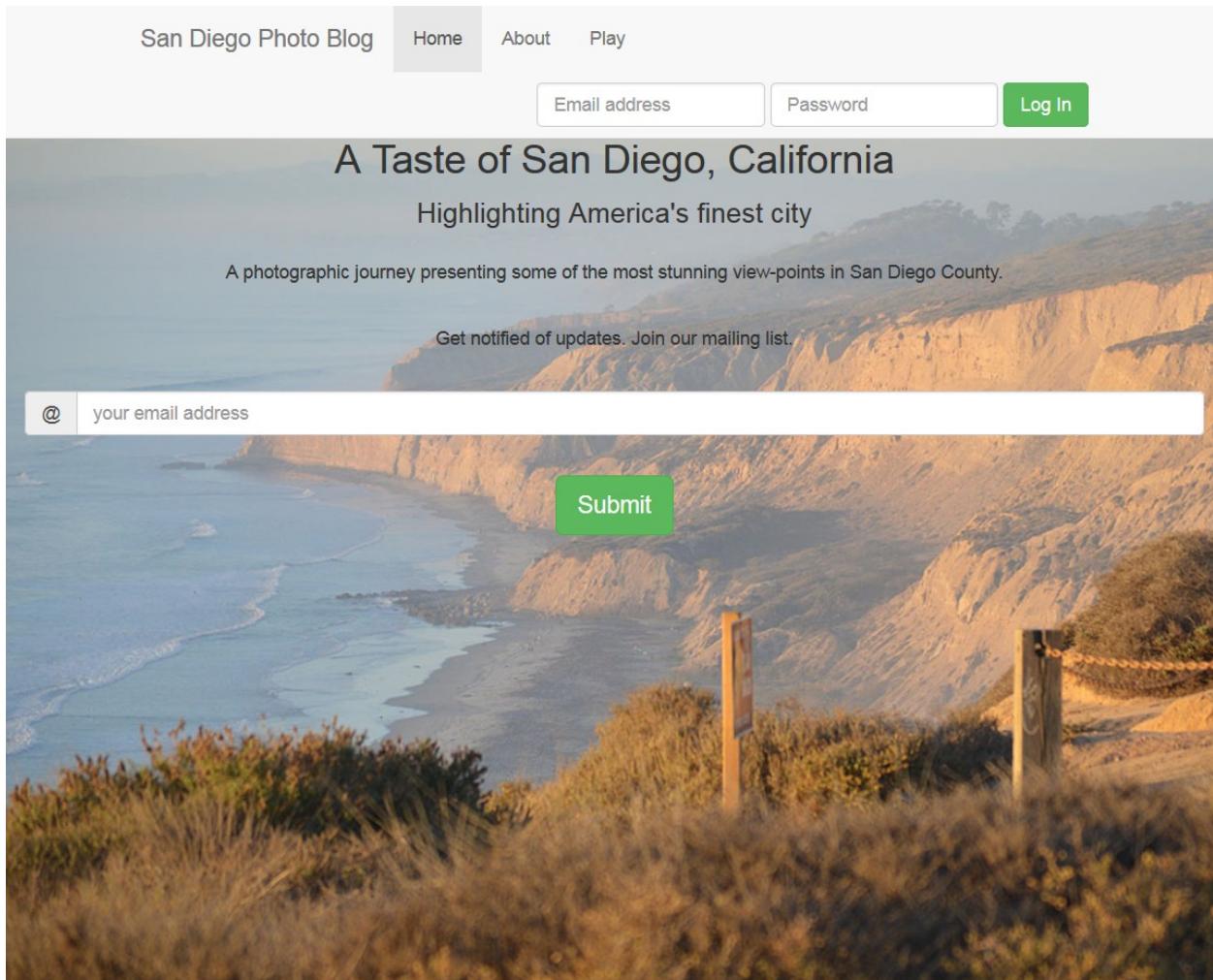


Figure 5: Tablet View

As the screen is shrunk to the tablet size browser, the background photo is scaled to the same size as the browser window. The text size is adjusted, as is the navbar dimensions and display area. The “Login” area of the navbar is wrapped to a second line to ensure a tablet user understands there is a place to log in to their account on the navbar.

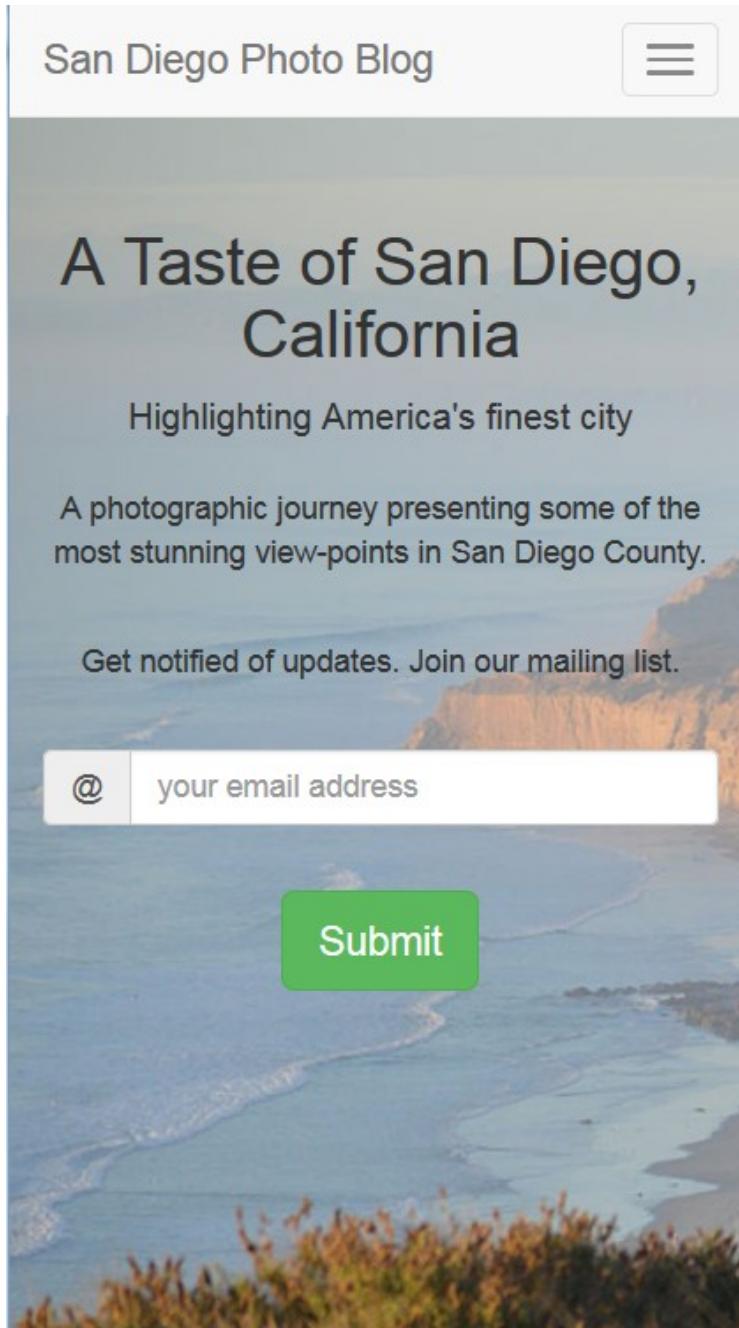


Figure 6: Smartphone Size

Viewing the website in smartphone size, the photograph is no longer scaled below a reasonable size. If the background photograph got too small then it would be mostly blocked by the text and controls on the screen. Instead of scaling the background photograph, only a portion of the scaled photograph appears in the smartphone browser. This ensures that the background photo remains identifiable while the text, controls and buttons remain accessible to website visitors. You will notice that the navbar options have now been collapsed and appear at the top of the screen with a series of lines, (on the right side), representing a menu. When a user clicks this icon the navbar menu is opened at the top of the screen.

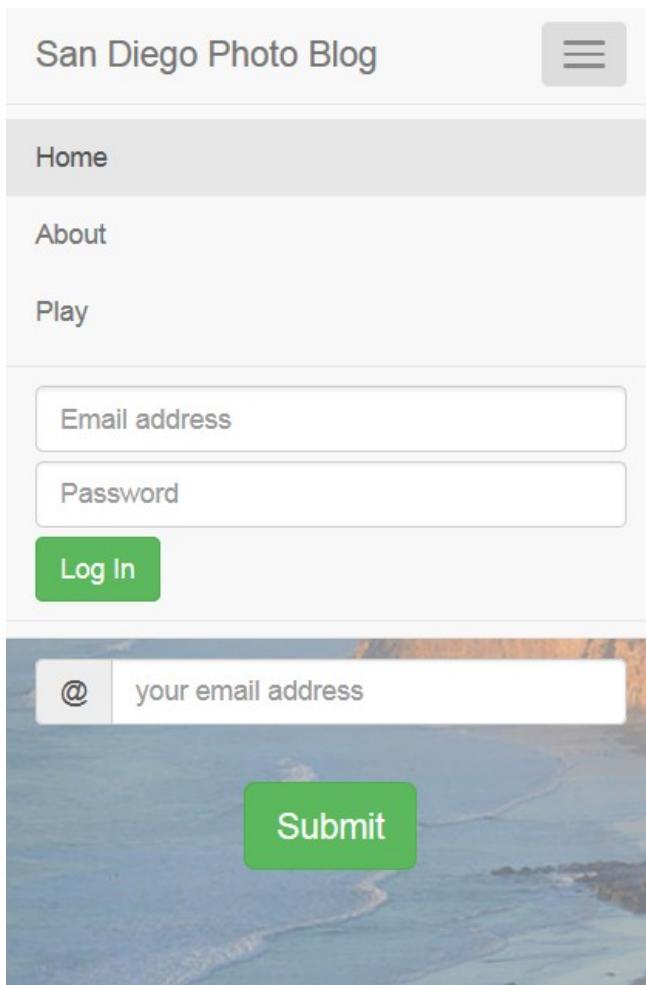


Figure 7: Expanded Navbar Menu

Figure 6 demonstrates the way in which Bootstrap manages text on the website to accommodate for any particular browser a visitor might be using to access the site. Text is neatly resized and wrapped to multiple lines when smaller browser devices are used to access the website.

The middle container of the website design is accessed when a user scrolls down the landing page. This section contains the “Photo Index” which contains a list of the collections of photographs that appear in the photo blog. A “View” button allows the users to navigate to a particular collection of photographs that appear within the photo index.

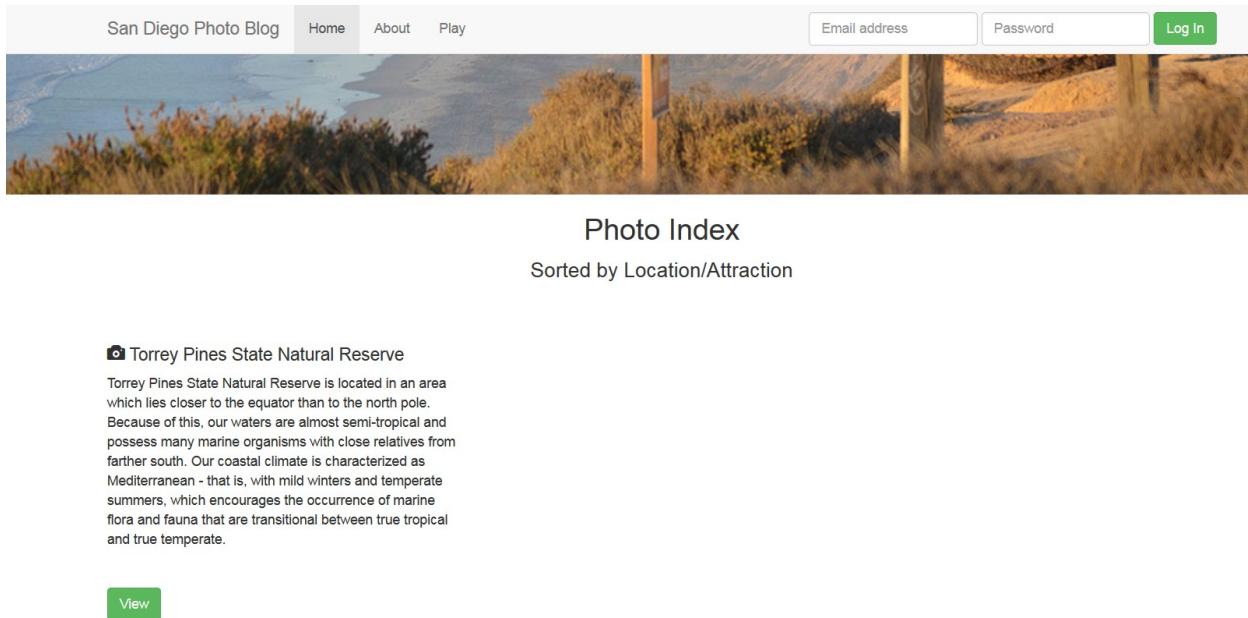
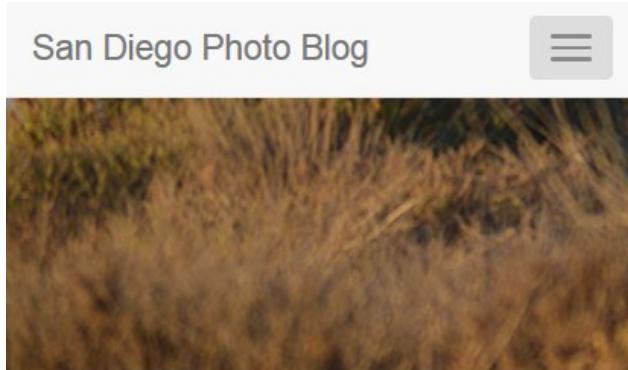


Figure 8: Middle Container with the Photo Index

Like the top container, the middle container scaled automatically as the browser window becomes smaller. On a smartphone the middle section columns wrap to become a single column. The single columns are stacked one on top of the other allowing a user on a smartphone to simply scroll down the page to read all of the contents. Notice how the lengthy text about Torrey

Pines has been wrapped to multiple lines while all of the text remains visible and clearly readable to anyone accessing the site from a smartphone browser.



The screenshot shows a mobile version of the website. At the top, there's a header bar with "San Diego Photo Blog" on the left and a menu icon (three horizontal lines) on the right. Below the header is a large, blurred image of tall, dry grass or brush. Underneath the image, the title "Photo Index" is displayed in a large, bold font. Below the title, the text "Sorted by Location/Attraction" is shown. A section titled "Torrey Pines State Natural Reserve" follows, featuring a camera icon and a detailed description of the reserve's unique location and climate. At the bottom of this section is a green "View" button.

## Photo Index

Sorted by Location/Attraction

 Torrey Pines State Natural Reserve

Torrey Pines State Natural Reserve is located in an area which lies closer to the equator than to the north pole. Because of this, our waters are almost semi-tropical and possess many marine organisms with close relatives from farther south. Our coastal climate is characterized as Mediterranean - that is, with mild winters and temperate summers, which encourages the occurrence of marine flora and fauna that are transitional between true tropical and true temperate.

[View](#)

Figure 9: The Middle Container Contents are scaled and wrap to the next line

The Bootstrap framework creates a truly responsive environment for this website where access is possible from any of the modern browsing devices. Like the top and middle containers, a user accesses the footer container simply by scrolling down the screen. The footer container

holds the details and the link for creating an account to purchase the high resolution versions of the photographs contained in the slideshows. Eventually it would be populated with the necessary controls and links to choose photographs to add to a shopping cart.

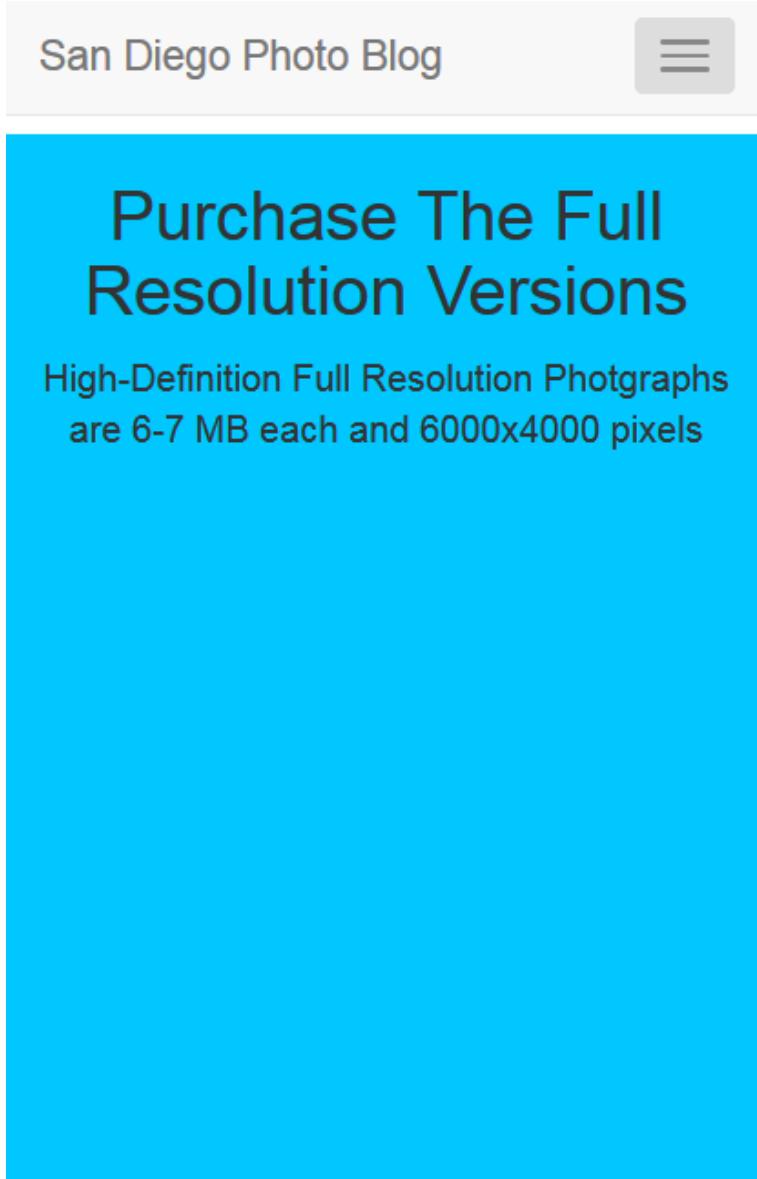


Figure 10: The Footer Container for Purchasing Full-Size Image Files

Throughout the application there are various icons such as the collapsed menu button in the navbar and the camera icon next to the Torrey Pines State Nature Preserve title. These icons are a part of the Bootstrap framework and are accessed with a call to the glyphicon list within the

related division tags. For example, the code for adding the menu icon when the navbar collapses is as follows;

```
<button type="button" class="navbar-toggle" data-toggle="collapse"
data-target=".navbar-collapse">
    <span class="sr-only">Toggle Navigation</span>

    <span class="icon-bar"></span>
    <span class="icon-bar"></span>
    <span class="icon-bar"></span>
</button>
```

Figure 11: Code for Menu Button in Collapsed Navbar View

The code syntax to add the camera glyphicon to the Torrey Pines title looks like this;

```
<h4><span class="glyphicon glyphicon-camera"></span> Torrey Pines
State Natural Reserve</h4>
```

Figure 12: Code to Add Camera Glyphicon to Title

This code can be used as a template to create other photo blogs with varying subject matter simply by editing the background photographs and the text. Many different photographic subjects can be included into a single photo blog by using the index section in the middle container to index the various subject matter for any photo blog.

## The Code

```
<!*****>
<!*****>
<!***** Photo Blog Landing Page - Bootstrap Application *****>
<!*****>
<!*****>
<!***** Designed by: Daniel J. LeBlanc for *****>
<!***** www.planetstew.com *****>
<!*****>
<!*****>
<!***** A responsive landing page website template that *****>
<!***** has been hand-designed to create a more *****>
<!***** customized appearance as opposed to the standard*****>
<!***** photo-album template available directly from *****>
<!***** www.getbootstrap.com *****>
<!*****>
```

```

<!*****>
<!DOCTYPE html>
<html lang="en">
  <head>
    <meta charset="utf-8">
    <meta http-equiv="X-UA-Compatible" content="IE=edge">
    <meta name="viewport" content="width=device-width, initial-
scale=1">
    <!-- The above 3 meta tags *must* come first in the head; any
other head content must come *after* these tags -->
    <title>San Diego Photo Blog Landing Page</title>

<!*****>
<!***** Bootstrap CSS Link *****>
<!*****>
<!-- Bootstrap -->
<link href="css/bootstrap.min.css" rel="stylesheet">

<!*****>
<!***** MHTML5 Scripts Link *****>
<!*****>
<!-- HTML5 shim and Respond.js for IE8 support of HTML5 elements
and media queries -->
<!-- WARNING: Respond.js doesn't work if you view the page via
file:// -->
<!--[if lt IE 9]>
<script
src="https://oss.maxcdn.com/html5shiv/3.7.2/html5shiv.min.js"></script>
>
<script
src="https://oss.maxcdn.com/respond/1.4.2/respond.min.js"></script>
<![endif]-->

<!*****>
<!***** Internal CSS Styles*****>
<!*****>
<style>

  .box {
    border:1px solid grey;
    background-color:#d3d3d3;
  }

  #topContainer {
    background-image:url("torreyPines.jpg");
    height:400px;
    width:100%;
    background-size:cover;
  }

  #topRow {

```

```

        margin-top:100px;
        text-align:center;
    }

    .bold {
        text-weight:bold;
    }

    .marginTop {
        margin-top:30px;
    }

    .center {
        text-align:center;
    }

    #footer {
        background-color:#00c7ff;
    }

    .marginBottom {
        margin-bottom:30px;
    }
</style>

</head>

<!***** Begin Main Website Body*****>
<!***** Implement Spy Scroll *****>
<!***** Instantiate Navbar & Container*****>
<body data-spy="scroll" data-target=".navbar-collapse">

<div class="navbar navbar-default navbar-fixed-top">

    <div class="container">

        <div class="navbar-header">
            <a href="" class="navbar-brand">San Diego Photo
Blog</a>

            <button type="button" class="navbar-toggle" data-
toggle="collapse" data-target=".navbar-collapse">
                <span class="sr-only">Toggle Navigation</span>

                <span class="icon-bar"></span>
                <span class="icon-bar"></span>

```

```
        <span class="icon-bar"></span>
    </button>
</div>
<div class="collapse navbar-collapse">
    <ul class="nav navbar-nav">
        <li class="active"><a href="#">Home</a></li>
        <li><a href="#">About</a></li>
        <li><a href="#">Play</a></li>
    </ul>

    <form class="navbar-form navbar-right">

        <div class="form-group">
            <input type="email" placeholder="Email address" class="form-control" />
        </div>

        <div class="form-group">
            <input type="password" placeholder="Password" class="form-control" />
        </div>

        <button type="submit" class="btn btn-success">Log In</button>

    </form>
</div>
</div>

<!--***** Instantiate Top Container *****-->
<div class="container contentContainer" id="topContainer">

    <div class="row">
        <div class="col-md-6 col-md-offset-3" id="topRow">
            <h2 class="marginTop">A Taste of San Diego, California</h2>
            <p class="lead">Highlighting America's finest city</p>
            <p>A photographic journey presenting some of the most stunning view-points in San Diego County.</p>
            <p class="bold marginTop">Get notified of updates. Join our mailing list.</p>
        </div>
    </div>
</div>
```

```
<form class="marginTop">

    <div class="input-group">
        <span class="input-group-addon">@</span>
        <input type="email" class="form-control"
placeholder="your email address" />
    </div>

    <button type="submit" class="btn btn-success btn-
lg marginTop">Submit</button>

</form>

</div>

</div>

<!*****>
<!**** Instantiate Middle Container *****>
<!*****>
<div class="container contentContainer">

    <div class="row center">

        <h2>Photo Index</h2>
        <p class="lead">Sorted by Location/Attraction</p>

    </div>

    <div class="row marginBottom">

        <div class="col-md-4 marginTop">

            <h4><span class="glyphicon
glyphicon-camera"></span> Torrey Pines State Natural Reserve</h4>

            <p>Torrey Pines State Natural Reserve is located in an area which
lies closer to the equator than to the north pole. Because of this, our waters are almost semi-
tropical and possess many marine organisms with close relatives from farther south. Our coastal
climate is characterized as Mediterranean - that is, with mild winters and temperate summers,
which encourages the occurrence of marine flora and fauna that are transitional between true
tropical and true temperate.</p>

            <button class="btn btn-success
marginTop">View</button>

        </div>

    </div>
```

```
</div>

<!*****>
<!**** Instantiate Footer Container *****>
<!*****>

<div class="container contentContainer" id="footer">

    <h2 class="center title">Purchase The Full Resolution
Versions</h2>
    <p class="lead center">High-Definition Full Resolution
Photographs are 6-7 MB each and 6000x4000 pixels</p>

</div>

<!*****>
<!**** JQuery Link for Javascript Plugins *****>
<!*****>
    <!-- jQuery (necessary for Bootstrap's JavaScript plugins) -->
    <script
src="https://ajax.googleapis.com/ajax/libs/jquery/1.11.2/jquery.min.js
"></script>
    <!-- Include all compiled plugins (below), or include individual
files as needed -->
    <script src="js/bootstrap.min.js"></script>

<!*****>
<!**** Establish Container Heights according to browser *****>
<!*****>

<script>

    $(".contentContainer").css("min-height", $(window).height());

```

### References

CSS/Grid Options. (n.d.). Retrieved from <http://getbootstrap.com/css/#grid-example-basic>

## International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 6, June 2015

# Optimizing Front End Applications and JavaScript

Vamsi Krishna Myalapalli<sup>1</sup>, Srinivas Karri<sup>2</sup>

Software Engineer, Open Text Corporation, Mind Space IT Park, Hitec City, Hyderabad, India<sup>1,2</sup>

**ABSTRACT:** In the contemporary world it is inevitable to develop Front End Applications without JavaScript. Many JavaScript programmers simply do code with less concern towards long term maintainability and optimized processing. Though JAVA Script offers sundry methods of coding systems to reach the same end, there exist some practices which are pre-requisite to ensure that consequences will be prolific. As such this paper proposes simple, miscellaneous, flexible, reliable and easy methodologies to make web pages efficient and faster, making the application robust. The exploration of this paper could serve as a benchmarking tool and code refactoring tool for overhauling coding practices as well as tuning web pages. Experimental fallouts of our investigation advocate that response time, flexibility, maintainability and reusability of the application are enriched.

**KEYWORDS:** JAVA Script Tuning; JAVA Script Best Practices; UI Tuning; JAVA Script Optimization; JAVA Script Code Refactoring; Web Page Tuning; Web Page Optimization.

### I. INTRODUCTION

Initially, the Web was conceived as a collection of static HTML documents, tied together with hyperlinks. Soon, as the Web grew in popularity and size, the webmasters who were creating static HTML web pages felt they needed something more. They wanted the opportunity for richer user interaction, mainly driven by desire to save server round-trips for simple tasks such as form validation. JavaScript's instant popularity happened during the period of the Browser Wars. JAVA Script is a client side and dynamic programming language. It is the HTML and Web Programming language. JavaScript is categorized as prototype based script language with dynamic typing and first class functions. The combination of these amenities will make it an imperative, multi paradigm, object-oriented and functional programming styles. JavaScript is not a classic OO language, but a prototypal one.

JavaScript performance really begins with getting the code onto a page in the most efficient way possible. A large source of performance problems in JavaScript is poorly written code that uses inefficient algorithms or utilities. In effect, JavaScript forces the developer to perform the optimizations that a compiler would normally handle in other languages. This paper exposes proactive best practices or tuning techniques that the programmers should gaze at.

### II. BACKGROUND AND RELATED WORK

High Performance JAVA Programming [1] explained several ways to tune programs at statements level. It explains statement tuning using profiling methodologies. Also it explained techniques to tune programs when the code is communicating with web pages and web protocols.

High Performance C Programming [2] expounded sundry logical methodologies to tune code in loops, methods and in other control structures. It also explained performance impact of variable scope.

This paper proposes Front End Application tuning i.e. tuning User Interface, Web pages etc., JavaScript tuning and enhancing response time that end user experiences. Hopefully this paper could serve as the benchmark to yield High Performance JavaScript and High Performance Web Pages.

# International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 6, June 2015

### III. PROPOSED MODEL

This paper brings out several best programming practices in JavaScript language and serves as a Benchmarking tool. Tuning methods and best practices are explained in this section and their corresponding programmatic implementation is explained in Section 4.

**Loading and Execution #1-4:** JavaScript performance in the browser is arguably the most important usability issue facing developers. The problem is complex because of the blocking nature of JavaScript, which is to say that nothing else can happen while JavaScript code is being executed. In fact, most browsers use a single process for both user interface (UI) updates and JavaScript execution, so only one can happen at any given moment in time. The longer JavaScript takes to execute, the longer it takes before the browser is free to respond to user input.

1) **Script Positioning:** The HTML 4 specification indicates that a <script> tag may be placed inside of a <head> or <body> tag in an HTML document and may appear any number of times within each. Traditionally, <script> tags that are used to load external JavaScript files have appeared in the <head>, along with <link> tags to load external CSS files and other meta-information about the page. It's best to keep as many style and behaviour dependencies together, loading them first so that the page will come in looking and behaving correctly.

2) **Grouping Scripts:** Each <script> tag blocks the page from rendering during initial download, it's helpful to limit the total number of <script> tags contained in the page. This applies to both inline scripts as well as those in external files. Every time a <script> tag is encountered during the parsing of an HTML page, there is going to be a delay while the code is executed; minimizing these delays improves the overall performance of the page. An inline script placed after a <link> tag referencing an external style sheet caused the browser to block while waiting for the style sheet to download. This is done to ensure that the inline script will have the most correct style information with which to work. Never put an inline script after a <link> tag for this reason.

3) **Non-Blocking Scripts:** JavaScript's tendency to block browser processes, both HTTP requests and UI updates, is the most notable performance issue facing developers. Keeping JavaScript files small and limiting the number of HTTP requests are only the first steps in creating a responsive web application. The richer the functionality an application requires, the more JavaScript code is required, and so keeping source code small isn't always an option. Limiting our self to downloading a single large JavaScript file will only result in locking the browser out for a long period of time, despite it being just one HTTP request. To get around this situation, we need to incrementally add more JavaScript to the page in a way that doesn't block the browser. The secret to non-blocking scripts is to load the JavaScript source code after the page has finished loading. This means downloading the code after the window's load event has been fired. There are a few techniques for achieving this result.

- a) Deferred Scripts
- b) Dynamic Script Elements
- c) XMLHttpRequest Script Injection

4) **Non-Blocking Pattern:** Loading a significant amount of JavaScript onto a page should be two-step process: first, include the code necessary to dynamically load JavaScript, and then load the rest of the JavaScript code needed for page initialization. Since the first part of the code is as small as possible, potentially containing just the load Script() function, it downloads and executes quickly, and so shouldn't cause much interference with the page. Once the initial code is in place, use it to load the remaining JavaScript.

**Flow Control #5-9:** The overall structure of our code is one of the main determinants as to how fast it will execute. Having a very small amount of code doesn't necessarily mean that it will run quickly, and having a large amount of code doesn't necessarily mean that it will run slowly. A lot of the performance impact is directly related to how the code has been organized and how we are attempting to solve a given problem.

## International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 6, June 2015

5) **For-in Loop vs. Other Loop:** For-in loop is comparatively slower than other loops. Since, in each-iteration, the loop results in a property lookup either on the instance or on a prototype, thus it has considerably more overhead per iteration and is therefore slower than the other loops. For the same number of loop iterations, for in loop can end up as much as seven times slower than the other loop types. We should never use for-in to iterate over members of an array.

6) **Memoization:** Work avoidance is the best performance optimization technique. The less work our code has to do, the faster it executes. Along those lines, it also makes sense to avoid work repetition. Performing the same task multiple times is a waste of execution time. Memoization is an approach to avoid work repetition by caching previous calculations for later reuse, which makes memoization a useful technique for recursive algorithms.

7) **Call Stack Limits:** The amount of recursion supported by JavaScript engines varies and is directly related to the size of the JavaScript call stack. Even though it is possible to trap these errors in JavaScript, it is not recommended. No script should ever be deployed that has the potential to exceed the maximum call stack size. Apart from this stack overflow errors prevent the rest of the code from executing. If we run into a stack overflow error, change the method to an iterative algorithm or make use of memoization to avoid work repetition.

8) **If-Else vs. Switch:** Switch executes faster than If-Else. But If-else offers readability. So rewriting If-Else will optimize it. The rewritten if-else statement should have maximum number of four condition evaluations each time through. This is achieved by applying a binary-search-like approach, splitting the possible values into a series of ranges to check and then drilling down further in that section. The average amount of time it takes to execute this code is roughly half of the time it takes to execute the previous if-else statement when the values are evenly distributed between 0 and 10. This approach is best when there are ranges of values for which to test (as opposed to discrete values, in which case a switch statement is typically more appropriate).

9) **Lookup Tables:** Sometimes the best approach to conditionals is to avoid using if-else and switch altogether. When there are a large number of discrete values for which to test, both if-else and switch are significantly slower than using a lookup table. Lookup tables can be created using arrays or regular objects in JavaScript, and accessing data from a lookup table is much faster than using if-else or switch, especially when the number of conditions is large. When using a lookup table, the operation becomes either an array item lookup or an object member lookup. This is a major advantage for lookup tables: since there are no conditions to evaluate, there is little or no additional overhead as the number of possible values increase. Lookup tables are most useful when there is logical mapping between a single key and a single value. A switch statement is more appropriate when each key requires a unique action or set of actions to take place.

**Data Access #(10-11):** It has to be determined where data should be stored for optimal reading and writing, where data is stored is related to how quickly it can be retrieved during code execution.

10) **Variables vs. Object Members:** Literal values and local variables can be accessed very quickly, whereas array items and object members take longer.

Local variables are faster to access than out-of-scope variables because they exist in the first variable object of the scope chain. The further into the scope chain a variable is, the longer it takes to access. Global variables are always the slowest to access because they are always last in the scope chain.

Nested object members incur significant performance impact and should be minimized.

We can enhance the performance of JavaScript code by storing frequently used object members, array items, and out-of-scope variables in local variables. We can then access the local variables faster than the originals.

11) **Prototype Chaining:** The deeper into the prototype chain that a property or method exist, the slower it is to access. Avoid the ‘with’ statement because it augments the execution context scope chain. The catch clause of a try-catch statement will have the same effect.

## International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 6, June 2015

**DOM Scripting #(12-16):** DOM (Document Object Model) scripting is expensive, and it's a common performance bottleneck in rich web applications. The DOM is a language-independent application interface for working with XML and HTML documents. Even though the DOM is a language-independent API, in the browser the interface is implemented in JavaScript.

**12) Minimize DOM Access:** Minimize DOM access, and try to work as much as possible in JavaScript. Use local variables to store DOM references that are accessed repeatedly. Leaving the DOM alone is big JavaScript optimization. Example: Appending an array of list items: if we append each of these to the DOM individually, it is considerably slower than appending them all at once. This is because DOM operations are expensive.

**13) HTML Collections:** HTML collections represent the live, underlying document. Cache the collection length into a variable and use it when iterating, and make a copy of the collection into an array for heavy work on collections.

**14) Event Delegation:** Using event delegation minimizes the number of event handlers. When there are a large number of elements on a page and each of them has one or more event handlers attached (such as on-click), this may affect performance. Attaching every handler comes at a price—either in the form of heavier pages (more mark-up or Java- Script code) or in the form of runtime execution time. The more DOM nodes we need to touch and modify, the slower our application, especially because the event attaching phase usually happens at the on-load (or DOMContentReady) event, which is a busy time for every interaction-rich web page. Attaching events takes processing time, and, in addition, the browser needs to keep track of each handler, which takes up memory.

A simple and elegant technique for handling DOM events is event delegation. It's based on the fact that events bubble up and can be handled by a parent element. With 'event delegation', we attach only one handler on a wrapper element to handle all events that happen to the children descendant of that parent wrapper.

**15) Building DOM Node and All its Sub-Nodes Offline:** When adding complex content such as tables to a site, performance is improved by adding complex sub-trees offline.

**16) Minimizing Reflow in DOM:** DOM operations are resource-heavy because of reflow. Reflow is basically the process by which the browser re-renders the DOM elements on the screen. For instance, if we change the width of a div with JavaScript, the browser has to refresh the rendered page to account for this change. Any time an element is added or removed from the DOM, reflow will occur.

The solution for this is a very handy JavaScript object, "Document Fragment". Document Fragment is basically a document-like fragment that isn't visually represented by the browser. Having no visual representation provides a number of advantages; mainly we can append nodes to a 'documentFragment' without incurring any browser reflow.

**String Processing #(17-20):** Pragmatically all JavaScript programs are intimately tied to strings. A typical program deals with numerous tasks like these that require to merge, split, rearrange, search, iterate over, and otherwise handle strings; and as web applications become more complex, progressively more of this processing is done in browser.

**17) String Concatenation:** For String Concatenation we use either 'Array.prototype.join' or 'Concat' or '+' operator. Array joining is slower than other methods of concatenation in most browsers, but this is efficient in IE7 and earlier. So based on the browser prefer concatenation method. On the other hand 'concat' is a little slower than simple + and += operators in most cases.

- 18) Regular Expressions:** The following are sundry ways to advance Regular Expression efficiency:
- Focus on Failing Faster.
  - Start regexes with simple, required tokens.
  - Making quantified patterns and their following token mutually exclusive.

## International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 6, June 2015

- d) Reduce the amount and reach of alternation.
- e) Use non-capturing groups: Capturing groups spend time and memory remembering back-references and keeping them up to date. If we don't need a back-reference, avoid this overhead by using a non-capturing group—i.e., (?:...) instead of (...).
- f) Capture interesting text to reduce post-processing.
- g) Expose required tokens.
- h) Use appropriate Quantifiers.
- i) Reuse regexes by assigning them to variables.
- j) Split complex regexes into simpler pieces.

**19) When Not to Use Regular Expressions:** When used with care, regexes are very fast. However, they usually overkill when we are merely searching for literal strings. This is especially true if we know in advance which part of a string we want to test. Backtracking is both a fundamental component of regex matching and a frequent source of regex inefficiency.

**20) String Trimming:** Removing leading and trailing whitespace from a string is a simple but common task. Trimming strings is not a common performance bottleneck, but it serves as a decent case study for regex optimization since there are lot of ways to implement it. Trimming can be performed with and without using regular expressions. Using two simple regexes (one to remove leading whitespace and another for trailing whitespace) offers a good mix of brevity and cross-browser efficiency with varying string contents and lengths. Looping from the end of the string in search of the first non-whitespace characters, or combining this technique with regexes in a hybrid approach, offers a good alternative that is less affected by overall string length.

**Responsive Interfaces #(21-26):** There's nothing more frustrating than clicking something on a web page and having nothing happen. This problem goes back to the origin of transactional web applications and resulted in the now-ubiquitous "please click only once" message that accompanies most form submissions.

**21) Browser UI Threading:** No JavaScript task should take longer than 100 milliseconds to execute. Longer execution times cause a noticeable delay in updates to the UI and negatively impact the overall user experience.

Browsers behave differently in response to user interaction during JavaScript execution. Regardless of the behavior, the user experience becomes confusing and disjointed when JavaScript takes a long time to execute.

**22) Yielding with Timers:** Timers can be used to schedule code for later execution, which allows us to split up long-running scripts into a series of smaller tasks.

**23) Array Processing with Timers:** One common cause of long-running scripts is loops that take too long to execute. The approach is to split up the loop's work into a series of timers.

The actual amount of time to delay each timer is largely dependent on our use case. It's best to use at least 25 milliseconds because smaller delays leave too little time for most UI updates.

One side effect of using timers to process arrays is that the total time to process the array increases. This is because the UI thread is freed up after each item is processed and there is a delay before the next item is processed. Nevertheless, this is a necessary trade-off to avoid a poor user experience by locking up the browser.

**24) Splitting Up Tasks:** One task can often be broken down into a series of subtasks. If a single function is taking too long to execute, check to see whether it can be broken down into a series of smaller functions that complete in smaller amounts of time. This is often as simple as considering a single line of code as an atomic task, even though multiple lines of code typically can be grouped together into a single task.

## International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 6, June 2015

**25) Timers and Performance:** Timers can make a huge difference in the overall performance of our JavaScript code, but overusing them can have a negative effect on performance. Performance issues start to appear when multiple repeating timers are being created at the same time. Low-frequency repeating timers-those occurring at intervals of one second or greater have little effect on overall web application responsiveness. The timer delays in this case are too large to create a bottleneck on the UI thread and are therefore safe to use repeatedly. When multiple repeating timers are used; with a much greater frequency (between 100 and 200 milliseconds), the application will become noticeably slower and less responsive. To limit the number of high-frequency repeating timers in our web application create a single repeating timer that performs multiple operations with each execution.

**26) Enforce Web Workers:** Web workers introduce an interface through which code can be executed without taking time on the browser UI thread; Thus, preventing UI locking. Web workers represent a potentially huge performance improvement for web applications because each new worker spawns its own thread in which to execute JavaScript. That means not only will code executing in a worker not affect the browser UI, but it also won't affect code executing in other workers.

Web workers are suitable for any long-running scripts that work on pure data and that have no ties to the browser UI. This may seem like a fairly small number of uses, but buried in web applications there are typically some data-handling approaches that would benefit from using a worker instead of timers.

**AJAX #(27-29):** Ajax is a cornerstone of high-performance JavaScript. It can be used to make a page load faster by delaying the download of large resources. It can prevent page loads altogether by allowing for data to be transferred between the client and the server asynchronously. It can even be used to fetch all of a page's resources in one HTTP request. By choosing the correct transmission technique and the most efficient data format, we can significantly improve how our users interact with our site.

Once we have selected the most appropriate data transmission technique and data format, we can start to consider other optimization techniques. These can be highly situational, so be sure that our application fits the profile before considering them.

**27) Cache Data:** The fastest Ajax request is one that we don't have to make. There are two main ways of preventing an unnecessary request:

- a) On the server side, set HTTP headers which ensure that response will be cached in the browser.
- b) On the client side, store fetched data locally so that it doesn't have to be requested again.

The first technique is the easiest to set up and maintain, whereas the second gives us the highest degree of control.

Improve perceived loading time of page by using Ajax to fetch less important files after rest of the page has loaded.

**28) Setting HTTP Headers:** If Ajax responses should be cached by the browser, we must use GET to make the request. But simply using GET isn't sufficient; we must also send the correct HTTP headers with the response. The Expires header tells the browser how long a response can be cached. The value is a date; after that date has passed, any requests for that URL will stop being delivered from cache and will instead be passed on to the server.

An Expires header is the easiest way to make sure that Ajax responses are cached on the browser. We don't have to change anything in the client-side code, and can continue to make Ajax requests normally; knowing that the browser will send the request on to the server only if the file isn't in cache. It's also easy to implement on the server side, as all languages allow us to set headers in one way or another. This is the simplest approach to ensure that data is cached.

**29) Storing Data Locally:** Instead of relying on the browser to handle caching, we can also do it in a more manual fashion, by storing the responses we receive from the server. This can be done by putting the response text into an object, keyed by the URL used to fetch it.

A local cache also works well for users browsing on mobile devices. Most of the browsers on such devices have small or non-existent caches, and a manual cache is the best option for preventing unnecessary requests.

# International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 6, June 2015

**Programming Practices #30-52:** Every programming language has pain points and inefficient patterns that develop over time. JavaScript presents unique performance challenges related to the way we organize our code.

**30) Avoid Double Evaluation:** JavaScript allows us to take a string containing code and execute it from within running code. There are 4 standard ways to accomplish this: eval(), the Function() constructor, setTimeout(), and setInterval(). Each of these functions allows us to pass in a string of JavaScript code and have it executed.

Whenever we're evaluating JavaScript code from within JavaScript code, we incur a double evaluation penalty. This code is first evaluated as normal, and then, while executing, another evaluation happens to execute the code contained in a string. Double evaluation is a costly operation and takes much longer than if the same code were included natively.

Avoiding double evaluation is the key to achieve the most optimal JavaScript runtime performance possible. Optimizing JavaScript engines often cache the result of repeated code evaluations using eval().

**31) Using Object/Array Literals:** There are multiple ways to create objects and arrays in JavaScript, but nothing is faster than creating object and array literals. Literals are evaluated faster apart from taking up less space in code, so the overall file size is smaller. As the number of object properties and array items increases, so too does the benefit of using literals.

**Using Fast Parts of Language #32-33:** Hardware friendly code will always get executed faster.

**32) Using Bitwise Operators:** Bitwise Operators are incredibly fastest operations. Hence the possibility of using Bitwise operators should be explored in the code.

**33) Using Native Methods:** No matter how optimal our JavaScript code is, it will never be faster than the native methods provided by the JavaScript engine. The reason for this is native parts of JavaScript—those already present in the browser before we write a line of code—are all written in a lower-level language such as C++. i.e. these methods are compiled down to machine code as part of browser and hence don't have same limitations as our JavaScript code.

**34) Avoid Eval Functions:** It is the most misused feature of JavaScript. Eval will be slower because it needs to run the compiler just to execute a trivial assignment statement. On the other hand eval function compromises security of application, because it grants too much authority to eval'd text. And it compromises the performance of the language as a whole in the same way that the 'with' statement does.

**35) Avoid 'new' Operator:** JavaScript's new operator creates a new object that inherits from the operand's prototype member, and then calls the operand, binding the new object to this. This gives the operand (which had better be a constructor function) a chance to customize the new object before it is returned to the requestor.

If we forget to use the new operator, we instead get an ordinary function call, and this is bound to the global object instead of to a new object. That means that our function will be clobbering global variables when it attempts to initialize the new members. That is a very bad thing. There is no compile-time warning. There is no runtime warning.

By convention, functions that are intended to be used with new should be given names with initial capital letters, and names with initial capital letters should be used only with constructor functions that take the new prefix. This convention gives us a visual cue that can help spot expensive mistakes that the language itself is keen to overlook.

An even better coping strategy is to not use new at all. Avoid 'new Object' and 'new Array'. Use {} and [] instead.

**36) Function Statement vs. Function Expression:** JavaScript has a function statement as well as a function expression. This is confusing because they can look exactly the same. A function statement is shorthand for a var statement with a function value.

The statement function foo( ) {} means about the same thing as

var foo = function foo( ) {};// foo is a variable containing a function value.

To use the language well, it is important to understand that functions are values.

Function statements are subject to hoisting. This means that regardless of where a function is placed, it is moved to the top of the scope in which it is defined. This relaxes the requirement that functions should be declared before used,

## International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

**Vol. 4, Issue 6, June 2015**

which I think leads to sloppiness. It also prohibits the use of function statements in if statements. It turns out that most browsers allow function statements in if statements, but they vary in how that should be interpreted. That creates portability problems.

**37) The Equality Operators:** JavaScript has two sets of equality operators: === and !==, and their evil twins == and !=. The good ones work the way we would expect. If the two operands are of the same type and have the same value, then === produces true and !== produces false. The evil twins do the right thing when the operands are of the same type, but if they are of different types, they attempt to coerce the values. The rules by which they do that are complicated and unmemorable. These are some of the stimulating cases:

" === '0'	// false	0 === "	// true
0 === '0'	// true		
false === 'false'	// false	false === '0'	// true
false === undefined	// false	false === null	// false
null === undefined	// true	'\t\r\n' === 0	// true

The lack of transitivity is alarming. We should not use the evil twins. Instead, always use === and !==. All of the comparisons just shown produce false with the === operator.

**38) Evaluating Local Variables:** Local variables are found based on the most to the least specific scope and can pass through multiple levels of scope, the look-ups can result in generic queries. When defining the function scope, within a local variable without a preceding var declaration, it is important to precede each variable with var in order to define the current scope in order to prevent the look-up and to speed up the code.

**39) Manipulate Element Fragments before adding them to DOM:** Before placing the elements to the DOM, we have to ensure that all tunings are performed in order to improve JavaScript performance. This will eliminate the need to set aside Prepend or AppendjQuery APIs.

**40) Using .js file to Cache Scripts:** By utilizing this method, increased performance can be achieved because it allows the browser to load the script once and will only recall it from cache should the page be reloaded or revisited.

**41) Curtail Scope Chains:** Global scopes can be slow, because each time a function executes, it cause a temporary calling scope to be created. JavaScript searchers for the first item in the scope chain, and if it doesn't find the variable, it swells up the chain until it hits the global object.

**42) Create Shortcut Codes to Speed Up Coding:** For codes that are constantly being processed, speeding up the coding process can be achieved by creating shortcuts for longer codes, for example, 'document.getElementById'. By creating a shortcut, longer scripts will not take as long to code and will save time in the overall process.

**43) Enhancing Speed of Object Detection:** The efficient method of using Object Detection is to use a code created dynamic object detection, rather than performing object detection inside of a function.

**44) Function In-lining:** This helps in eliminating call costs, and replaces a function call with the body of the called function. In JavaScript, performing a function call is an expensive operation because it takes several preparatory steps to perform: allocating space for parameters, copying the parameters, and resolving the function name.

**45) Implement Common Sub-expression Elimination:** Common sub-expression elimination is a performance-targeted compiler optimization technique that searches for instances of identical expressions and replaces them with a single variable holding the computed value. We can expect that using a single local variable for a common sub-expression will always be faster than leaving the code unchanged.

## International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 6, June 2015

**46) Deter Global Variables:** The scripting engine needs to look through the scope, when referencing global variables from within function or another scope, the variable will be destroyed when the local scope is lost.

**47) Primitive Functions vs. Function Calls:** Performance in critical loops and functions can be enhanced by using equivalent primitive functions instead of function calls.

**48) Don't Retain Alive References of other Documents:** Do not retaining alive references of other documents after the script has finished with them. This is because any references to those objects from that document are not to be kept in its entire DOM tree, and the scripting environment will not be kept alive in memory. Thus the document itself is no longer loaded.

**49) Using XMLHttpRequest:** XMLHttpRequest assists to reduce the amount of content coming from the server and avoids the performance impact of destroying and recreating the scripting environment in between page loads. It is important to ensure that XMLHttpRequest is supported, or otherwise it can lead to glitches.

**50) Evade 'try-catch-finally' Clauses:** Whenever the catch clause is executed, where the caught exception object is assigned to a variable, "try-catch-finally" creates a new variable in the current scope at runtime. A number of browsers do not handle this process efficiently because the variable is created and destroyed at runtime.

**51) Using Closures Sparingly:** Closures are a very powerful and useful aspect of JavaScript, but they come with their own performance drawbacks. Closures can basically be thought of as the new in JavaScript, and we use one whenever we define a function on the fly, for instance:`document.getElementById('foo').onclick = function(ev) { };`

The problem with closures is that by definition, they have a minimum of three objects in their scope chain: 'the closure variables' 'the local variables', and 'the globals'. This last item leads to all the performance problems.

**52) Don't Dig too Deep into Arrays:** Deeper we dig, the slower the operation, because array item lookups are slow. If we dig three levels into an array, that's three array item lookups instead of one. So if we constantly reference `foo.bar` we can get a performance boost by defining `var bar = foo.bar;`

**Dealing with CSS #(53-57):** Inefficient handling of CSS will degrade the performance by consuming more time.

**53) Avoid CSS Expressions:** CSS expressions are a powerful (and dangerous) way to set CSS properties dynamically. The problem with expressions is that they are evaluated more frequently. Not only are they evaluated whenever the page is rendered and resized, but also when the page is scrolled and even when the user moves the mouse over the page.

Two techniques for avoiding problems created by CSS expressions are 'Creating One-Time Expressions' and using 'Event Handlers' instead of CSS expressions.

**54) Prefer HTML <link> Tag over @import Directive:** To refer to an external style sheet file from HTML file `<link>` tag or `@import` directive can be used. `@import` will cause wait event until the whole page has been read and rendered before loading and applying the external reference from the `@import` directive.

**55) Speed-up Table Layouts:** Rendering HTML tables is notoriously labor-intensive on the browser. There are typically four or more levels of tag nesting that, alone, take time to parse. The browser then needs to calculate the widths of each table cell, which it attempts to do intelligently, based on the width of the contents of each cell in the table. This means the browser usually needs to read in the data for the entire table before it is able to render it correctly. On a slow page, where we see the HTML table loading progressively onto the page, we might observe that the layout of the table alters—some of the columns change width—as the data is still being downloaded, and settles on its final dimensions only when all the data has completed downloading.

# International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 6, June 2015

The CSS table-layout:fixed style rule reduces this constant calculation and re-evaluation work the browser must do to render our HTML tables. It's used as follows:

```
table {table-layout:fixed; }
```

The table-layout: fixed rule “fixes” the table layout, which means that the rendering engine will calculate the widths of the table cells based solely on data found in the cells contained in the header row of the table. Since it does not need to do any more cell- width calculations, the time taken to render a long table is reduced.

**56) Avoid Inefficient CSS Selectors:** The CSS selector provides the mechanism for the browser to apply our style rules to our page. Typically, the browser will search for style rules to apply to a page element as it is created, comparing the tag name, id attribute, and class attribute of the element to the list of style rules. The browser then searches for style rules to apply based on possible inherited values from other CSS selectors in the document; and combine the results giving precedence to more specific style rules or rules given later in the document. The browser effectively needs to perform a series of searches to locate the styles to apply to an element, and each of these searches takes a certain length of time to complete.

Avoid specifying selectors that include tag names, as these cause the longest style rule searches to take place. Instead, filter our selectors by an appropriate id attribute located on a parent element. The search does not need to attempt to look for style rules applied to any other id attribute, thus improving the speed at which results are returned.

**57) Change CSS Classes not Styles:** Changing CSS class is more optimal than changing style. This boils down to another reflow issue: whenever a layout style is changed, reflow occurs. Layout styles mean anything that might affect the layout and force the browser to reflow; for instance width, height, font-size, float etc. CSS classes don't avoid reflow, they simply minimize it. Instead of incurring a reflow penalty every time we change a given style, we can use a CSS class to change a number of styles at once, and in turn only incur a single reflow. So it makes performance sense to use CSS classnames whenever changing more than one layout style. Additionally, it's also optimal to append a style node to the DOM if we need to define a number of classes on the fly.

**Don't Repeat Work #(58-59):** The concept of work avoidance is made up of two things: don't do work that isn't required, and don't repeat work that has already been completed. The first part is usually easy to identify as code is being refactored. The second part—not repeating work is usually more difficult to identify because work may be repeated in any number of places and for any number of reasons.

**58) Lazy Loading:** This eliminates work repetition in functions through lazy loading. Lazy loading means that no work is done until the information is necessary. For Example: There is no need to determine which way to attach or detach event handlers until someone makes a call to the function.

Calling a lazy-loading function always takes longer the first time because it must run the detection and then make a call to another function to accomplish the task. Subsequent calls to the same function, however, are much faster since they have no detection logic. Lazy loading is best used when the function won't be used immediately on the page.

Lazy Load is also capable of loading CSS files dynamically. This is typically less of an issue because CSS file downloads are always done in parallel and don't block other page activities.

**59) Conditional Advance Loading:** This is an alternative to Lazy Loading, which does the detection upfront, while the script is loading, instead of waiting for the function call. The detection is still done just once, but it comes earlier in the process.

Conditional advance loading ensures that all calls to the function take the same amount of time. The trade-off is that the detection occurs as the script is loading rather than later. Advance loading is best to use when a function is going to be used right away and then again frequently throughout the lifetime of the page.

## International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 6, June 2015

**Building and Deploying High-Performance JavaScript Applications #(60-67):** There exists a need to make our web applications delivered as efficiently as possible. While part of that work is done during Design and Development cycles, Build and Deployment phase is also essential and often overlooked. If care is not taken during this phase, performance of application will suffer, no matter how much effort we've put into making it faster.

**60) Combining Java Script Files:** Combining JavaScript files to reduce the number of HTTP requests. Simple optimization would be to group some, if not all, of this code into one external JavaScript file, thereby dramatically cutting down the number of HTTP requests necessary to render the page.

**61) Pre-processing JavaScript Files:** Pre-processing our JavaScript source files will not make application faster by itself, but it will allow among other things, conditionally instrument our code in order to measure how our application is performing.

**62) JavaScript Minification:** JavaScript Minification is the process by which a JavaScript file is stripped of everything that does not contribute to its execution. This includes comments and unnecessary whitespace. The process typically reduces the file size by half, resulting in faster downloads, and encourages programmers to write better, more extensive in-line documentation.

YUI Compressor is a tool that performs all kinds of smart operations in order to offer a higher level of compaction than other tools in a completely safe way. In addition to stripping comments and unnecessary whitespace, the YUI Compressor offers the following features:

- a) Replacement of local variable names with shorter (one-, two-, or three-character) variable names, picked to optimize 'gzip' compression downstream.
- b) Replacement of bracket notation with dot notation whenever possible (e.g., foo["bar"] becomes foo.bar)
- c) Replacement of quoted literal property names whenever possible (e.g., {"foo":"bar"} becomes {foo:"bar"}).
- d) Replacement of escaped quotes in strings (e.g., 'aaa\bbb' becomes "aaa'bbb").
- e) Constant folding (e.g., "foo"+"bar" becomes "foobar").

**63) Build time vs. Runtime Build Processes:** Concatenation, pre-processing and minification are steps that can take place either at build time or at runtime. Runtime build processes are very useful during development, but generally are not recommended in a production environment for scalability reasons. As a general rule for building high-performance applications, everything that can be done at build time should not be done at runtime.

**64) Caching JavaScript Files:** Making HTTP components cacheable will greatly enhance the experience of repeat visitors to our website. Although caching is most often used on images, it should be used on all static components, including JavaScript files.

We can also consider using client-side storage mechanisms if they are available, in which the JavaScript code must itself handle the expiration.

Another technique is the use of the HTML 5 offline application cache.

**65) Caching Issues:** Adequate cache control can really enhance the user experience, but it has a downside: when revving up our application, we want to make sure our users get the latest version of the static content. This is accomplished by renaming static resources whenever they change.

**66) Using a Content Delivery Network:** A content delivery network (CDN) is a network of computers distributed geographically across the Internet that is responsible for delivering content to end users. The primary reasons for using a CDN are reliability, scalability, and above all, performance. In fact, by serving content from the location closest to the user, CDNs are able to dramatically decrease network latency.

## International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 6, June 2015

Switching to a CDN is usually a fairly simple code change and has the potential to dramatically improve end-user response times. It is worth noting that the most popular JavaScript libraries are all accessible via a CDN.

**67) Deploying JavaScript Resources:** Deployment of JavaScript resources usually amounts to copying files to one or several remote hosts, and also sometimes to running a set of shell commands on those hosts, especially when using a CDN to distribute newly added files across delivery network.

**Efficient Profiling and Debugging #(68-69):** Code must be precisely profiled & debugged to produce robust code.

**68) Naming Anonymous Functions for Profiling:** Depending on the profiler, some data can be obscured by the use of anonymous functions or function assignments. As this is a common pattern in JavaScript, many of the functions being profiled may be anonymous, making it difficult or impossible to measure and analyse. The best way to enable profiling of anonymous functions is to name them. Using pointers to object methods rather than closures will allow the broadest possible profile coverage.

**69) Using Uncompressed Version for Debugging:** Always use uncompressed versions of scripts for debugging and profiling. This will ensure that our functions are easily identifiable.

**70) Script Blocking:** Browsers limit script requests to one at a time. This is done to manage dependencies between files. As long as a file that depends on another comes later in the source, it will be guaranteed to have its dependencies ready prior to execution. The gaps between scripts may indicate script blocking. Newer browsers have addressed this by allowing parallel downloading of scripts but blocking execution, to ensure dependencies are ready. Although this allows the assets to download more quickly, page rendering is still blocked until all scripts have executed.

Script blocking may be compounded by slow initialization in one or more files, which could be worthy of some profiling, and potentially optimizing or refactoring. The loading of scripts can slow or stop the rendering of the page, leaving the user waiting. Network analysis tools can help identify and optimize gaps in the loading of assets. Visualizing these gaps in the delivery of scripts gives an idea as to which scripts are slower to execute. Such scripts may be worth deferring until after the page has rendered, or possibly optimizing/refactoring to reduce execution time.

**Tools #(71-73):** We should have the right software essential for identifying bottlenecks in both the loading and running of scripts. Using profiling tools prior to beginning optimization will ensure that development time is spent focusing on right problem.

**71) Page Speed Tool:** Page Speed provides information about resources being loaded on a web page. But, in addition to load time and HTTP status, it shows the time spent on parsing and executing JavaScript, identifies deferrable scripts, and reports on functions that aren't being used. This is valuable information that can help identify areas for further investigation, optimization, and possible refactoring.

The Profile Deferrable JavaScript option, available on the Page Speed panel, identifies files that can be deferred or broken up in order to deliver a smaller initial payload. The Page Speed also provides a report on which functions were not called at all and which functions may be delay-able, based on the time they were parsed versus the time they were first called.

**72) Fiddler:** Fiddler is an HTTP debugging proxy that examines the assets coming over the wire and helps identify any loading bottlenecks.

Although 'time spent' and 'number of calls' are usually the most valuable bits of data, looking more closely at how functions are being called might yield other optimization candidates.

## International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 6, June 2015

**73) YSlow:** YSlow tool provides performance insights into the overall loading and execution of the initial page view. It scores the loading of external assets to the page, provides a report on page performance, and gives tips for improving loading speed.

**74) Reducing DNS Lookups:** When the client's DNS cache is empty (for both the browser and the operating system), the number of DNS lookups is equal to the number of unique hostnames in the web page. This includes the hostnames used in the page's URL, images, script files, style sheets, Flash objects, etc. Reducing the number of unique hostnames reduces the number of DNS lookups.

Reducing the number of unique hostnames has the potential to reduce the amount of parallel downloading that takes place in the page. Avoiding DNS lookups cuts response times, but reducing parallel downloads may increase response times.

In a nut shell minimize DNS lookups by using Keep-Alive and fewer domains.

**Evading Redirects #75:** A redirect is used to reroute users from one URL to another, which hurts performance.

**75) Alternatives to Redirects:** The following are several alternatives to Redirects.

- a) Missing Trailing Slash: One of the most wasteful redirects happens frequently and web developers are generally not aware of it. It occurs when a trailing slash (/) is missing from a URL that should otherwise have one.
- b) Connecting Web Sites: Imagine situation where a web site backend is rewritten. As often happens, the URLs in new implementation might be different. An easy way to transition users from the old URLs to new ones is to use redirects. Redirects are a way of integrating the two code bases using a well-defined API: URLs. Although redirects reduce the complexity for developers, it degrades the user experience.
- c) Tracking Internal Traffic: Redirects are often used to track the flow of user traffic. For internal traffic—i.e., traffic from web sites within the same company—it's worthwhile to avoid redirects by setting up Referrer logging to improve end user response times.
- d) Tracking Outbound Traffic: When we're trying to track user traffic, we might find that links are taking users away from our web site. An alternative to redirects for outbound traffic is to use a beacon—an HTTP request that contains tracking information in the URL. The tracking information is extracted from the access logs on the beacon web server(s).

**Enhancing End User Response Time #76-89:** Measures should be taken to minimize End User Wait time.

**76) Use Separate Domain Names for External Assets:** We should consider setting up a second domain name for our web application, if we intend to use HTTP cookies within our site.

By creating two separate domain names for a site, we can choose to host all images, style sheets, JavaScript files, and other external assets from one domain name, and all HTML from the other. By having the cookie data saved only to the domain that hosts the HTML files, we ensure that the cookie data is not sent to the server when requesting any other file type. This makes the data sent in the HTTP request message smaller, allowing it to reach the web server faster.

This technique is recommended only where we rely on cookie data being stored in the user's browser. In other circumstances, the extra DNS lookup, to locate the IP address of the second domain name, would actually result in worse performance for the end user, so this technique should be used carefully.

**77) Send HTML to the Browser in Chunks:** Most web servers aren't serving flat HTML files to their end users. Typically, the user requests a file, which causes the server to perform some action. The result of that action is the piecing together of a final HTML file, which is then sent to the user. Those actions are typically written in server-side scripting languages such as PHP, ASP.NET, or Java Server Pages (JSP).

After making a request to the server to view a page, the browser is left waiting while the server pieces together the HTML code to send back. If we could get access to some part of this resulting HTML as soon as possible, the browser could begin its work of loading in external assets, such as style sheets, while waiting for the server to send the

# International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 6, June 2015

remainder of the HTML page. This means the whole page will be ready for the end user to interact with sooner than if the browser had to wait for the entire HTML page to be sent in a single, large chunk.

**78) Compress the Output from the Server:** The biggest web server performance improvement can be achieved by compressing our text-based content-HTML, style sheets, and JavaScript files-before it is sent to the browser, letting the browser decompress the data before displaying it. Compression involves encoding data in a different, more efficient way. Compression can reduce file sizes by upto 70% of original. The two popular compression algorithms are known as gzip and deflate.

The great thing about this technique is that it is simple to enable on server. It is supported by every modern web browser. Browsers that don't support compression technique will be sent the data uncompressed from the server instead, so data is never lost. We should enable this feature in our web server, if it is not set by default, at our earliest available opportunity. We will immediately notice its impact, and so will our end users.

**79) Don't Load Every Asset from the Home Page:** Our home page is most often the first page our visitors will see when they visit our web site. We need to make a good impression with this page, both with its layout and its performance.

We may make the decision that, in order to speed up the rest of our web site, we are going to load all of the CSS and JavaScript for the entire site from the home page. These files will then be stored in the browser cache, so subsequent page requests will be faster. Unfortunately, by weighing down the site- entry page in this way, we cause a lot more data than is necessary to be downloaded, slowing down the rendering of what is the most important page on the site. Only reference what we absolutely need to on our home page, as it is the one that, above all others, needs to be perfect from a performance perspective.

**80) Split Components Across Domains:** The HTTP 1.1 specification includes a recommendation relating to the number of simultaneous files the browser should be able to download in parallel from the same domain name: it suggests a limit of two concurrent files. Some browsers enforce this limit to the letter; some choose to allow more than two simultaneous downloads from the same domain name.

The browser is limited in the number of simultaneous requests per domain name. So we have to set up another domain, point its DNS record to the same IP address as the first domain—since the limitation is only by domain name, not by IP address—so they are both referencing the same code on the same web server. By dividing our assets among the available domain names in this way, we are able to introduce a potentially large performance boost to our pages.

**81) Reduce the Number of HTML Elements:** The number of HTML elements on our page not only affects how long our HTML takes to download to the browser, but also the performance of our JavaScript code and the speed with which the browser's rendering engine is able to apply our CSS to our page.

**82) Define Arrays for HTML Collection Objects:** JavaScript uses a number of HTML collection objects such as document.forms.document.images, etc. Additionally these are called by methods such as getElementsByTagName and getElementsByClassName. As with any DOM selection, HTML collection objects are pretty slow, but also come with additional problems. As the DOM Level 1 spec says, "collections in the HTML DOM are assumed to be live, meaning that they are automatically updated when the underlying document is changed". While collection objects look like arrays, they are something quite different: the results of a specific query. Anytime this object is accessed for reading or writing, this query has to be rerun, which includes updating all the peripheral aspects of the object such as its length.

HTML collection objects are extremely slow. Additionally, these collection objects can lead to infinite loops where we might not expect. For instance:

```
vardivs = document.getElementsByTagName('div');
for (var i=0; i < divs.length; i++) { var div = document.createElement("div"); document.appendChild(div); }
```

This causes an infinite loop because divs represents a live HTML collection, rather than an array like we might expect. This live collection is updated every time we append a new <div> to the DOM, so i < divs.length never terminates.

## International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 6, June 2015

The way around this is to define these items in an array, which is a little more complex than just setting vardivs = document.getElementsByTagName('div');. Here is a script that uses to force an array:

```
function array(items) {    try {        return Array.prototype.concat.call(items);    }    catch (ex) {        var i = 0, len = items.length, result = Array(len);        while (i < len) {            result[i] = items[i];            i++;        }        return result;    }    vardivs = array(document.getElementsByTagName('div'));    for (var i=0; i<divs.length; i++) {var div = document.createElement("div");document.appendChild(div);    }
```

**83) Creating Reference Variables:** When working with a specific node recurrently, it is optimal to define a variable with that particular note, instead of switching to it repeatedly. This is not a significant enhancement but it can have a bigger impact on a large scale.

**84) Compress Files with GZip:** GZip can reduce a JavaScript file considerably, saving bandwidth, and accelerate the response time. JavaScript files can be very large, and without compression, it can bog down any website. Smaller files provide a faster and more satisfying web experience.

**85) Using JQuery as Framework:** JQuery is an easy to use JavaScript library that can help to speed up any website. JQuery provides a large number of plug-ins that can quickly be used.

**86) Don't Link to Non-existent Files:** As we've already seen, HTTP requests that don't return an intended response are wasteful; they keep the web server and the browser occupied for little benefit.

If a JavaScript file is being requested by the page that does not exist on the server, and an error page is returned by the server instead of the requested file, the browser will pause its parsing of the page while waiting for the contents of the error page to download. This exacerbates the effect of linking to non-existent files.

**87) Reduce Size of HTTP Cookies:** Each HTTP request message that is sent from the browser to server contains the HTTP cookie data associated with that domain. This is so that both the client, through JavaScript, and the server, through any back-end processing, have access to this information in order to customize the site for that particular user. Obviously, this data takes up space in the request message. Since it is communicated for each file being requested, it can add a lot of extra information that is rarely used except, typically, for the page that returns the HTML document.

By ensuring that the data stored in the cookie is small, the data being sent in each HTTP request message is reduced, and the server receives the message sooner. Consider including nothing more than a simple, unique user identifier within the HTTP cookie and storing other information within a database on the server, using the unique identifier as a key to look up this extra information.

**88) Consider PNG Images:** The three major image file formats used on web pages are Graphics Interchange Format (GIF), Joint Photographic Experts Group format (JPEG), and Portable Network Graphics format (PNG). PNG is a lossless image format apart from being smaller in size.

**89) Configuring ETags:** Entity tags (ETags) are a mechanism that web servers and browsers use to validate cached components. Reducing the number of HTTP requests necessary to render our page is the best way to accelerate the user experience. We can achieve this by maximizing the browser's ability to cache the components, but the ETag header thwarts caching when a web site is hosted on more than one server. Most of the components in the page have ETags that follow the default format for IIS. The same images downloaded from different servers have different ETags, meaning they will be downloaded more frequently than needed. Extra effort can be made to modify the ETag syntax to improve their cacheability. Simply Configure ETags efficiently or remove them.

**Evaluating the Time Complexity #90:** Simple code snippet can compute the amount of time the code is under execution.

## International Journal of Innovative Research in Science, Engineering and Technology

*(An ISO 3297: 2007 Certified Organization)*

**Vol. 4, Issue 6, June 2015**

**90) Tracking the Running Time of Code:** Tracking how long a piece of code has been running by using the native Date object. This is the way most JavaScript profiling works.

### IV. EXPERIMENTAL SETUP

In this section the methodologies which correspond to section 3 are explained via pragmatic programs and code snippets which could serve as exemplars.

```
1. <html><head><title>Script Tuning</title><link rel="stylesheet" type="text/css" href="styles.css">
</head><body><p>Hello world!</p>
<!-- Example of recommended script positioning -->
<script type="text/javascript" src="file1.js"></script><script type="text/javascript" src="file2.js"></script>
</body></html>
```

Instead of

```
<html><head><title>Script Tuning</title>
<script type="text/javascript" src="file1.js"></script><script type="text/javascript" src="file2.js"></script>
<link rel="stylesheet" type="text/css" href="styles.css">
</head><body><p>Hello world!</p></body></html>
```

Since each `<script>` tag blocks the page from continuing to render until it has fully downloaded and executed the Java- Script code, the perceived performance of this page will suffer.

```
2. <html><head><title>Script Example</title>
<link rel="stylesheet" type="text/css" href="styles.css"></head><body>
<p>Hello world!</p>
<!-- Example of recommended script positioning -->
<script type="text/javascript" src="
```

```
http://yui.yahooapis.com/combo?2.7.0/build/yahoo/yahoo-min.js&2.7.0/build/event/event-min.js ">
</script></body></html>
```

This code has a single `<script>` tag at the bottom loading multiple Java-Script files; the best practice for including external JavaScript on an HTML page.

```
4. <script type="text/javascript" src="loader.js"></script>
<script type="text/javascript">
loadScript("the-rest.js", function(){
Application.init();
});
```

Place this loading code just before closing `</body>` tag. Now execution won't prevent the rest of the page from being displayed. Second, when the second JavaScript file has finished downloading, all of the DOM necessary for the application has been created and is ready to be interacted with, avoiding the need to check for another event (such as `window.onload`) to know when the page is ready for initialization.

```
11. if (obj.a==undefined){ a = obj.b === undefined ? b : obj.b; }
else {obj.a = obj.b === undefined ? b : obj.b; }
```

Instead of

```
with(obj ) { a=b; }
```

```
24. functionsaveDocument(id){
var tasks = [openDocument, writeText, closeDocument, updateUI];
setTimeout(function(){
```

## International Journal of Innovative Research in Science, Engineering and Technology

*(An ISO 3297: 2007 Certified Organization)*

**Vol. 4, Issue 6, June 2015**

```
//execute the next task
var task = tasks.shift();
task(id);
//determine if there's more
if (tasks.length> 0) {
    Instead of
    functionsaveDocument(id){
        //save the document
        openDocument(id);writeText(id); closeDocument(id);
        //update the UI to indicate success
        updateUI(id);
    }
}
```

If function is taking too long, it must be split up into a series of smaller steps by breaking out the individual methods into separate timers. We can accomplish this by adding each function into an array and then using a pattern similar to the array processing pattern from the previous section.

29. Example of an XHR wrapper that first checks to see whether a URL has been fetched before:

```
varlocalCache = {};
functionxhrRequest(url, callback) { // Check the local cache for this URL.
if (localCache[url]) { callback.success(localCache[url]); return; }

// If this URL wasn't found in cache, make the request.

var req = createXhrObject();
req.onerror = function() { callback.error(); };
req.onreadystatechange = function() {
if (req.readyState == 4) {
if (req.responseText === "" || req.status == '404') {
callback.error();
return;
}

// Store the response on the local cache.
localCache[url] = req.responseText;
callback.success(req.responseText);
}
};

req.open("GET", url, true);
req.send(null);
}
```

Setting an Expires header is a better solution. It's easier to do and it caches responses across page loads and sessions. But a manual cache can be useful in situations where we programmatically want to expire a cache and fetch fresh data.

30. Example for 4 methods

```
var num1 = 5, num2 = 6,
    //eval() evaluating a string of code
result = eval("num1 + num2"),
    //Function() evaluating strings of code
sum = new Function("arg1","arg2","return arg1+arg2");
    //setTimeout() evaluating a string of code
setTimeout("sum = num1 + num2", 100);
    //setInterval() evaluating a string of code
```

## International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

**Vol. 4, Issue 6, June 2015**

```

setInterval("sum = num1 + num2", 100);

var item = array[0];
Instead of
var item = eval("array[0]");

31. //creating an object
varmyObject = {
name: "Vamsi", count: 50, flag: true, pointer: null }; //create an array
varmyArray = ["Vamsi", 50, true, null];
Instead of
// creating an object
varmyObject = new Object();
myObject.name = "Nicholas"; myObject.count = 50; myObject.flag = true; myObject.pointer = null;
Or
// creating an array
varmyArray = new Array();
myArray[0] = "Nicholas"; myArray[1] = 50; myArray[2] = true; myArray[3] = null;

```

53. One-Time Expression: If the CSS expression has to be evaluated only once, it can overwrite itself as part of its execution. The background style defined at the beginning of this chapter is a good candidate for this approach:

```

<style>
P { background-color: expression(altBgcolor( this )); }
</style>
<script type="text/javascript">
functionaltBgcolor(elem) {
elem.style.backgroundColor = (new Date()).getHours()%2 ? "#F08A00" : "#B8D4FF";
} </script>

```

CSS expression calls altBgcolor( ) function, which sets style's background-color property to an explicit value, and this replaces CSS expression. This style is associated with 10 paragraphs in page. Even after resizing, scrolling, and moving mouse around the page, CSS expression is evaluated only 10 times.

Event Handlers: Below setMinWidth( ) function to resize all paragraph elements when browser is resized:

```

functionsetMinWidth() {
setCntr();
varaElements = document.getElementsByTagName("p");
for ( var i = 0; i <aElements.length; i++ ) {
aElements[i].runtimeStyle.width = ( document.body.clientWidth<600 ? "600px" : "auto" );
}
}
if ( -1 != navigator.userAgent.indexOf("MSIE") ) { window.onresize = setMinWidth; }

```

```

56. #header .title { ... }
#results a { ... }
#field .label { ... }
Instead of
tabletbodytr td { ... }
#body #content #results a { ... }
formdiv#field label { ... }

```

## International Journal of Innovative Research in Science, Engineering and Technology

*(An ISO 3297: 2007 Certified Organization)*

**Vol. 4, Issue 6, June 2015**

58. Lazy Loaded Version

```

functionaddHandler(target, eventType, handler){
if (target.addEventListener){ //DOM2 Events
addHandler = function(target, eventType, handler){
target.addEventListener(eventType, handler, false);
};

} else { //IE
addHandler = function(target, eventType, handler){ target.attachEvent("on" + eventType, handler); };
}

//call the new function
addHandler(target, eventType, handler);
}

functionremoveHandler(target, eventType, handler){
if (target.removeEventListener){ //DOM2 Events
removeHandler = function(target, eventType, handler){
target.addEventListener(eventType, handler, false);
};

} else { //IE
removeHandler = function(target, eventType, handler){ target.detachEvent("on" + eventType,
handler); };
}

//call the new function
removeHandler(target, eventType, handler);
}

Instead of

functionaddHandler(target, eventType, handler){
if (target.addEventListener){ //DOM2 Events
target.addEventListener(eventType, handler, false);
};

} else { //IE
target.attachEvent("on" + eventType, handler); }
}

functionremoveHandler(target, eventType, handler){
if (target.removeEventListener){ //DOM2 Events
target.removeEventListener(eventType, handler, false);
};

} else { //IE
target.detachEvent("on" + eventType, handler); }
}

```

59. varaddHandler = document.body.addEventListener ?

```

function(target, eventType, handler){
target.addEventListener(eventType, handler, false);
};

function(target, eventType, handler){
target.attachEvent("on" + eventType, handler);
};

varremoveHandler = document.body.removeEventListener ?
function(target, eventType, handler){
target.removeEventListener(eventType, handler, false);
};

function(target, eventType, handler){
target.detachEvent("on" + eventType, handler); };

```

This example checks to see whether `addEventListener()` and `removeEventListener()` are present and then uses that information to assign the most appropriate function. The ternary operator returns the DOM Level 2 function if these methods are present and otherwise returns the IE-specific function. The result is that all calls to `addHandler()` and `removeHandler()` are equally fast, as the detection cost occurs upfront.

## International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 6, June 2015

68. Inline function: myNode.onclick = function() { myApp.loadData(); };  
Method call:myApp.\_onClick = function() { myApp.loadData(); };  
myNode.onclick = myApp.\_onClick;

Naming above corresponding Inline Function  
myNode.onclick = function myNodeClickHandler() { myApp.loadData(); };  
Naming above corresponding Method  
varonClick = function myNodeClickHandler() { myApp.loadData(); };

90. The beneath code tells the time, the code snippet is consuming to get executed.

```
var start = +new Date(),stop;
...
// Code to be profiled goes here
...
stop = +new Date();
alert("Time taken to Execute Code " + stop-start);
if(stop-start < 50){ alert("Just about right."); } else { alert("Taking too long."); }
```

### V. CONCLUSION

JavaScript performance really begins with getting the code onto a page in the most efficient way possible. Code interpretation is inherently slower than compilation since there's a translation process between the code and the computer instructions that must be run. No matter how smart and optimized interpreters get, they always incur a performance penalty.

In order to know what to improve, we need to know where the user spends her time waiting. Page weight and response time are strongly correlated.

The ultimate goal of writing usable JavaScript code is to have a web page that will work for the users, no matter what browser they are using or what platform they are on. To accomplish this, we set a goal of the features that we want to use, and exclude any browsers that do not support them. For the unsupported browsers, we then give them a functional, albeit less interactive, version of the site. The benefits to writing JavaScript and HTML interactions in this manner included cleaner code, more accessible web pages, and better user interactions.

### VI. REFERENCES

- [1] Vamsi Krishna Myalapalli and Sunitha Geloth, "High Performance JAVA Programming", IEEE International Conference on Pervasive Computing, Pune, January 2015.
- [2] Vamsi Krishna Myalapalli, Jaya Krishna Myalapalli and Pradeep Raj Savarapu, "High Performance C Programming", IEEE International Conference on Pervasive Computing, Pune, January 2015.
- [3] Nicholas C. Zakas , "High Performance JavaScript", Yahoo Press, First Edition, 2010.
- [4] Den Odell, "Pro JavaScript RIA Techniques", Apress Publishers, 2009.
- [5] Steve Sounders, "High Performance Web Sites", O'Reilly Publishers, First Edition, 2007.
- [6] Douglas Crockford, "JavaScript: The Good Parts", O'Reilly Publishers, 2008.
- [7] 'http://en.wikipedia.org/wiki/JavaScript' referred on 27th December, 2014.

### BIOGRAPHY



Vamsi Krishna completed his Bachelor's in Computer Science from JNTUK University College of Engineering, Vizianagaram. He is Microsoft Certified Professional (Specialist in HTML5 with JAVA Script & CSS3), Oracle Certified JAVA SE7 Programmer, DBA Professional 11g, Performance Tuning Expert, SQL Expert and PL/SQL Developer. He has fervor towards SQL & Database Tuning.

## **International Journal of Innovative Research in Science, Engineering and Technology**

*(An ISO 3297: 2007 Certified Organization)*

**Vol. 4, Issue 6, June 2015**



Srinivas Karri completed his Bachelor's in Computer Science from Gayathri Vidya Parishad College of Engineering, Visakhapatnam. He is Microsoft Certified Professional (Specialist in HTML5 with JAVA Script & CSS3), Oracle Certified JAVA SE7 Programmer.

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/273493095>

# Issues and challenges of using web blogs as a medium for research communication

Article in *Waikato Journal of Education* · August 2011

DOI: 10.15663/wje.v16i1.76

---

CITATIONS

3

READS

242

2 authors:



Zuwati Hasim  
University of Malaya

19 PUBLICATIONS 28 CITATIONS

[SEE PROFILE](#)



Rosemary De Luca  
The University of Waikato

10 PUBLICATIONS 120 CITATIONS

[SEE PROFILE](#)

Some of the authors of this publication are also working on these related projects:



A-maze-ing World of Museum [View project](#)



THE UNIVERSITY OF  
**WAIKATO**  
*Te Whare Wānanga o Waikato*

## *Faculty of Education*

Te Kura Toi Tangata

## **Waikato Journal of Education**

Te Hautaka Mātauranga o Waikato

Volume 16, Issue 1: 2011

**Special Edition:**  
**e-Learning in a Range of**  
**Educational Contexts**



# WAIKATO JOURNAL OF EDUCATION

## TE HAUTAKA MĀTAURANGA O WAIKATO

**Editors:**

Noeline Wright

**Editorial Board:**

Beverley Bell  
Bronwen Cowie  
Deborah Fraser  
Margie Hohepa  
Sally Peters  
Noeline Wright

Margaret Carr  
Rosemary DeLuca  
Richard Hill  
Judy Moreland  
Clive Pope

*Waikato Journal of Education* is a refereed journal, published annually, based in the Faculty of Education, The University of Waikato, Hamilton, New Zealand. It publishes articles in the broad field of education. For further information visit the WJE website <http://edlinked.soe.waikato.ac.nz/research/journal/index.php?id=8>

Correspondence and articles for review should be addressed to: Research Manager, Wilf Malcolm Institute of Educational Research, Faculty of Education, The University of Waikato, Private Bag 3105, Hamilton, 3240, New Zealand. Email: [wmier@waikato.ac.nz](mailto:wmier@waikato.ac.nz)

Business correspondence: Orders, subscription payments and other enquiries should be sent to the Administrator, *Waikato Journal of Education*, Wilf Malcolm Institute of Educational Research, Faculty of Education, The University of Waikato, Private Bag 3105, Hamilton, 3240, New Zealand, Email: [wmier@waikato.ac.nz](mailto:wmier@waikato.ac.nz)

Subscriptions: Within NZ \$40; Overseas NZ \$50

Copyright: © Faculty of Education, The University of Waikato

Publisher: Faculty of Education, The University of Waikato

Cover design: Donn Ratana

Printed by: Waikato Print

ISSN 1173-6135

# **Waikato Journal Of Education**

## **Te Hautaka Mātauranga o Waikato**

Volume 16, Issue 1: 2011

### **Special Section: e-Learning**

Editorial <i>Noeline Wright</i>	3
Collaborative Practices Using Computers and the Internet in Science Classrooms <i>Kathrin Otrel-Cass, Bronwen Cowie and Elaine Khoo</i>	5
Processing Mathematics Through Digital Technologies: A Reorganisation of Student Thinking? <i>Dr Nigel Calder</i>	21
The Science-for-Life Partnerships: Does Size <i>Really</i> Matter, and can ICT Help? <i>Garry Falloon</i>	35
Beyond Lecture Capture: Student-generated Podcasts in Teacher Education <i>Dianne Forbes</i>	51
Tweeting to Reflect on Teaching Practicum Experiences <i>Noeline Wright</i>	65
Perceptions of the Teaching Practicum Among Human Movement and Health Education Pre-service Teachers in Australia: The Role of University Coursework, University-School Partnerships and E-Learning <i>Jennifer A. O'Dea and Louisa R. Peralta</i>	77
Chinese International Students' Experience of Studying Online in New Zealand <i>Kerry Earl and Yan Cong</i>	93
Strategies for mLearning Integration: Evaluating a Case Study of Staging and Scaffolding mLearning Integration across a Three-Year Bachelor's Degree <i>Thomas Cochrane and Roger Bateman</i>	107
Evaluating an Online Learning Community: Intellectual, Social and Emotional Development and Transformations <i>Elaine Khoo and Michael Forret</i>	123
Issues and Challenges of Using Web Blogs as a Medium for Research Communication <i>Zuwati Hasim, Beverley Bell &amp; Rosemary De Luca</i>	143

### **General Section**

Conflict and Violence in Spanish Schools <i>Maria del Mar Badia Martín</i>	151
---	-----



## Issues and Challenges of Using Web Blogs as a Medium for Research Communication

**Zuwati Hasim**

University of Waikato & University of Malaya

**Rosemary De Luca & Beverley Bell**

Faculty of Education

University of Waikato

### Abstract

The advent of web-based technology has initially allowed millions of users to get hold of immense information and to communicate worldwide. In the field of education, for example, web-based technology has brought about significant influence in terms of teaching and learning approaches (Supyan, 2003; Supyan & Roziana, 2001; Zuwati, 2006). In fact, web-based technology is also now popular as a medium for data collection among researchers (C. Cooper, Cooper, Del Junco, Shipp, Whitworth, & Cooper, 2006; White, Carey, & Dailey, 2000). The purpose of this paper is to report on both issues that need addressing, and challenges in using web blogs as a medium for communicating with respondents for research purposes. The issues and challenges discussed in the paper were based on the researchers' own experience in conducting data collection using a qualitative approach through web blog discussions. With the socio-cultural approach in view, some recommendations are also included as guidelines for those planning to use such web-based technology as a medium of data collection in research.

### Keywords

Computer, internet, online, technology, web-based technology, web blog discussions, issues, challenges, data collection, socio-cultural approach, research

### Introduction

Computer and internet technology has brought about tremendous changes in life and everyday practice. In educational settings, for example, teaching is no longer confined within four walls and obviously has gone far beyond the chalk and talk approach. From



Faculty of Education, University of Waikato, Hamilton, New Zealand

ISSN: 1173-6135

(pp. 143-150)

blackboard teaching we have now moved to using the SMART board, the interactive whiteboard, online teaching and interacting. In keeping up-to-date, teachers or educators are not only required to master or become well versed in their teaching methods and content areas but also “to learn how to make the most effective instructional use of new technologies” (Lawless & Pellegrino, 2007, p. 575). This has somehow shown the technological effect on pedagogy. Another obvious influence of computer and internet technology in teaching is the medium for interaction or communication. Teacher-student and student-student interactions and communication have further extended outside the classroom setting. Moving from educational settings, apparently these technological advances have also triggered and promoted the use of computer and internet technologies for research purposes (Kanzaki, Makimoto, Takemura, & Ashida, 2004). The use of the internet for data collection is quite popular, especially for quantitative research. According to Lefever, Dal, and Matthiasdottir (2007), “online data collection in academic research might be replacing paper-and-pencil surveys or questionnaires in the near future” (p. 574). Online data collection is used widely in quantitative research (Tilghman & Johnson, 2006), while according to Kanzaki et al. (2004), “the use of internet for qualitative research is limited” (p. 229). Nonetheless, the use of online data collection for qualitative data is gradually becoming prevalent, as we could find more researchers have started using online or web-based technology as a tool for their research data collection.

Recently we notice that more researchers, who conduct qualitative research, integrate internet technology in their research design. Horvarth, Beadnell, and Bowen (2007), in their research on sexual behaviours among individuals at risk for HIV, for instance, have included the use of web diaries as part of their data collection method and found that “web diaries appear to be a promising tool for collecting information on health behaviors” (p. 537). Interviews, which are normally conducted face-to-face, can now be done virtually in a one-to-one approach or a focus group. Apparently, more and more researchers have now started to make full use of computer and internet technologies by means of which both quantitative and qualitative data are collected.

In this paper, we discuss the use of online technology, specifically the use of web blogs, as a tool for qualitative data collection.

### **Web blogs: An overview**

A web blog, usually known as a “blog”, is a website that allows individuals to create and log journal entries or experiences which can be shared by anyone the writer gives access to. According to August (2005), blogs are “essentially online diaries with dated entries, displayed in reverse chronological order on a simple website” (p. 25). A blog is also claimed to be a “collaborative space” for the worldwide community. The most common free blog websites are Wordpress, Thoughts.com and Blogger.

Wordpress, Thoughts.com and Blogger provide a free platform for individuals to create their own blog site with several useful features. Among the features are

- providing ready-made templates which can be useful for beginners to start setting-up their blog;
- allowing writers to manage access control, which enables them to control and select their readers—with this feature, writers are able to determine or invite their prospective readers;

- providing a column where readers could share their thoughts or comments on the related issues posted on the blog;
- allowing writers to modify the ready-made template by changing the colours, inserting pictures or photos, changing the fonts and the font sizes;
- allowing writers to immediately send email to their selected readers or other bloggers about their new posts; and
- allowing writers to actually send their posts to their blog via email or via their mobiles.

With these features, the web blog has served more than a social communication between writers and the readers. It has also succeeded as a useful tool for qualitative data gathering (Atkins, 2009). Due to the technological advancements, web blog technology is said to offer a number of potentials for qualitative researchers (August, 2005). In fact, with the opportunity to restrict access, where content can only be viewed by nominated participants, web blogs are surely a feasible tool for data collection, especially for qualitative researchers.

### **Web blogs as a tool for qualitative data collection: Research background**

This research involved two Malaysian English as Second Language (ESL) educators and 48 of their writing students. We conducted our research to explore the educators' perspectives on the use of formative assessment in enhancing ESL undergraduates' communicative writing competency at the tertiary level in a higher-learning institution in Malaysia. We carried out the study in two tiers whereby the first tier explored current practices and perspectives on the ESL writing assessment. Related issues arising from reviewing the current practices were identified and this led to the second tier of the study whereby alternatives were constructed and designed as a collaboratively developed intervention. This second tier of the study involved action research that focused on the implementation, evaluation, and modification (Cohen, Manion, & Morrison, 2007) of the collaboratively developed intervention. This research is a collaborative action research project between the researchers and two selected ESL educators who are teaching writing to ESL undergraduates. Collaborative action research project is the term used when a researcher conducts an action research project with individual teachers, a small group of teachers, or schoolwide (Gordon, 2008). Gordon (2008) indicates that collaborative action research "can empower educators, transform school cultures, and most importantly, dramatically improves student learning" (p. 1). Hence, a collaborative action research approach was adopted due to the fact that it encourages the sharing of problems and ideas between researchers and educators.

What we are going to share in this paper is our experience of the first tier of the study, which involved qualitative data collection via a web blog. At this level, data were collected in the form of interviews with two selected ESL educators and document analysis. We selected a web blog as the platform to conduct our interviews for several reasons, the main reason being that researchers and research participants were geographically divided: the researchers were in New Zealand, whereas the two selected educators (E1 and E2) were in Malaysia. In addition, we believed that by using the web blog we could promote flexibility in the discussion and accommodate the participants' time and space. We also decided to conduct the interviews with E1 and E2 on a web

blog believing that the discussions would be more informal, which could reduce any anxiety while at the same time encouraging us to discuss and share related ideas freely (Pena-Shaff, Altman, & Stephenson, 2005). Another reason for choosing the web blog medium for discussions and interviews was to develop flexible collaborative work in which each of us could respond, view and reflect on the ideas given by everyone involved in the interview sessions and discussions at any time. In the field of teaching, the use of web blogs is acknowledged as a tool for facilitating learning and discussions (Betts & Glogoff, 2004) and has been shown to increase interactivity and exchange of information (Williams & Jacob, 2004). Hence, blogs are seen as an advantage that can be expanded from teaching and learning contexts towards research development and processes.

The researchers monitored the web blogs (one for each participant) and the ESL educator participants were made aware that they needed to log into the discussions at least once a day. In protecting the participants' anonymity, the blog was made available only to the researchers and E1 and E2. For the purpose of this research, two web blogs were created, one for E1 and the other for E2, so as to ensure that the responses given by E1 were not influenced by E2's responses, and vice versa. These blogs were also set for invited readers, which meant only the researchers could determine who could view the blog and who would be invited to join the blog.

### **Advantages of using web blogs for qualitative research**

Qualitative data collection through web blog is relatively new and is little explored among educational researchers as opposed to online surveys. We found that web blogs were convenient and practical to use as a medium for qualitative data collection. Availability of more than one free web blog platform meant we had the ability to choose which worked best, at the same time saving the costs of travelling and printing. Web blogs as an online qualitative research tool offer several advantages like many other online technologies such as email and web-based surveys. They are practical and offer flexibility in qualitative data gathering.

Balden and Wittman (2009) point to two of the common advantages of online qualitative data collection. First is the ability to connect with respondents from different geographical areas, which reduces the need to travel, and second is the ability to make respondents more at ease, as the environment is less intimidating. We agree with this claim as we found that the respondents were very comfortable and open in discussing the relevant topics through the web blog. We also found that interviews on the web blog created an informal setting, thus reducing the level of anxiety and allowing respondents to write their thoughts and responses freely. Joinson (2001) also claims that the use of computer-mediated communication preserves the respondent's anonymity. As such, "interviewees feel less inhibited in a more anonymous virtual environment" (Evans, Elford, & Wiggins, 2008, p. 320).

Another advantage of web blogs is that they allow flexible, collaborative work between researchers and participants; the technology allows us to view, reflect, and respond at any time and duration since communication was done asynchronously. Web blogs also provided flexibility for respondents so the discussions could accommodate their time and space; participants could answer the interview questions whenever they were ready.

In relation to cultural differences, using a web blog as a medium for data collection minimises the issue of improper or culturally inappropriate gestures being used. This helped reduce the anxiety and self-conscious feelings of both the researchers and the participants. Presenting appropriate behaviour to accommodate different cultural perspectives can be quite significant when we are dealing with respondents from diverse cultures.

### **Issues and challenges in using web blog**

The blog was fully developed on 2nd April 2008 and made accessible to E1 and E2 after consents were received by all required parties. As such, it was launched on Wednesday 7th May 2008, when we finally received consent from the Vice-Chancellor of the institution. Despite the advantages outlined above, there are some challenges and issues that are worth addressing.

First is the participants' technology literacy background. We experienced a delay in response from E1 and E2 because they were not sure of how to go into the blog even though a website address was given to each respondent. They seemed unfamiliar with the medium. We responded immediately with a guideline of how to join and access the web blog. As happens often in other research, sometimes what we planned did not turn out as it was supposed to. Two weeks after the blog was launched, E1 requested she be withdrawn from the research. Being inexperienced in the computer skills was the main reason for her withdrawal.

Since we were left with only E2 as our participant, we then had to search for another educator who would willingly participate in our research. With the help of the head of the department, we managed to find one and continued to identify her as E1. Having given her the information and the consent form, we then registered her name and invited her to join the web blog. As part of our selection process, we made sure that the new participant had the necessary computer and internet skills. Having to find and recruit another participant had taken a week of the allotted time for the interview session, not to mention that the participants had already taken two weeks to get into the blog. Unfamiliarity with the web blog technology delayed the interviewees' response to the web blog discussions. We, therefore, in relation to computer literacy and familiarity, have identified "time" as another issue.

A further issue that needs to be pointed out is "internet accessibility". We found this was also a factor that delayed responses and communication between the respondents and us. Our respondents had limited access to the internet as they could only access the web blog when they were at their workplace. Not only that, the quality of the internet connection also links to this internetaccessibility issue, whereby narrow bandwidth of internet connection reduces and disrupts the flow of communication. There were times where we had to wait a few days for the participants to respond due to the internet connection problem.

Kollock and Smith (1996) pointed out that one weakness of using web blogs or online interview collection is the absence of facial expressions and aural cues. In some studies, the importance of facial expressions and aural cues are quite major. However, our research required us to gather background and detailed information on how writing is taught and how assessment is exercised. Hence, facial expressions and aural cues were not significant. What was important was the content, as we were not investigating

communication strategies, and the questions that we put on the blog were direct questions. For example, we asked questions like "how are assessment *for* and *of* learning viewed?", "what do you think of your students' writing ability?", "have you used any of the assessment results or information for planning towards your teaching?" and "how do you use the assessment information in your planning for teaching?".

### **Recommendations**

In using a web blog as a research communication tool, particularly to conduct interviews, we would like to suggest, based on our experience, that proper monitoring procedures are required to ensure that data collection could be completed within the timeframe set. On top of this, researchers should also consider their participants' backgrounds. This will help them in dealing with the socio-cultural issues, such as how to address each participant, what is the best way to ask questions and how to give prompts and reminders, so as to avoid being impolite. Also, to ensure anonymity, researchers should instruct participants to use pseudonyms and use a special email address just for blogging purposes. In using web blogs to conduct interviews, researchers also need to allow ample time for participants to respond to each question posted. This is to accommodate the time difference (if the respondents are geographically diverse) and to allow them to think and reflect on the addressed issues or topics.

Deciding on and rationalising how many questions at a time to post on the web blog are also important and should be looked into. In our research, we decided earlier to post one question at a time. Since we had five main questions and more than 10 sub-questions for each main interview question, we felt that it would be appropriate to ask a question at a time to prevent the respondents from being confused and demotivated to participate. Generally, researchers need to strategise the procedures in the way that suits their research and purpose.

In dealing with the issue of computer literacy, perhaps it would be good for a researcher to set certain criteria for selecting participants. If possible, researchers should provide step-by-step guidelines and procedures to the respondents on how to participate in the web blog discussions or interviews. As well as participants' computer literacy, researchers also need to confirm that there is internet facility available to our prospective participants.

### **Conclusion**

Web blogs are a potential tool for qualitative data collection. They have been used widely in clinical and medical fields of research and are becoming popular in the social sciences as well. Just like many other data collection techniques, web blogs provide several advantages and challenges. However, depending on the research purpose and procedures, we believe that web blogs could assist in qualitative data collection, as they provide researchers with the opportunity to be flexible and at the same time create positive environments for research participants.

## References

- Atkins, D. (2009). Harnessing the power of blogs for qualitative research. *QRCA Views*. Retrieved from www.qrca.org
- August, S. (2005). Rethinking blogs as a qualitative research tool. *QRCA Views*. Retrieved from www.qrca.org
- Balden, W., & Wittman, S. (2009). *Using online qualitative research methods to your advantage*. Fenton, MO: Maritz Research.
- Betts, D. J., & Glogoff, S. J. (2004). Instructional models for using weblogs in elearning: A case study from a virtual and hybrid course. *Syllabus*. Retrieved from download.101com.com/syllabus/conf/summer2004/PDFs/w01.pdf
- Cohen, L., Manion, L., & Morrison, K. (2007). *Research methods in education*. London, England: Routledge.
- Cooper, C. J., Cooper, S. P., Del Junco, D. J., Shipp, E. M., Whitworth, R., & Cooper, S. R. (2006). Web-based data collection: Detailed methods of a questionnaire and data gathering tool. *Epidemiologic Perspectives & Innovations*, 3(1), 1–11.
- Evans, A., Elford, J., & Wiggins, D. (2008). Using the internet for qualitative research. In C. W. W. Stainton-Rogers (Ed.), *The Sage handbook of qualitative research in psychology*. London, England: SagePublishers.
- Gordon, S. P. (2008). The power of collaborative action research. In S. P. Gordon (Ed.), *Collaborative action research: Developing professional learning communities* (pp. 1-14). London, England: Teachers College Press.
- Horvarth, K. J., Beadnell, B., & Bowen, A. M. (2007). A daily web diary of the sexual experiences of men who have sex with men: Comparisons with a retrospective recall survey. *AIDS and Behavior*, 11(4), 537–548.
- Joinson, A. N. (2001). Knowing me, knowing you: Reciprocal self-disclosure in internet-based surveys. *Cyber Psychology & Behavior*, 4(5), 587–591.
- Kanzaki, H., Makimoto, K., Takemura, T., & Ashida, N. (2004). Development of web-based qualitative and quantitative data collection systems: Study on daily symptoms and coping strategies among Japanese rheumatoid arthritis patients. *Nursing and Health Sciences*, 6(3), 229–236.
- Kollock, P., & Smith, M. (1996). Managing the virtual commons: Cooperation and conflict in computer communities. In S. Herring (Ed.), *Computer-mediated communication: Linguistic, social and cross-cultural perspectives*. Amsterdam, The Netherlands: John Benjamins.
- Lawless, K. A., & Pellegrino, J. W. (2007). Professional development in integrating technology into teaching and learning: Knowns, unknowns, and ways to pursue better questions and answers. *Review of Educational Research*, 17(4), 575–614.
- Lefever, S., Dal, M., & Matthiasdottir, A. (2007). Online data collection in academic research: advantages and limitations. *British Journal of Educational Technology*, 38(4), 574–582.
- Pena-Shaff, J., Altman, W., & Stephenson, H. (2005). Asynchronous online discussions as a tool for learning: Students' attitudes, expectations, and perceptions. *Journal of Interactive Learning Research*, 16(4), 409–430.
- Supyan, H. (2003, August). *Pengaturcaraan untuk Guru Bahasa Inggeris: Pembangunan Bahan Pembelajaran Berbantuan Komputer Berasaskan Web*. Paper presented at Atur'03 Workshop: Teaching and Learning Programming in Malaysia, Cyberview Lodge Resort, Cyberjaya, Malaysia.

- Supyan, H., & Roziana, R. (2001, May). *CALL for borderless classrooms*. Paper presented at International Association of Language Learning Technology Seminar: Exploring New Directions in Language Learning Technology, Houston, TX.
- Tilghman, C. J. T., & Johnson, R. (2006). Integration of technology in a clinical research setting. *The ABNF Journal*, 17(3), 112–114.
- White, A., Carey, L. M., & Dailey, K. A. (2000, April). *Improving web-based survey research data collection*. Paper presented at the Annual Meeting of the American Educational Research Association, New Orleans, LO.
- Williams, J. B., & Jacobs, J. (2004). Exploring the use of blogs as learning spaces in the higher education sector. *Australasian Journal of Educational Technology*, 20(2), 232–247.
- Zuwati, H. (2006). Open and distance learning: The effectiveness of online discussion forums in promoting the use of English for communication. *AsiaCall Online Journal*, 1(1), 22–33.

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/262401330>

# Social networking for web-based communities

Article in International Journal of Web Based Communities · January 2013

DOI: 10.1504/IJWBC.2013.051292

---

CITATIONS  
20

READS  
3,541

---

2 authors:



Tomayess B.T. Issa

Curtin University

159 PUBLICATIONS 544 CITATIONS

[SEE PROFILE](#)



Piet Kimmers

University of Twente

516 PUBLICATIONS 2,771 CITATIONS

[SEE PROFILE](#)

Some of the authors of this publication are also working on these related projects:



Open Government in Europe [View project](#)



IRNet - International Research Network for study and development of new tools and methods for advanced pedagogical science in the field of ICT instruments, e-learning and intercultural competences [View project](#)

## **Social Networking for Web-Based Communities**

---

### **Tomayess Issa**

Curtin University  
GPO Box U1987  
Perth Western Australia 6845

### **Piet Kommers**

University of Twente,  
P.O. Box 217, 7500 AE Enschede, the Netherlands  
E-mail: Kommers@edte.utwente.nl

**Abstract:** In the 21st century a new technology was introduced to facilitate communication, collaboration, and interaction between individuals and businesses. This technology is called Social Networking; this technology is now part of Internet commodities like email, browsing and blogging. From the 20th century until now the Internet has shaped the way organizations, academics and health sectors to interact, communicate, connect, and exchange knowledge around the world. Social Networking can reduce enterprises cost, increase profit, and assist to develop new communication forms between consumers, stakeholders, vendors, suppliers, universities and health departments. However, this technology can create new challenges for education and its governance and management. Social networking is considered a precursor to the new 3D virtual presence that will gradually supplant the telephone and video conferencing and finally even the face-to-face communication. This article examines these opportunities, challenges, and threats of social networking in organization, education and health care sectors.

**Keywords:** Social networking, virtual communities, organization, education and health sectors

**Reference** to this paper should be made as follows: Issa, T., Kommers, P. 'Social Networking for Web-Based Communities', *Int. J. Web Based Communities*, Vol. X, No. Y, pp.000-000.

**Biographical notes:** Dr. Tomayess Issa is a Senior Lecturer, Postgraduate Course Leader and Postgraduate Online Coordinator at Curtin University, Australia. Tomayess has vast experience in Australian tertiary education, teaching HCI and Usability, Social Network, Sustainability and Green IT and Networking. Tomayess completed her doctoral research in Web development and Human Factors, and published several journals and conferences based on her PhD's results and teaching research. Tomayess is a member of an international conference program committee, and she is currently conduct research locally and globally in information systems, HCI, Usability, Internet, Sustainability and Green IT, social network and teaching and learning.

Dr. Piet Kommers is an Associate Professor at the University of Twente. His specialties are advanced learning tools such as concept mapping, virtual reality and mobile learning. His research and teaching stretches from teacher education via the European Joint Research Projects to international projects under the auspices of UNESCO. His recent publications are on learners' preconceptions and representations that express pre-intuitive ideas before the actual learning may start: Cognitive Support for Learning and Imagining the Unknown. He is the Editor of several research journals and organizes conferences in mobile learning, e-society and web-based communities.

---

## **1 Introduction**

Internet has changed human experience in interaction and collaboration, as internet becomes an essential technology for individuals, corporate enterprises and health sectors. These sectors are using this technology to access the required information, education, entertainment, marketing, political, social, sell and buys products and watch television. Besides using the internet, these sectors shifted their attention to other technologies alike social networking. Social networking is a ‘particular consumption of digital media or internet that has little to do with traditional informational media use, using the social networking provides a mechanism for the audience to connect, communicate, and interact with each other and their mutual friends though instant messaging or social networking site’ (Correa et al., 2010, p. 247 - 248). The contribution of social networking is to promote unforeseen benefits and decrease traditional costs like face-to-face meetings and expensive marketing campaigns (Kelin, 2008). However, social networking also introduces new threats like security, privacy, workload, legal conflicts, risking reputation etc.(Harris, 2010 , Amichai-Hamburger and Hayat, 2011, Mitchell et al., 2011, Bryne and Lee, 2011 ). This study seeks to expand the literature review by investigating the relationship between personality and social use and discuss the positive and negative effects of social networking usage on individuals, organizations, and education and health sectors.

## **2 Background**

Social networking has been labelled as the new social mechanism driven by just-in-time communication and the mentality to share. Internet and Social Networking are introduced to the broader public as a potential social revolution. Hansen, Shneiderman & Smith (2011) indicate that social networking technologies have created new numerous platforms of interacting i.e. social networking, text messaging, shared photos, podcasts, streaming videos, wikis, blogs and discussion groups (Hanna et al., 2011). Currently, the world population is seven billion people, while internet users are two billion and greater than one million are social network users. It was noted that Western Europe lags behind in social network penetration, while the markets in Brazil, China and India show the highest awareness and penetration of social networks. This means that > 70% of internet population are using social networking sites for personal and organization usage (Rosenberg, 2011, Internet World Stats, 2011, Wauters, 2011). According to Wauters (2011) social networkers are member of networks on average, in Europe is 1.9, USA 2.1, Australia 1.5, Japan 1.8 Brazil: 3.1, India 3.9, and finally in China is 3.4. These figures indicated that India, China and Brazil have a higher social network penetration compared to USA, Australia, Japan and Europe.

Various types of social networking sites are available on the internet providing facilities to organizations and individuals. These sites are divided into six types: 1) profile-based, which holding information about individuals i.e. profile, pictures, links. 2) Content-based, examples of these services are: Flickr, Shelfari, Youtube.com, last.fm. 3) White label, this service will allow users to form their own mini communities within sites, i.e. PeopleAggregator and Ning. 4) Multi-User Virtual Environments, this service will allow users to interact with others, an example for this service, i.e. SecondLife and WorldofWarcraft. 5) Mobile Social network sites: an example for this service is MySpace and Twitter offer mobile phone versions of their services, sharing information and knowledge between users via their phones. Furthermore under this service there is another platform i.e. MYUBO which allow users to share and view video over mobile networks. 6) Micro-Blogging/Presence updates: Micro-blogging services such as

Twitter and Jaiku allow users to publish a short message publicly or within contact groups. 7) Social search engines: is an important web development which utilizes the popularity of social networking services. An example i.e.: Wink and Spokeo (Medaglia et al., 2009, Digizen.org, n.d).

According to Alexa (2011) the ten global websites for 2011 are: Google; Facebook; YouTube; Yahoo!; Wikipedia; Baidu.com; Blogger.com; Windows Live; Twitter; QQ.com. Malita (2011) added more social networking websites which are offering similar facilities from interaction, collaboration and communication i.e. MySpace; Gather.com (social networking); Second Life (virtual reality); Digg (news sharing); Flickr (Photo Sharing) and Miniclip (game sharing). Recent studies (Buck, 2011, Wauters, 2011) indicate that Facebook and Twitter are considered the main social networking sites in USA, Brazil, Europe, China, India, Japan and Australia (see Table 1). In addition, that more people around the world are using Facebook compared to Twitter that is only used by 16% of the population while the awareness for Twitter is 80% (Wauters, 2011).

Social Networking Usage	USA	Brazil	Europe	China	India	Japan	Australia
Membership	Facebook: 70% Twitter: 20%	Facebook: 59% Twitter: 34%	Facebook: 62% Twitter: 16%	Facebook: 17% MySpace: 14%	Facebook: 77% Twitter: 41%	Facebook: 13% Twitter: 29%	Facebook: 63% Twitter: 12%
Awareness	Facebook: 93% Twitter: 77%	Facebook: 87% Twitter: 76%	Facebook: 96% Twitter: 80%	Facebook: 59% MySpace: 54%	Facebook: 93% Twitter: 90%	Facebook: 74% Twitter: 76%	Facebook: 94% Twitter: 85%
Country's Population	528,720,588	190,732,694	738,523,843	1,341,403,687	1,205,910,000	127,380,000	22,769,704

Table 1 Social Networking Usage – Membership, Awareness, and the Country's population

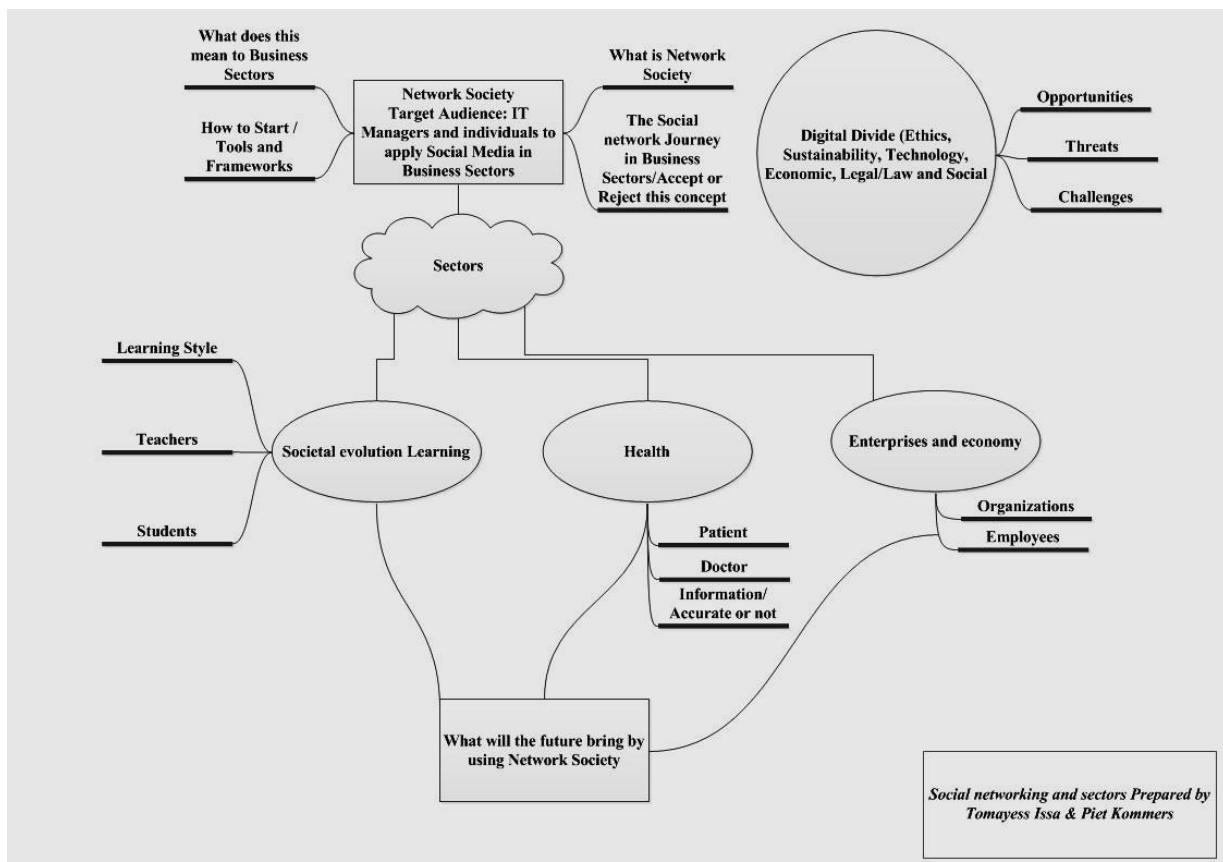
Social networking sites' usage by individuals and organizations has improved from enterprise-wide collaboration, communication and productivity without graphical boundaries (Swensrud, 2011, Lin and Lu, 2011, European Travel Commission, 2011, Kane et al., 2010, Forrester Research, 2010). Besides connecting with others, getting information about new/current products and brands is driving membership of social networks (Wauters, 2011). It was distinguished that social networking sites started to replace the email and other means of online communication to online chatting, and posting the latest information in relation to company's brands and products. Majority of consumers and stakeholders found out using this method is more convenient and efficient compared with the traditional method (Anonymous, 2009, Bennett et al., 2010, Burrus, 2010, Langheinrich and Karjoth, 2010).

Social networking is playing a major role in various sectors from management, marketing, recruiting and screening job application, sharing information and knowledge, disaster recovery, education, and health. For this study, the researchers will examine and investigate the social networking role in the education, organizations and health sectors since social networking usage can develop/enhance communication and collaboration and afford new opportunities for these sectors. Based on the recent trends and its extrapolations it seems as a more realistic characterization to label it as a catalytic role in on-going rather than essential new mechanisms. In other words: it is the speed, rather than the direction that is affected by the coming of social media. Using this technology is evolutionary rather than revolutionary nature may become clear from its shift in speed, scope, scale, and social heterarchy rather than hierarchy. The latter aspect

is the growing awareness that social status and reputation get more and more specific for particular human capacities. Social networking usage in education, business, health and by individuals has defined a variety of ‘networked tools or technologies that emphasize the social aspects of the internet as a channel for communications, collaboration, and creative expression, and is often interchangeable with the terms web 2.0 and social software’ (Dabbagh and Kitsantas, 2011, p.1). Social networking usage offered various services as social networking has speed up on-going trends like globalization, the 24 hours economy, inter rather than intra-personal cognition and the empowerment of brittle stages on group formation and businesses.

Kietzmann et al.(2011) posit that using social networking will create and develop interactive platforms as employers and employees, individuals and communities can share, create, discuss, interact, connect, collaborate in various issues by using this platform. Furthermore, one notable change that has been brought by the social networking website usage is the new wave of informal and user friendly relationship between employers and employees, competitors, suppliers and investors, as this type of relationship will escalation trust and satisfaction between both parties (DiStaso et al., 2011). Sharing the social networking experience with these sectors is easier, faster, effective and more efficient, however, training and implementing will take time, as both employers and employees must provide the necessary service and assistance to their consumers and stakeholders continuously (Dabbagh and Kitsantas, 2011, DiStaso et al., 2011). This study will emphasize how social networking websites is offering unexpected new reaches towards transforming in the traditional fields. However, it was noted that ICT mindedness has already been assimilated in the various application domains and allow these sectors to evolve based on the combined thinking from the both parties, from end and ICT solutions simultaneously (see Figure 1).

Figure 1: Social networking and sectors



### **3 Focus of the Research**

In order to find a stable perspective, the Educational sector will be taken as key focus in this study. Looking from the recent shifts in education it is possible to look to subsequent effects in Health and Corporate Enterprises.

- The transfer from educational evolution to health will be described in terms of new formats for doctor-patient communication; Patients have a much more extensive understanding of medical knowledge and many of them are computer-literate so that they can find alternative approaches on the web. While in the recent past this communication was conceived just for “conveying the message” it is now a decisive stage in the medication plan: Is the patient fully aware of the spectrum of alternative medications and potential types of interventions? What implications can be estimated when certain alternative approaches are chosen? Etc.
- The transfer from educational evolution to Corporate Communication and the benefits from Communities of Practice. Furthermore, a strong impact of changed educational culture on the way work, innovation and learning becomes intertwined. As school promotes youngsters to develop understanding in teams via games and simulation models, it is inevitable that the future employee will manifest as a team player rather than a soloist. This goes together with the growing need for more interdisciplinary approaches in problem solving and design. Communities of Practice (CoPs) as defined by Wenger, White & Smith (2009) are the best description of how this ‘Corporate Learning’ may evolve in the next decades.

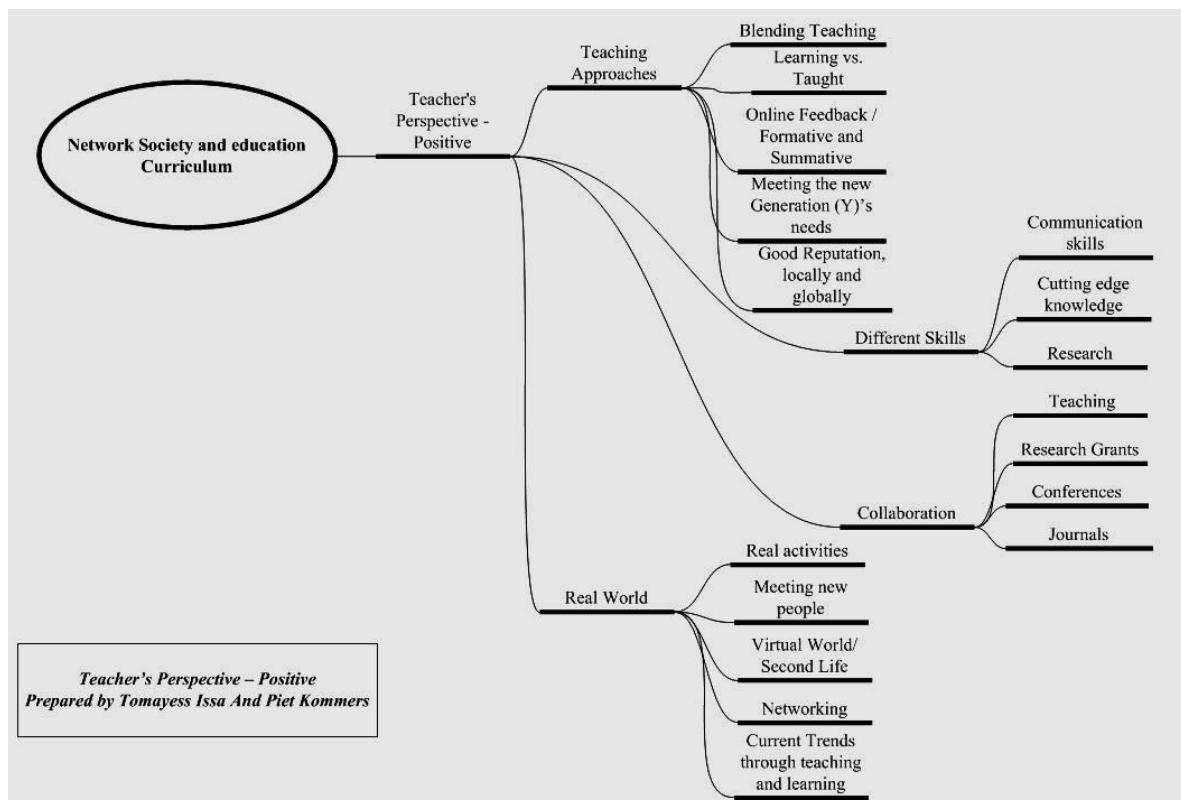
The approach to take the educational sector as prime perspective is not a trivial one; Institutional learning faces the problem of inertia caused by assessment methods from before. The real incentive for education to evolve is the fact that current students are supposed to be competitive in the knowledge economy of tomorrow. Parents and students rapidly understand this new need.

### **4 Discussion**

Under the label ‘Sectors’ the researchers will explore and discuss social networking impacts in the three societal sectors, and identify the opportunities, challenges and threats by adopting this technology in their work. The first sector is Societal Evolution in Education, under this sector; the researchers will discuss it from the perspectives of learning-/teaching style. The second sector is Enterprises and Economy, as the researchers will focus on the aspects of innovation and the effects of Communities of Practice i.e. organizations and employees. The third sector is Health. It will be monitored on the aspects of doctor-patient communication (see Figure 1). From the teacher’s perspective, social networking integration in teaching sector will generate new awareness and acquaintance for both teachers and students: 1) new teaching approaches, 2) gaining new different skills, and 3) collaboration and real world activities will be industrialized. A recent study (Zamorano et al., 2010, Struck et al., 2011) confirm that social networking integration in the teaching pedagogy and curriculum will enhance/develop teaching styles and meeting students’ needs i.e.: 1) using blended teaching to ensure that classes are more interactive and collaborative between students compared with the traditional teaching methods; 2) autonomous learning vs being taught: under this category students will start ‘learning how to learn’ by reading, analysing and synthesising articles, completing some class activities and presenting their finding to their colleagues during the class.

This technology will encourage especially the shy students to participate, engage in the learning process, and move their thinking outside the box. 3) Good reputation will be raised for the teachers who are willing/ using new techniques in their teaching process, and this will attract more students to her/his class. 4) Also new teaching styles will be developed to match the new generation needs, i.e. generation Y. Beside the above, teachers will develop their skills in respect to communication, cutting edge knowledge, research, and sharing the latest knowledge from locally and globally perspectives between her/his students. Furthermore, using social networking will allow for further collaboration between teachers nationally and universally especially to teaching, research grants, conferences, and journals. Finally, a new concept will be available is the real world. Under this concept teachers will utilize the virtual world/second life in their teaching and research to make their teaching more challenging and exciting to her/his students. Finally, Waddington (2011, p.14-15) pose that 'by incorporating social networking into lessons, teachers model and teach their students digital citizenship which is what students need to know to engage in activities on the internet in a constructive, beneficial, and appropriate fashion'.

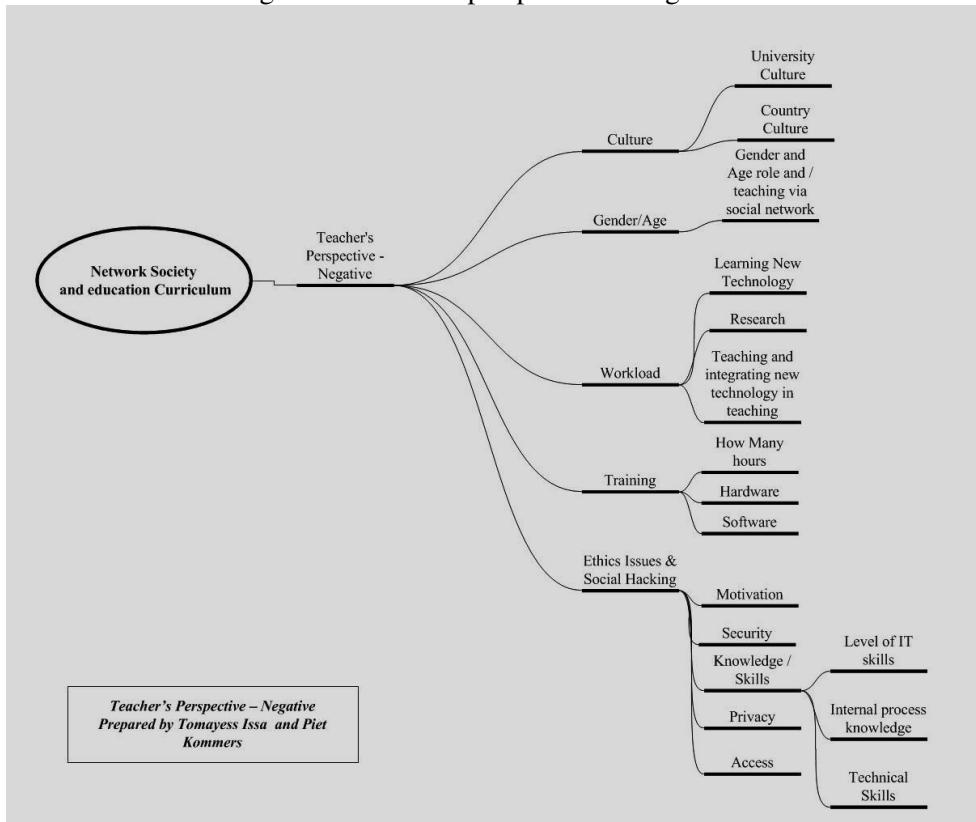
Figure 2: Teacher's Perspective – Positive



On the other hand, adopting social networking in teaching will transform teachers' expectation in the following aspects: 1) Culture; 2) Gender; 3) Workload; 4) Training; 5) Ethics Issues and Social Hacking. Culture aspect will affect the teaching delivery, as specific universities and nations having mix reaction toward social networking integration in their teaching pedagogy and curriculum, as culture can assist or prevent this integration, since some nations are mild toward this integrating in their curriculum for the following aspects: workload, culture and custom aspects, privacy and security (Forrester Research, 2010, Weaver and Morrison, 2008). Both gender and age are playing a major role in social networking teaching delivery, as majority of academics are coming from various generations i.e.: baby boomers, and generations X and Y. Each

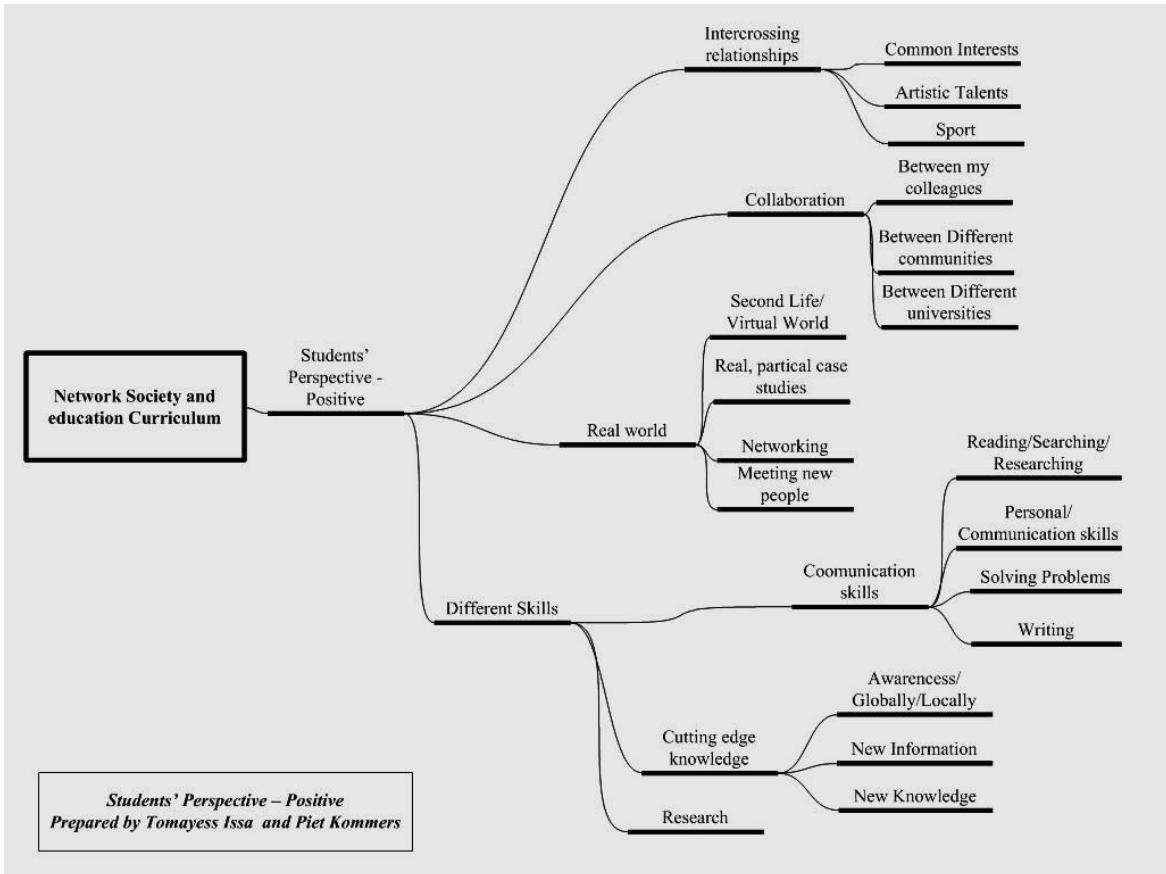
generation has different needs and requirements in respect to training and workload. Therefore, the concerns behind social networking adoption in teaching are unlimited to culture, gender and age, however, workload, training and ethics issues are part of these limitations. A current research (Bennett et al., 2010, Forrester Research, 2010, Langheinrich and Karjoh, 2010) indicate that using social networking in teaching sector will increase teachers' workload from training/learning new concepts about social networking, and new materials must be added to his/her lecture notes and activities to match social networking needs. Furthermore, from Figure 3, working with social networking is unlimited to the workload, ethics and social hacking, there are other aspects need to be consider in relation to motivation, security, privacy, control and access (Hew, 2011).

Figure 3: Teacher's perspective – Negative



From the student's perspective, the literature review (Dabbagh and Kitsantas, 2011, Thompson et al., 2008) confirm that working and learning with social networking will bring new opportunities for students in respect to the cross-sectional relationships, collaboration, real world and learning different skills (see Figure 4). Students will have the authority and chance to select his/her peers based on the study (or work) experience, research interests, artistic, talents, sport and others. Using this technology will develop more collaboration between students not only locally but globally simultaneously. Finally, the social networking will foster students' independent learning, as new skills will cultivate from communication, cutting edge and research. Using these skills rapidly will allow students to develop these skills for the current study and as well as for the real world life. Finally, several studies echoed (Van Deursen et al., 2011, Verdick.org;, 2011, Baams et al., 2011 ) that students will have the chance to meet new people, building new networking, and using the second life for learning purpose or fun.

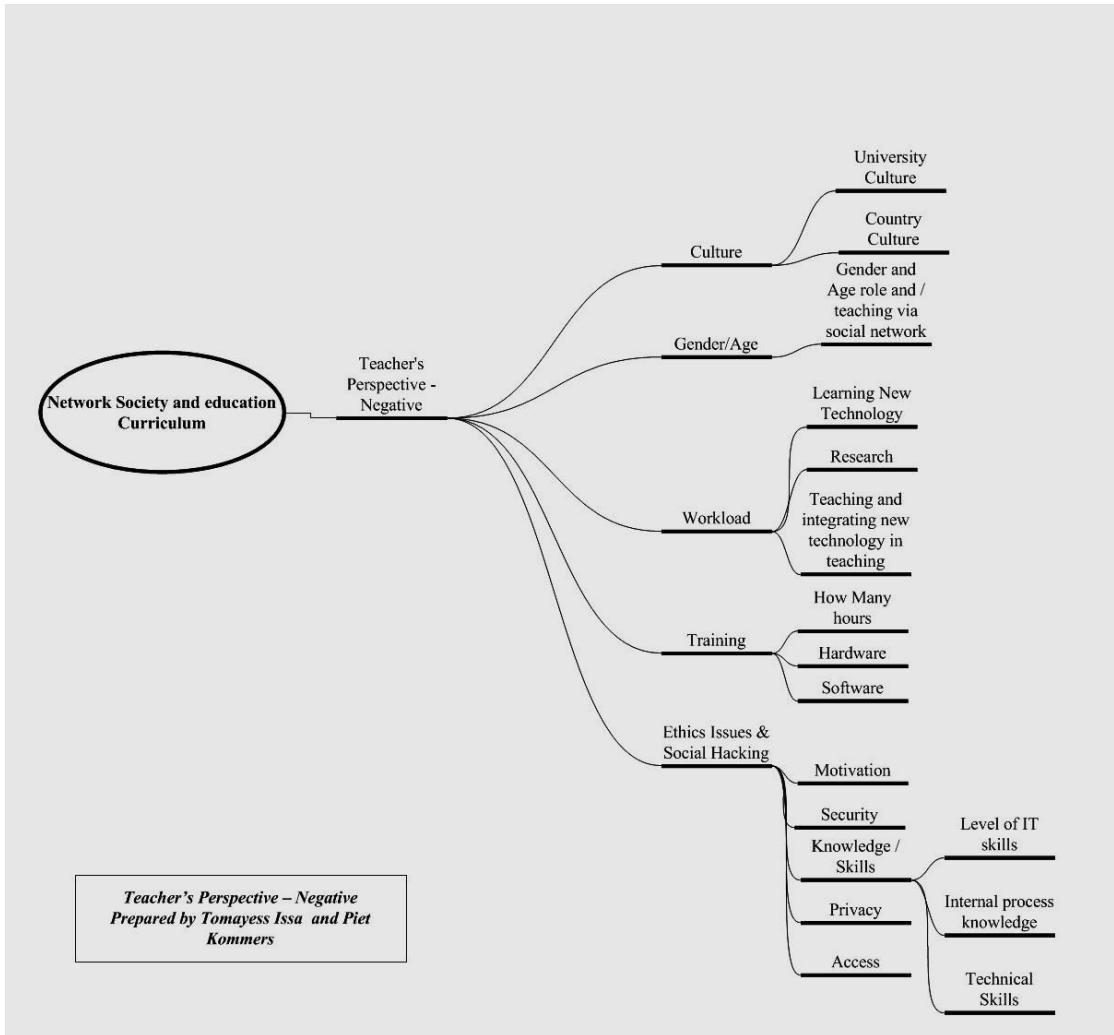
Figure 4: Students' perspective – Positive



However, social networking is unrestricted to the benefits; however, integrating it in the teaching sector will develop new challenges and threats to both students and teachers simultaneously. Kaya (2010) posit that social networking integration in the education will establish peer-student networks prior to students arriving on campus in ways that may not have been previously possible without the affordances of new networking. From the students' perspective, the social networking will affect students ability in learning as majority of them will become lazy, lonely, depress, stress, and lack of concentrating in reading and searching, and face of face contact between friends and family will be dissolved (Carr, 2008, Walther et al., 2010 ). Furthermore, social networking will generate new academic problems for students in relation to reports and essay writing, proofreading and the most significant aspect is grammar. Currently majority of students are depending more and more on the internet facilities to finalize and complete their assessments, and majority of these websites are lacking the writing and grammar standards and this will influence students ability in his/her assessment presentation (see Figure 5).

Several studies (Kearns and Frey, 2010, Lee, 2009 , Shaw and Gant, 2002, Sun, 2011, Mokhtari et al., 2009 ) confirm and posit that these skills are essential not only for the university life but for future life as well. Therefore, incorporation the social networking principles in teaching will enhance these skills not decrease them. However, to achieve this in the university life, a good collaboration must be carried out between teachers and students to address these concerns, and to understand how the integration in curriculum and units will assist students in their university study, workplace in the future, and life in general without harming the writing and grammar standards.

Figure 5: Student's Perspective – Negative

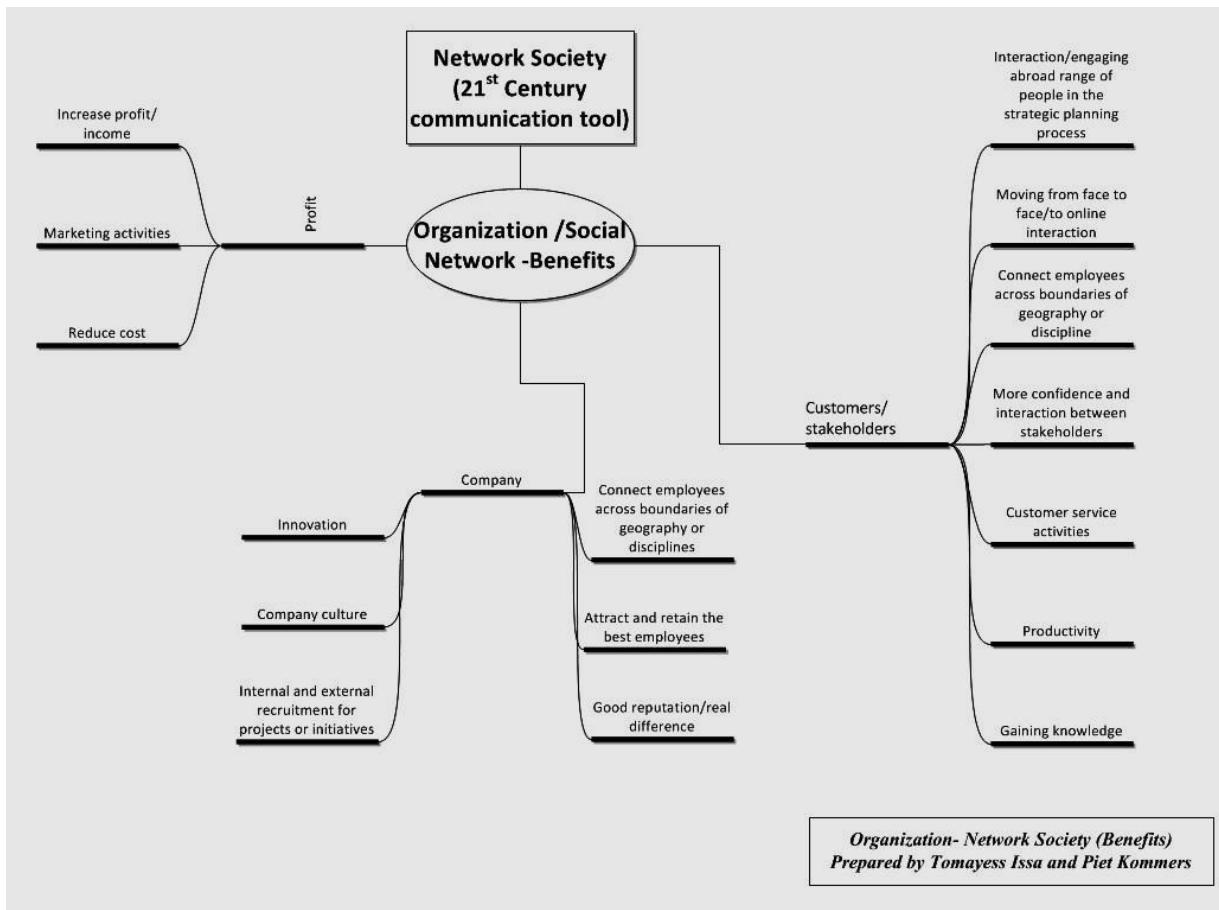


From the organization's perspective, using social networking in the organization sectors will construct new opportunities in organizations nationally and universally, as organizations will become more creative, innovative and ingenious. Beside the above, using social networking in the organizations will allow for more interaction and engagement between customers/stakeholders as it will give them the chance to participate in the strategic planning process and moving their meeting from traditional meeting (face to face) to the new interaction which is online. Beside that more interaction between employees will occur across geographical boundaries, and employees' knowledge and cutting edge will cultivate (see Figure 6). DeAndrea et al.(2011, p.2) indicate that social networking usage enable the 'mass dissemination of messages, reduce the constraints of geographical dispersion and facilitate the record ability of communication'.

Adopting social networking in organizations will develop new culture in the organization, as employers and employees will have the chance to interact internally and externally to exchange ideas and sharing new knowledge and cutting edge with their consumers/ stakeholders regarding company brands and new knowledge and information. Wauters (2011) indicate that employees are consider as brand ambassadors to share information about their new products or services and announce company events. Several studies (Verhoeven et al., 2011, Swensrud, 2011, Rosenberg, 2011, Malita, 2011, Lin and Lu, 2011, Wauters, 2011) indicate that positive brand experiences by social networking campaign will have highest impact on brand perception and buying intention.

Using the social networking in organizations, employees will become more innovative and creative, while organizations will build an excellent prestigious reputation constructed on their achievements and successes. Moreover, social networking integrating in organizations strategy will attract and retain best employees to work, and preserve internal and external recruitment for projects or initiatives which will be available based on their request.

Figure 6: Organization social network – Benefits

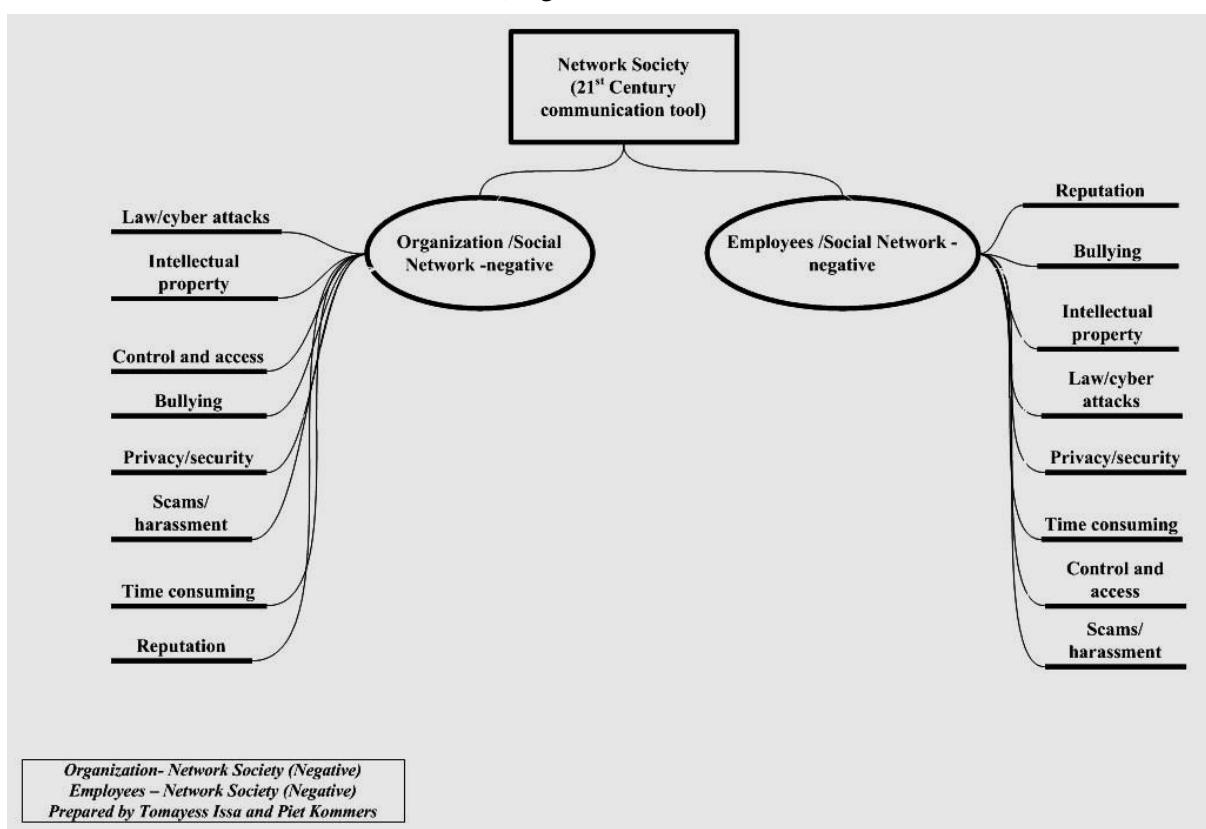


Additionally, consumers and stakeholders are playing a major role in the social networking present in the organization. From the organizations' perspective, there are various concepts behind social networking usage in the organization sector which are: interaction, customers' service activities, and productivity. This technology will assist to develop informal interaction, communication and collaboration between organization and consumers, as employees will start to share organization brands and the latest information and knowledge with their consumers. For example, the interaction between organizations, employees and consumers will encourage them to involve more in the organizations' strategies especially the marketing perspective. Wauters (2011) indicate that consumers would like to be more involved in the marketing, creating, innovating of organizations' brands and the most concept to start conversations. Currently, organizations' brands are available on social networking, and this will encourage consumers to try them by using various platforms i.e.: recommendation from friend, invitation by network contact, search engine, advertising on social networking, online advertising, buying intention, and traditional advertisements. Sharing the positive and negative brand experiences on social networking by consumers will invite more consumers to purchase/reject these information/products, companies or brands since consumers trust each other most (Bennett et al., 2010, Forrester Resarch, 2010, Langheinrich and Karjoth, 2010, Lester and Perini, 2010, Lin and Lu, 2011, Wauters, 2011, Hanna et al., 2011). Currently,

there is a shift for using different devices i.e. mobile devices to reach consumers in line to introduce/ selling organizations' brands especially in China and India. Social networking sites can be easily through these devices especially smartphones usage. .

On the other hand, using social networking will create new challenges and threats to organizations and their employees as both are sharing the same concerns in relation to social networking integrating in the workplace. Social networking will create experiments and challenges to organizations and employees in relation to privacy/security, scams/harassment, intellectual property, control and access, law/cyber-attacks, time consuming, and bullying. These negative aspects have a huge influence and risk on both organisations and employees from reputation, culture, vision and mission. A recent research (Bennett et al., 2010, Forrester Resarch, 2010, Langheinrich and Karjoth, 2010, Dwyer and Hiltz, 2007 )confirm that using social networking can benefit organizations and their employees, but in some situation can quickly destroy company reputation that took years to build and can lead to risks in productivity and legal obligation (see Figure 7). To prevent these intimidations and threats organizations should develop/adopt a set of guidelines to match their needs or using the guidelines which are mainly focusing on these concerns.

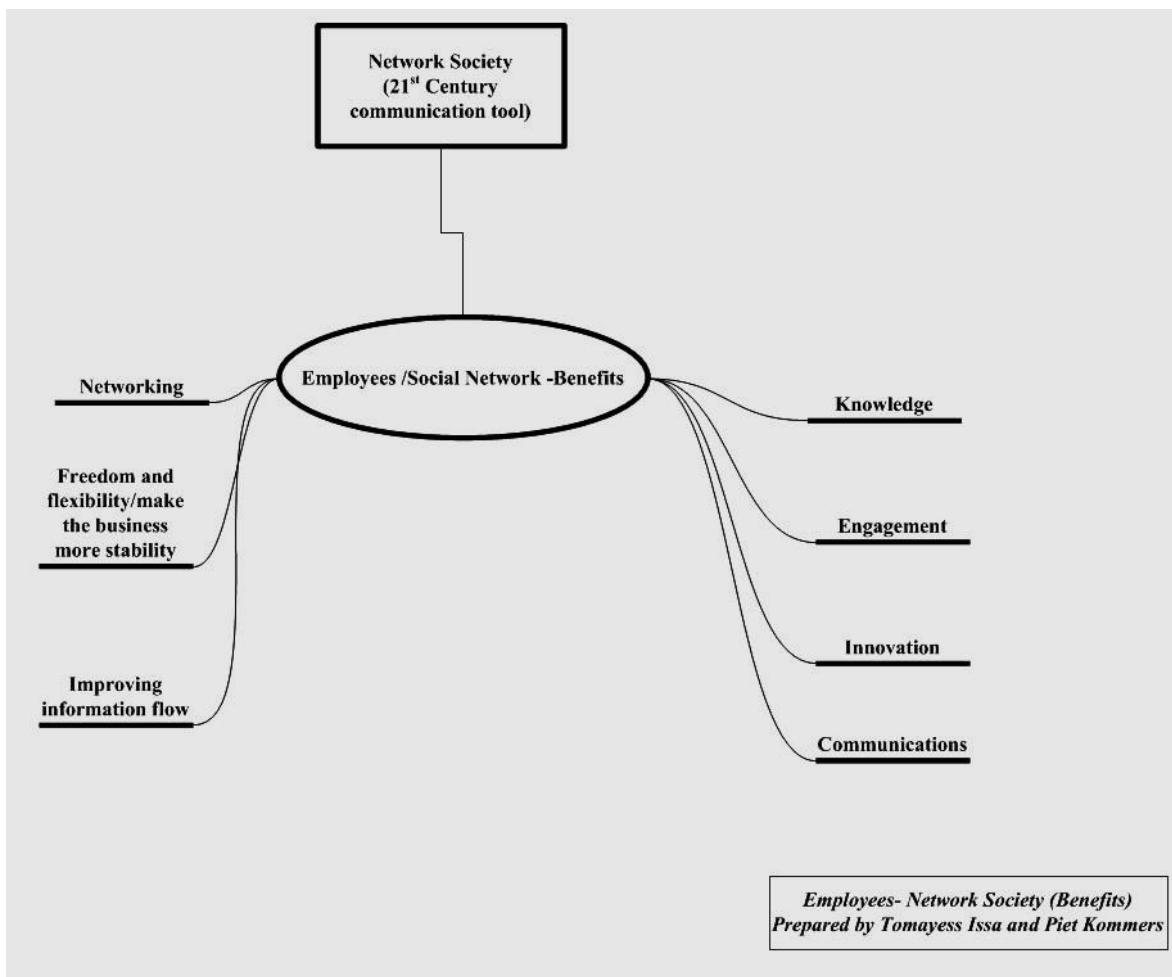
Figure 7: Organization - Social Network and Employees- Social Network (Negative)



Several studies (Fitzpatrick, 2010, Kaplan and Haenlein, 2010, Landman et al., 2010, McKenna, 2010) provide several guidelines and instructions for organizations and individuals for implementing social networking sites. These guidelines mainly focus in respect to legal risks, security, privacy and reputation. Therefore, organizations, management and employees should consider these guidelines, or policies before the implementation. On the other hand, new guidelines should be implemented or developed to match organizations and employees' requirements and needs.

From the employee's perspective, it was noted integration social networking in the work sector (see Figure 8) will allow employees to obtain/develop new: skills, communications, networking, and becoming more innovative and productive in their work. Beside the above, social networking will bring freedom and flexibility in the organization which driven it to be more immovability and stability (Arevalo, 2010, Thakurta, 2010, Curtis et al., 2010 , DiStaso et al., 2011).

Figure 8 Employees - Social Network Benefits



The final sector to be discussed in this study is the health sector; the researchers examined and investigated how social networking sites can assist the health sector for the education intention. The integration between social networking sites and e-health is emerging as an important platform of communication, collaboration and the most important aspect is education health information (Hanson et al., 2011, Kontos et al., 2010 ). With the same indication Lefebvre (2007) indicate that social networking is not a new way to 'reach' people – it is an 'attract and join' space'. Previously, users need to interact and communicate with others via several platforms from telephone, face to face, or traditional methods to obtain their needs (Kommers, 2011 ). However, currently the situation is different as users can interact and acquire the information via the Internet or social networking sites by asking their friends or internet users regarding his/her needs. Majority of users confirmed that using this method is more convenient and easier compared with the traditional methods; however vast challenges and threats from security, privacy, and cognitive, social and physical developments will be occurred by using this method.

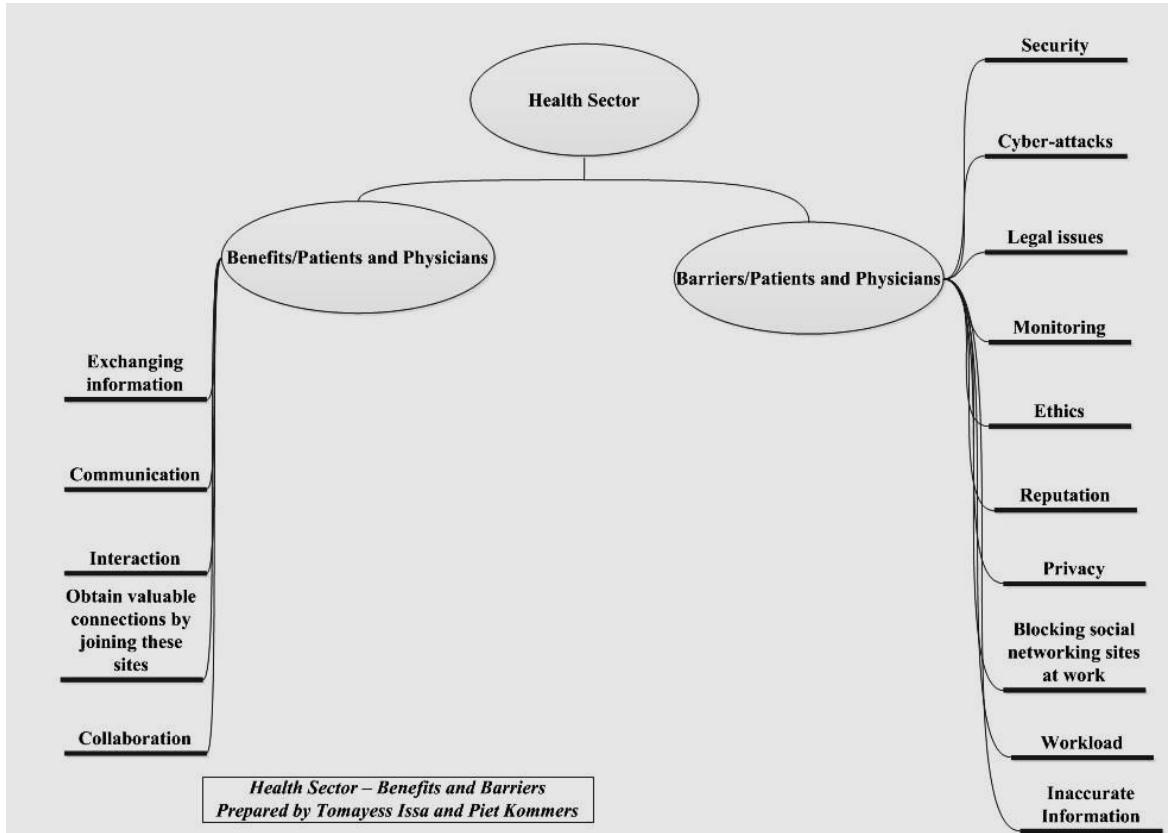
From the health sector, it was noted that 60% of physicians already use/interested in using physician communities, while the rest are unconcern/uninterested of using the social networking to interact and connect with their patients (iHealthBeat, 2009). Moreover, under the social networking sites especially Twitter, there are 140 health care. These health care locations are mainly focus on specific issues, from risk management communication, augmenting telemedicine, exercise management and encouragement, weight management and support and others. These locations aims to share/interact the latest knowledge and cutting edge with their patients (Baumann, 2009 ). With the same demonstration Boulos and Wheelert, (2007) designate that social networking can manage online information and knowledge repositories including medical and health information and the most important aspect will allow physicians and patients to access these records in line to exchange, communicate, collaborate information between physicians and their patients. There are various social networking sites which are mainly focus on health i.e. Medicine Group, Doc2Doc, DocCheck Faces; DoctorNetworking; DoctorsHangout, Healtheva and others (Medicalicious, 2009 ). These websites aimed to ease doctors, surgeons, specialists nurses and students their career load, enhance their knowledge, secure cutting edge knowledge, and to obtain valuable connections by joining these websites.

Currently there are a large number of patients and physicians are using the social networking sites for exchanging ideas and health information and resources. This type of relationship can develop a positive relationship between patients and physicians in relation to trust, confidence and virtual support. However, according to Cullen (2010) patients without internet access may become relatively more disadvantaged in relation to health matters, and there is some evidence that this may be occurring.

This technology is providing an enormous benefits to the health sector as patients can interact and exchange information with their physicians without any graphical boundaries, and this interaction will allow patients to earn new/update their knowledge in respect to the health issues. A recent study by Hanson et al. (2011) confirm that using social networking usage in the health sector will have a significant benefit on patients, physicians, and students to obtain cutting edge knowledge and building excellent interaction and collaboration between themselves.

However, patients, physicians, surgeons, specialists nurses and students must consider the barriers, challenges and threats behind using social networking sites from ethics, security, privacy, cyber-attacks, reputation, legal issues and physicians' workload (Keenan, 2009 , Bennett et al., 2010, Forrester Research, 2010, Lester and Perini, 2010, Lin and Lu, 2011, Swensrud, 2011, Hanson et al., 2011). Hanson et al.(2011, p.201) add another challenge of social networking usage in the health sector 'employers monitoring or blocking social networking sites at work, difficulty of use of social networking especially among older health educator, and the lack of belief that using social networking technologies would enhance job performance'. These barriers are essential in the health sector and these barriers should be considered by the health sector before the social networking implementation (see Figure 9).

Figure 9 Health Sector – Social Networking Benefits and Barriers



Therefore to solve these challenges and threats in the health sector, a set of guidelines should be developed for appropriate online behaviour for employees and patients for preventing these problems especially the legal problems, and posting an inaccurate information under these sites including blogs and other platforms.

### Conclusion

This article discussed and investigated the social networking usage from three perspectives: organization, academics and health sectors. Under each sector the researchers discussed each perspective from: teachers, students, employees and organizations, patients and physicians and later the paper discussed the barriers and benefits of each sector by using social networking websites. From the literature review it was noted that social networking started to play a major role in these sectors in respect to the communication, marketing, collaboration, exchange information and gaining cutting edge knowledge and skills. However, social networking can fetch different challenges from training, workload, security, privacy, ethics, reputation, legal issues and cyber-attacks. Therefore, to cope with these challenges and threats a set of guidelines should be developed for appropriate online behaviour. Finally, this study with its empirical evidence raised the alarm to these sectors in relation to the problems and benefits behind social networking usage in their sectors, as responsibility lay first on each individual who is working in these sectors as s/he must think seriously how to tackle down the current problems in their workplace and acquire the rewards of social networking. Further research will be carried out by the researchers to examine and investigate other sectors with different criteria.

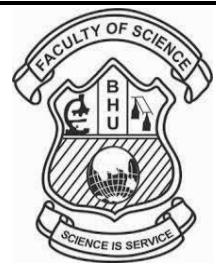
## References

- ALEXA. 2011. *The web Information Company: Alexa Top 500 Global Sites* [Online]. Available: <http://www.alexa.com/topsites/global> [Accessed 12 Nov 2011 ].
- AMICHAI-HAMBURGER, Y. & HAYAT, Z. 2011. The impact of the Internet on the social lives of users: A representative sample from 13 countries. *Computers in Human Behavior*, 27 585 - 589
- ANONYMOUS 2009. Social networking and the workplace Making the most of web 2.0 technologies. *Strategic direction*, 25, 20.
- AREVALO, J. 2010. Critical Reflective Organizations: An Empirical Observation of Global Active Citizenship and Green Politics. *Journal of Business Ethics*, 96, 299-316.
- BAAMS, L., JONAS, K., UTZ, S., BOS, H. & VUURST, L. 2011 Internet use and online social support among same sex attracted individuals of different ages. *Computers in Human Behavior*, Article in Press 1 - 8
- BAUMANN, P. 2009 *140 Health Care uses for Twitter* [Online]. Available: <http://philbaumann.com/2009/01/16/140-health-care-uses-for-twitter/> [Accessed 22 Nov 2011 ].
- BENNETT, J., OWERS, M., PITTS, M. & TUCKER, M. 2010. Workplace impact of social networking *Property Management* 28, 138 - 148.
- BOULOS, M. & WHEELERT, S. 2007. The emerging Web 2.0 social software: an enabling suite of sociable technologies in health and health care education. *Health Information and Libraries Journal*, 24, 2-23.
- BRYNE, S. & LEE, T. 2011 Toward Predicting Youth Resistance to Internet Risk Prevention Strategies. *Journal of Broadcasting & Electronic Media*, 55, 90 - 113
- BUCK, S. 2011. *How the World Uses Social Networks [INFOGRAPHIC]* [Online]. Available: <http://mashable.com/2011/09/23/world-social-networks-infographic/> [Accessed 22 Nov 2011 ].
- BURRUS, D. 2010. Social Networks in the Workplace: The Risk and Opportunity of Business. *Strategy and Leadership*, 38, 50-53.
- CARR, N. 2008. Is Google Making Us Stupid? *The Atlantic Monthly*.
- CORREA, T., HINSLY, A. & GIL DE ZUNIGA, H. 2010. Who Interacts on the Web?: The Intersection of Users' Personality and Social Media Use *Computers in Human Behavior* 26, 247 - 253.
- CULLEN, K. 2010. Health - Work Research Centre (Study on the Social Impact of ICT) - Topic Report 3 (D7.2) In: UNIVERSITÄT SIEGEN, F. W. U. N. M. & GERMANY (eds.).
- CURTIS, L., EDWARDS, C., FRASER, K., GUDELSKY, S., HOLMQUIST, J., THORNTON, K. & SWEETSER, K. 2010 Adoption of Social Media for Public Relations by NonProfit Organizations. *Public Relations Review* 36, 90 - 92.
- DABBAGH, N. & KITSANTAS, A. 2011. Personal Learning Environments, social media, and self-regulated learning: A natural Formula for connecting formal and informal learning *Internet and Higher Education*
- DEANDREA, D., ELLISON, N., LAROSE, R., STEINFELD, C. & FIORE, A. 2011. Serious social media: On the use of social media for improving students' adjustment to college *Internet and Higher Education*.
- DIGIZEN.ORG. n.d. *WHAT ARE SOCIAL NETWORKING SERVICES?* [Online]. Available: <http://www.digizen.org/downloads/social-networking-overview.pdf> [Accessed 22 Nov 2011 ].
- DISTASO, M., MCCORKINDALE, T. & WRIGHT, D. 2011. How Public relations executives perceive and measure the impact of social media in their organizations *Public Relations Review*, 37, 325 - 328
- DWYER, C. & HILTZ, S. P., K. Year. Trust and Privacy Concern Within Social Netwrokng Sites: A comparison of Facebook and MySpace In: Thirteenth Americas Conference on Information Systems (AMCIS) 2007 Keystonee, Colorado 1 - 13.
- EUROPEAN TRAVEL COMMISSION. 2011. *Social Networking and UGC* [Online]. Available: <http://www.newmediatrendwatch.com/world-overview/137-social-networking-and-ugc> [Accessed 16 Nov 2011 ].
- FITZPATRICK, A. 2010. *Facebook and social networking – inappropriate use by employees* [Online]. Available: <http://www.gadens.com.au/Publications-View.aspx?documentid=1704#article2> [Accessed 22 Nov 2011 ].
- FORRESTER RESARCH 2010. Social Networking in The Enterprise: Benefits and Inhibitors USA: Forrester Resarch

- HANNA, R., ROHM, A. & CRITTENDEN, V. 2011. We're all connected: The power of the social media ecosystem *Business Horizons*, 54, 265 - 273
- HANSEN, D., SHNEIDERMAN, B. & SMITH, M. 2011. *Analyzing social media networks with NodeXL: Insights from a connected world*, Boston Elsevier
- HANSON, C., WEST, J., NEIGER, B., THACKERAY, R., BARNES, M. & MCINTRYE, E. 2011. Use and Acceptance of Social Media among Health Educators *American Journal of Health Education* 42, 197 - 204.
- HARRIS, J. 2010 *How the internet is altering your mind* [Online]. Available: <http://www.guardian.co.uk/technology/2010/aug/20/internet-altering-your-mind> [Accessed 15 May 2011 ].
- HEW, K. 2011. Reivew: Students' and teachers' use of Facebook. *Computers in Human Behavior*, 27, 662 - 676.
- IHEALTHBEAT. 2009. *How Well are Online Physician Communities Being Received?* [Online]. Available: <http://www.ihealthbeat.org/Data-Points/2009/How-Well-Are-Online-Physician-Communities-Being-Received.aspx> [Accessed 22 Nov 2011 ].
- INTERNET WORLD STATS. 2011. *Internet World Stats* [Online]. Available: <http://www.internetworldstats.com/stats.htm> [Accessed 22 Nov 2011 ].
- KANE, K., ROBINSON, J. & BERGE, Z. 2010. Tapping into social networking Collaborating enhances both knowlege management and e-learning *VINE: The journal of information and knowledge management systems*, 40, 62-70.
- KAPLAN, A. M. & HAENLEIN, M. 2010. Users of the world, unite! The challenges and opportunities of Social Media. *Business Horizons*, 53, 59-68.
- KAYA, T. 2010. *CUNY social network mixes scholarship with Facebookstyle friendship*. [Online]. Chronicle of Higher Education. Available: <http://chronicle.com/blogs/wiredcampus/cuny-social-network-mixes-scholarshipwith-facebook-style-friendship/27266> [Accessed 12 Nov 2011].
- KEARNS, L. & FREY, B. 2010. Web 2.0 Technologies and Back Channel Communication in an Online Learning Community. *TechTrends*, 54, 41 - 54.
- KEENAN, A. 2009 Sociability and Social Interaction on Social Networking Websites *Library Review* 58, 438 - 450
- KELIN, K. 2008. *Are Social Networking Sites Useful for Business?* [Online]. Available: [http://www.businessweek.com/print/smallbiz/content/aug2008/sb2008086\\_346094.htm](http://www.businessweek.com/print/smallbiz/content/aug2008/sb2008086_346094.htm) [Accessed 22 Nov 2011].
- KIETZMANN, J., HERMKENS, K., MCCARTHY, I. & SILVESTRA, B. 2011. Social Media? Get Serious! Understanding the Functional Building Blocks of social Media *Business Horizons*, 54, 241 - 251.
- KOMMERS, P. 2011 Future Developments in E-Simulations for Learning Soft Skills in the Health Professions In: HOLT, D., SEGRAVE, S. & CYBULSKI, J. (eds.) *E-Simulations for Educating the Professions in Blended Learning Environments*. IGI Publisher.
- KONTOS, E., EMMONS, K., PUENO, E. & VISWANATH, K. 2010 Communication Inequalities and Public Health Implications of Adult Social Networking Site Use in the United States. *Journal of Health Communication* 15, 216 - 235.
- LANDMAN, M. P., SHELTON, J., KAUFFMANN, R. M. & DATTILO, J. B. 2010. Guidelines for Maintaining a Professional Compass in the Era of Social Networking. *Journal of Surgical Education*, 67, 381-386.
- LANGHEINRICH, M. & KARJOTH, G. 2010. Social networking and the risk to companies and institutions. *Information Security Technical Report*, 15, 51-56.
- LEE, S. 2009 Online Communication and Adolescent Social Ties: Who benefits more from Internet use? *Journal of Computer-Mediated Communication*, 14, 509 - 531
- LEFEBVRE, R. 2007. Data on the Safety of Health Social Network Sites Available from: [http://socialmarketing.blogs.com/r\\_craig\\_lefebvre\\_social/ehealth/](http://socialmarketing.blogs.com/r_craig_lefebvre_social/ehealth/) [Accessed 22 Nov 2011 ].
- LESTER, J. & PERINI, M. 2010. Potential of Social Networking Sites for Distance Education Student Engagement *Online Education* 150 67 - 77.
- LIN, K. & LU, H. 2011. Why people use social networking sites: An empirical study integrating network externalities and motivation theory. *Computers in Human Behavior*, 27, 1152 - 1161.
- MALITA, L. 2011. Social Media time management tools and tips *Procedia Computer Science* 3, 747 - 753.

- MCKENNA, B. 2010. Social networking: The 'what not to do' guide for organisations. . *InfoSecurity*, 7, 22 - 24.
- MEDAGLIA, R., ROSE, J., NYVANG, T. & SAEBO, O. Year. Characteristics Of Social Networking Services. In: MCIS 2009, 2009 Athens
- MEDICALICIOUS. 2009 *Top 25 Social Networking Sites for Healthcare & Medical Professionals* [Online]. Available: <http://medicallabtechnicianschool.org/2009/top-25-social-networking-sites-for-healthcare-medical-professionals/> [Accessed 22 Nov 2011 ].
- MITCHELL, M., LEBOW, J., URIBE, R., GRATHOUSE, H. & SHOGER, W. 2011. Internet use, happiness, social support and introversion: A more fine grained analysis of person variables and internet activity. *Computers in Human Behavior*, Article in Press 1- 5
- MOKHTARI, K., REICHARD, C. & GARDNER, A. 2009 The Impact of Internet and Television Use on the Reading Habits and Practices of College Students. *Journal of Adolescent & Adult Literacy*, 52, 609 - 619
- ROSENBERG, M. 2011. *Current World Population* [Online]. Available: <http://geography.about.com/od/obtainpopulationdata/a/worldpopulation.htm> [Accessed 22 Nov 2011].
- SHAW, L. H. & GANT, L. M. 2002. In Defense of the Internet: The Relationship between Internet Communication and Depression, Loneliness, Self-Esteem, and Perceived Social Support. *CyberPsychology & Behavior*, 5, 157-171.
- STRUCK, R., HYNASLAHTI, H., LIPPONEN, L., VESTERINEN, O., VHTIVUORI-HANNINEN, S., MYLLARI, J. & TELLA, S. 2011. Podcasts as Learner-Created Content in Higher Education *International Journal of Online Pedagogy and Course Design* 1, 20 - 30
- SUN, S. 2011. The Internet Effects on Students Communication at Zhengzhou Institute of Aeronautical Industry Management *Advances in Computer Science, Environment, Ecoinformatics and Education* 218, 418 - 422.
- SWENSRUD, K. 2011. *Best Practices for Enterprise Social Networking* [Online]. Available: <http://thenextweb.com/socialmedia/2011/04/18/best-practices-for-enterprise-social-networking/> [Accessed 16 Nov 2011].
- THAKURTA, R. 2010. Management of Requirement Volatility - A Study of Organizational Competency and How it is influenced by the Project Environment *Journal of Information Technology Management XXI*, 24 - 34
- THOMPSON, L., DAWSON, K., FERDIG, R., BLACK, E., BOYER, J., COUTTS, J. & PARADISE, N. 2008. The Intersection of Online Social Networking with Medical Professionalism *Journal of General Internal Medicine* 23, 954 - 957.
- VAN DEURSEN, A. J. A. M., VAN DIJK, J. A. G. M. & PETERS, O. 2011. Rethinking Internet skills: The contribution of gender, age, education, Internet experience, and hours online to medium- and content-related Internet skills. *Poetics*, 125 - 144.
- VERDICK.ORG;. 2011. *Positive Effects of Internet Usage on Child Development* [Online]. Available: <http://www.verdick.org/child-development-and-the-internet/child-dev-pos> [Accessed 25 Sept 2011].
- VERHOEVAN, P., TENCH, R., ZERFASS, A., MORENO, A. & VERCIC, D. 2011. How European PR Practitioners handle digital and social media. *Public Relations Review*.
- WADDINGTON, J. 2011. Social Networking: The Unharnessed Educational Tool *Undergraduate Research Journal of UCCS*, 4.1, 12 - 18.
- WALTHER, J., VAN DER HEIDE, B., TONG, S., CARR, C. & ATKIN, C. 2010 Effects of Interpersonal Goals on Inadvertent Intrapersonal Influence in Computer-Mediated Communication. *Human Communication Research*, 36, 323 - 347
- WAUTERS, R. 2011. *Over 1 Billion People Use Social Networks Today, And Other Stats* [Online]. Available: <http://techcrunch.com/2011/09/14/over-1-billion-people-use-social-networks-today-and-other-stats/> [Accessed 22 Nov 2011].
- WEAVER, A. & MORRISON, B. 2008. Social Networking *Computer* 41, 97 - 100
- WENGER, E., WHITE, N. & SMITH, J. 2009. *Digital Habitats; stewarding technology for communities*, USA, CPsquare.

ZAMORANO, M., RODRIGUEZ, M., RAMOS-RIDAO, A., PASADAS, M. & PRIEGO, I. Year. An Innovation Teaching Experience Following Guidelines of European Space of Higher Education in the Interactive Learning *In:* MILTIADIS D. LYTRAS, PATRICIA ORDÓÑEZ DE PABLOS, ADRIAN ZIDERMAN, ALAN ROULSTONE, HERMANN A. MAURER & IMBER, J. B., eds. Knowledge Management, Information Systems, E-Learning, and Sustainability Research - Third World Summit on the Knowledge Society, WSKS 2010,, 2010 Greece. 545 - 554.



# A Django Based Educational Resource Sharing Website: Shreic

Adamya Shyam<sup>\*1</sup>, Nitin Mukesh<sup>2</sup>

<sup>\*1</sup>Department of Computer Science, Banaras Hindu University. adamyashyam2016@gmail.com

<sup>2</sup>Department of Mathematics, Indian Institute of Technology, Mumbai. nitinmukesh681@gmail.com

**Abstract:** Technological Implementations in the field of Academics has helped Students as well as Professionals in very important ways. The availability of all educational resources helps the students a lot in their educational life. The paper illustrates a website model with the help of which Students can be able to access class notes, previous year question papers, syllabus, and can sell their old books from the same digital platform as well. The paper also describes the role of software engineering in project development. The project is developed on Django Framework; the backend development is in Python, Jinja2 and SQLite. The frontend consists of HTML, CSS and Java. Appropriate SDLC Model and Testing techniques have been used in the development process. Each step of the SDLC Model (Iterative Model) is described thoroughly and respective ER Diagrams and Flow Charts have been shown. The project developed is highly efficient, user-friendly and simple.

**Index Terms:** Software Engineering, Django, HTML, CSS, SDLC, Python, Testing.

## I. INTRODUCTION

In this era of digitalization, the availability of different resources on different digital devices is making our lives easy and convenient. In the field of academics too, there are many educational websites that share educational resources like short notes, video lectures, presentations and books etc. But, none of them provide class notes or question papers related to courses taught in a particular college or university; and most of the students due to lack of communication from batch mates or seniors, often face the problem of not getting class notes, if were absent or previous year question papers from seniors. Taking these problems under consideration, the idea of an online

platform for resource sharing purposes was developed named Shreic (*Sharing Resources In Campus*). The idea is to provide all class notes and previous year question papers of different courses of a college/university at a single platform.

Also, in colleges after completion of the course, students either sell their books to junkyards or few of them donate it to their juniors. Only a few of them keep those books with themselves. So, the website also works like an e-commerce website where old books can be sold or donated as per the wish of the seller.

The project is developed in the Django framework. The backend consists of Python, Django, SQLite and Jinja2. Cloudinary, an online cloud service has been used for storing data. Finally, black box and white box testing were done in order to test the functional, structural and logical features of the website.

The development process followed the Iterative Model of Software Development. The idea was to add functionality and then to design it, test it and implement it. Although this approach takes more resources but with each iteration the next iteration takes less time to be developed and with the help of this approach, errors were easily found and rectified at the same time.

The feasibility study helped us to enlist the main objectives viz.

1. Different Educational Categories (viz. Entrance, Recruitment, Academics and Entertainment).
2. Different Subcategories within each Educational Category.
3. Each Subcategory will contain respective Old Books, Question Papers and Class Notes.
4. Each User can add Class Notes, Old Books or Question Papers which once verified by Admin Users will be added on the website.

\* Corresponding Author

5. Old Books can be purchased via Cash on Delivery Method.
6. A Chat-Box for communication between Customers and Sellers.
7. The User will see resources relevant to its own University only.

The testing of the project was done in two ways viz. Black Box Testing which was done by Users. The Users were asked to run the project and check all of the features. The feedback was recorded and amendments were made as required; and White Box Testing in which different test cases were made for each unit of source code and were tested. For each test case, the desired output was expected. When the desired output was not encountered it led to a bug. Each error was removed from the source code and all units were integrated at last.

The project is developed under the Django Python Web Framework. It encourages rapid development and clean, pragmatic design. Built by experienced developers, it takes care of much of the hassle of Web development, so we can focus on writing our app without needing to reinvent the wheel. The front end of the project has been made user-friendly with efficient use of HTML, CSS and JavaScript. The back end has been coded in Python Programming Language. We easily achieve more functions with fewer lines of code using Python. Web development with Python is very popular because of its readability and efficiency.

Python is used for the development process taking the security issues in concern. Python is more secure than several widely used programming languages. Django further helps enterprises to enhance the security of their websites and web applications by preventing a variety of security attacks — cross-site scripting (XSS), cross-site request forgery (CSRF), SQL injection, and clickjacking. The web application is made to exchange data with the webserver securely by deploying the web application behind HTTPS. The security issues are resolved in order to prevent any unwanted attack on the database as well as the server.

The project after development was deployed on a public server with the domain [www.shreic.com](http://www.shreic.com). The website is very user-friendly and easy to operate. This project will help students a lot in their educational life.

## II. LITERATURE SURVEY

Various websites and research papers have been developed keeping the idea of educational resource sharing and its importance in mind. Few of them are listed here:

1. Used Books Factory:

It is an online platform to sell old books of different categories.

2. Vioric-Torri, C. & Alexandrache, C. (2012):

The study reflects how educational technology influences the learning styles of students and how to form and develop the competences of learning in the new generations.

3. TutorialsPoint:

The website provides tutorials on different topics related to computer science and technology. Provides pdf notes for the same and also provides guidance for competitive exams.

4. The Physics Classroom:

For PDF notes and tutorials related to the various fields of Physics.

5. Kelly, L., & Breault, K. (2006):

The objective of the research project was to provide the Australian Museum with guidance on how to best develop a website that meets the needs of students and teachers in the primary and secondary levels across a range of curriculum areas. General objectives were to gain insights into how students and teachers are using the internet and what they are looking for when they access websites.

6. Aglasem:

Online Portal that provides previous year question papers and answer keys related to different competitive exams and some universities' semester papers.

7. BHU Student Club:

It is an online social group that provides old semester papers of a few courses that are offered at Banaras Hindu University.

After a brief study of the related works, it has been observed that all these websites possess different functions of the project proposed but none of them have all of the features collectively. Also, there is no such website where sharing class notes can be done except for social media. The following project has been developed keeping all these disadvantages in mind.

## III. PROPOSED APPROACH

### A. Software Development Life Cycle

SDLC is a process that defines the various stages involved in the development of software for delivering a high-quality product. SDLC stages cover the complete life cycle of software i.e. from inception to retirement of the product. The purpose of SDLC is to deliver a high-quality product which is as per the customer's requirement.

SDLC has defined its phases as Requirement gathering, Designing, Coding, Testing, and Maintenance. It is important to adhere to the phases to provide the Product in a systematic manner.

### B. SDLC Model

A software life cycle model is a descriptive representation of the software development cycle. The software development model helps the developer to select a strategy to develop the software. A software development model has its own set of tools, methods and procedures, which are expressed clearly and defines the software development life cycle. This project has been developed using the Iterative model (Jalote, 2003).

In this life cycle model, a Project Control List (PCL) on the basis of current known requirements is developed. A PCL is a list containing the series of tasks/functionalities that are to be present in the given system. If at a certain phase of development, we come across any new requirement, we add it to our Project Control List.

For developing the website, a task is chosen from the given PCL and Planning, Analysis, Designing, Testing and Evaluation is performed as shown in Figure 1. When the specific functionality is added we remove it from the Project Control List. In a similar way, one task at a time from PCL is chosen, implemented and then removed from PCL. This process iterates

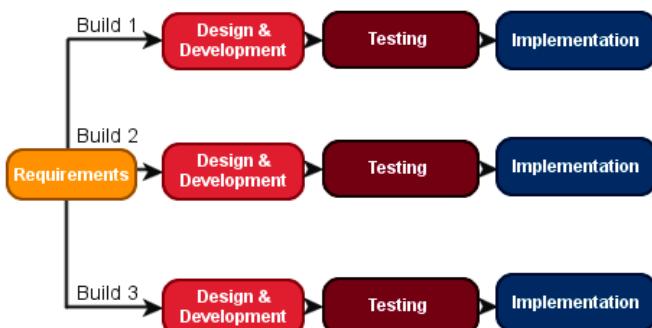


Fig. 1. Iterative Model

until the desired requirements of the product are not met.

After each iteration, the management team can do work on risk management and prepare for the next iteration. Because a cycle includes a small portion of the whole software process, it is easier to manage the development process.

In the Iterative model, the newer iterations are incrementally improved versions of previous iterations. Moreover, in the event that a new iteration fundamentally breaks a system in a catastrophic manner, a previous iteration can quickly and easily be implemented or “rolled back,” with minimal losses, which is a boon for post-release maintenance.

In the Iterative Model, the initial run-through of all stages may take some time, but each subsequent iteration will be faster and faster, allowing the life cycle of each new iteration to be trimmed down to a matter of days or even hours in some cases.

#### C. Feasibility Study

A feasibility analysis is used to determine the viability of an idea, like ensuring a project is legally and technically feasible as well as economically justifiable.

During the development of this project, the feasibility study was done as follows:

##### 1) Project Requirements

The following objectives were proposed in order for the successful development of the project.

- User Registration
- User Login

- Administrator Login
- Different Educational Categories (viz. Entrance, Recruitment, Academics and Entertainment).
- Different Subcategories within each Educational Category.
- Each Subcategory will contain respective Old Books, Question Papers and Class Notes.
- Separate Account Page for each User.
- Each User can add Class Notes, Old Books or Question Papers which once verified by Admin Users will be added on the website.
- Administrators can Add or Delete Resources if desired.
- Old Books can be purchased via Cash on Delivery Method.
- A Chat-Box for communication between Customers and Seller.
- The User will see resources relevant to its own University only.
- A Dynamic Search Bar.

This requirement list was also used as the Project Control List during development.

Certain goals regarding the efficiency of the project to be developed were also proposed, which are as follows:

- **Planned Approach:** The working of the website is well planned and organized. The data will be stored properly in data stores, which will help in the retrieval of information as well as its storage.
- **Accuracy:** The level of accuracy in the proposed system will be higher. All operations would be done correctly and it ensures that whatever information is retrieved or stored is accurate.
- **Reliability:** The reliability of the proposed system will be high due to the above stated reasons. The reason for the increased reliability of the system is that now there would be proper storage of information.
- **No Redundancy:** In the proposed system utmost care would be taken so that no information is repeated anywhere, in storage or otherwise. This would assure the economic use of storage space and consistency in the data stored.
- **Immediate retrieval of information:** The main objective of the proposed system is to provide quick and efficient retrieval of information regarding users, orders, products etc.
- **Easy to Operate:** The system should be user-friendly and should be such that it can be developed within a short period of time and fit in the limited budget of the organization.

#### D. E-R Diagram

The project consists of many relational models. Every model consists of different attributes. The Primary Key is shown with

an underline under the name. Each Relation is characterized by Structural Constraint where the first number denotes Participation Constraint (1 for Total Participation and 0 for Partial Participation) and the second number denotes the Cardinality Ratio (1:1 or 1: N or M: N).

*1) Participation Constraint:*

Total Participation: If each entity of an Entity Type has a relationship instance in Relationship Set then the participation is total.

Partial Participation: If few entities of an Entity Type have a relationship instance in Relationship Set then the participation is partial.

*2) Cardinality Ratio:*

1:1: Only one entity of an Entity Set can be related to anyone entity of the other Entity Set.

M: N: Many entities of an Entity Set can be related to many entities of the other Entity Set.

1: N: One entity of an Entity Set can be related to any number of entities of the other Entity Set.

There are 3 ER Diagrams that are used in the development process. The ER Diagram in Figure 2 illustrates the relation of MyUser Model with different Models related to user details. The Model MyUser is connected to Models Gender, College, City, State, Country and User. The Model Country is connected to Model State and Model State is connected to Model City.

The ER Diagram shown in Figure 3 describes the relation of MyUser Model with different Models related to book and note details. The Model MyUser can add BookDet to the database. MyUser can request for book which will be recorded in BookReq Model. MyUser can add Notes to NotesDet Model. Book will be of a Category and corresponding to it there will be Subcategory I and Subcategory II. Notes also have Category, Subcategory I and Subcategory II.

And, the last one as shown in Figure 4, illustrates the relation of MyUser Model with different Models related to chats, notification and orders. The Model MyUser can chat with another MyUser in Chatroom. ChatW will create a ChatRoom for MyUser if is not created yet. All notifications that notifies MyUser is in Notification. MyUser can add products to ShoppingCart in the Session logged in. MyUser can order an Order which will be delivered by another instance of MyUser.

#### IV. IMPLEMENTATION

##### A. Technologies Used

Various front-end and back-end technologies are available in this era of digitalization. The technologies used in this project are discussed briefly in the following sections.

*1) Front End Technologies*

*a) HTML*

HTML stands for Hypertext Markup Language, and it is the most widely used language to write Web Pages. Hypertext refers to the way in which Web pages (HTML documents) are linked together. Thus, the link available on a webpage is called Hypertext. As its name

suggests, HTML is a Markup Language which means you use HTML to simply "mark-up" a text document with tags that tell a Web browser how to structure it to display (Musciano & Kennedy, 1996).

Originally, HTML was developed with the intent of defining the structure of documents like headings, paragraphs, lists, and so forth to facilitate the sharing of scientific information between researchers. Now, HTML is being widely used to format web pages with the help of different tags available in HTML language.

*b) CSS*

CSS (Powell, 2010) stands for Cascading Style Sheets. CSS describes how HTML elements are to be displayed on the screen, paper, or in other media. CSS saves a lot of work. It can control the layout of multiple web pages all at once.

*c) JavaScript/JQuery*

JavaScript (JS) is a high level, interpreted programming language. JavaScript has curly-bracket syntax, dynamic typing, prototype-based object-orientation, and first-class functions.

Alongside HTML and CSS, JavaScript is one of the core technologies of the World Wide Web (Flanagan, 2006). JavaScript enables interactive web pages and is an essential part of web applications. The vast majority of websites use it, and major web browsers have a dedicated JavaScript engine to execute it.

JavaScript supports event-driven, functional and imperative (including object-oriented and prototype-based) styles. It is important to validate the form submitted by the user because it can have inappropriate values. So, validation is must to authenticate the user. JavaScript provides the facility to validate the form on the client-side so data processing will be faster than server-side validation.

*d) BootStrap*

Bootstrap (Shenoy & Sossou, 2014) is a free and open-source CSS framework directed at responsive, mobile-first front-end web development. It contains CSS and (optionally) JavaScript-based design templates for typography, forms, buttons, navigation, and other interface components.

To use bootstrap, we are required to either install in our system or use CDN. CDN is short for content delivery network. A CDN is a system of distributes servers that deliver pages and other web content to a user, based on the geographic locations of the user, the origin of the webpage and the content delivery server.

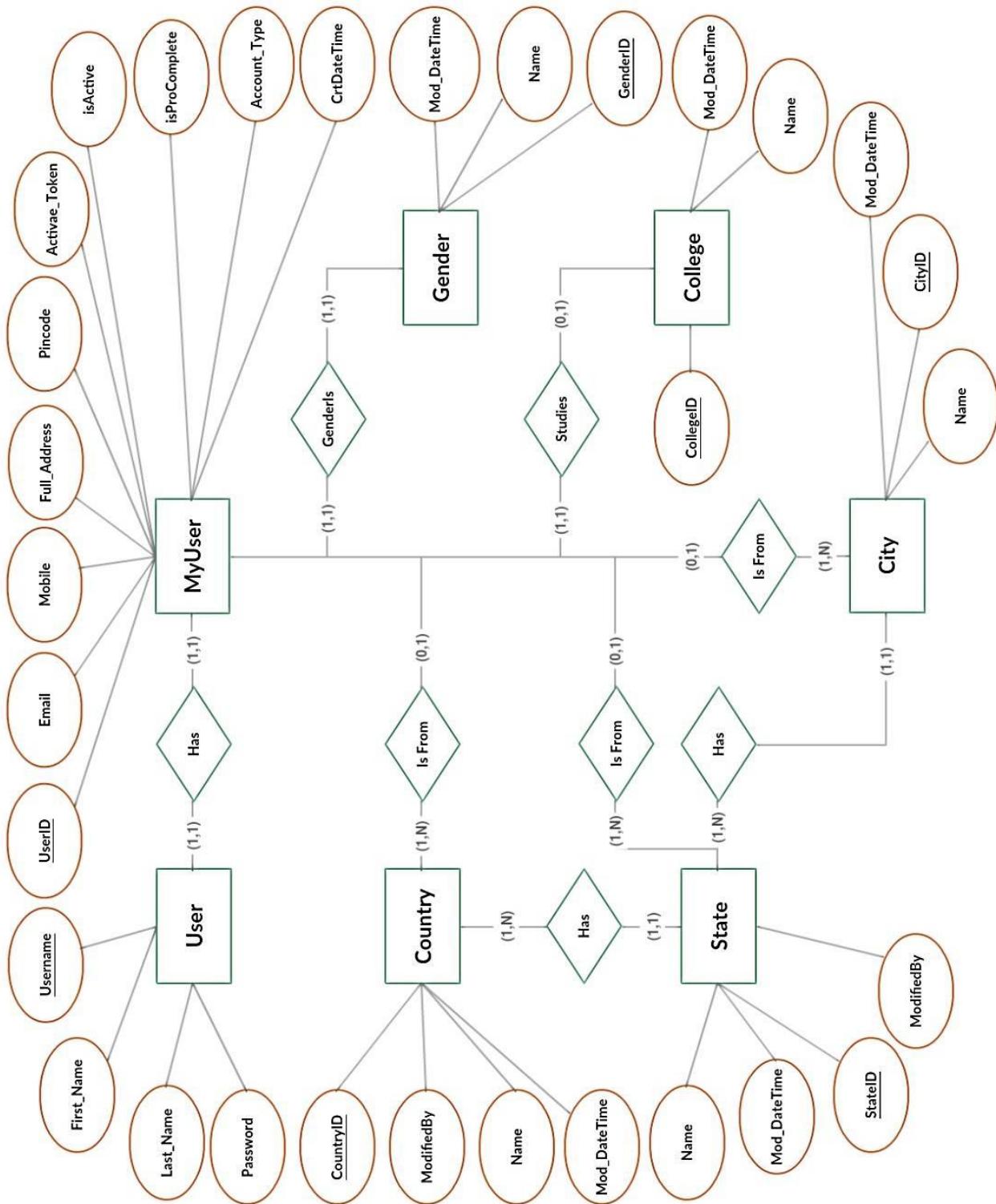


Fig. 2. ER Diagram for MyUser model and Personal Details' Models

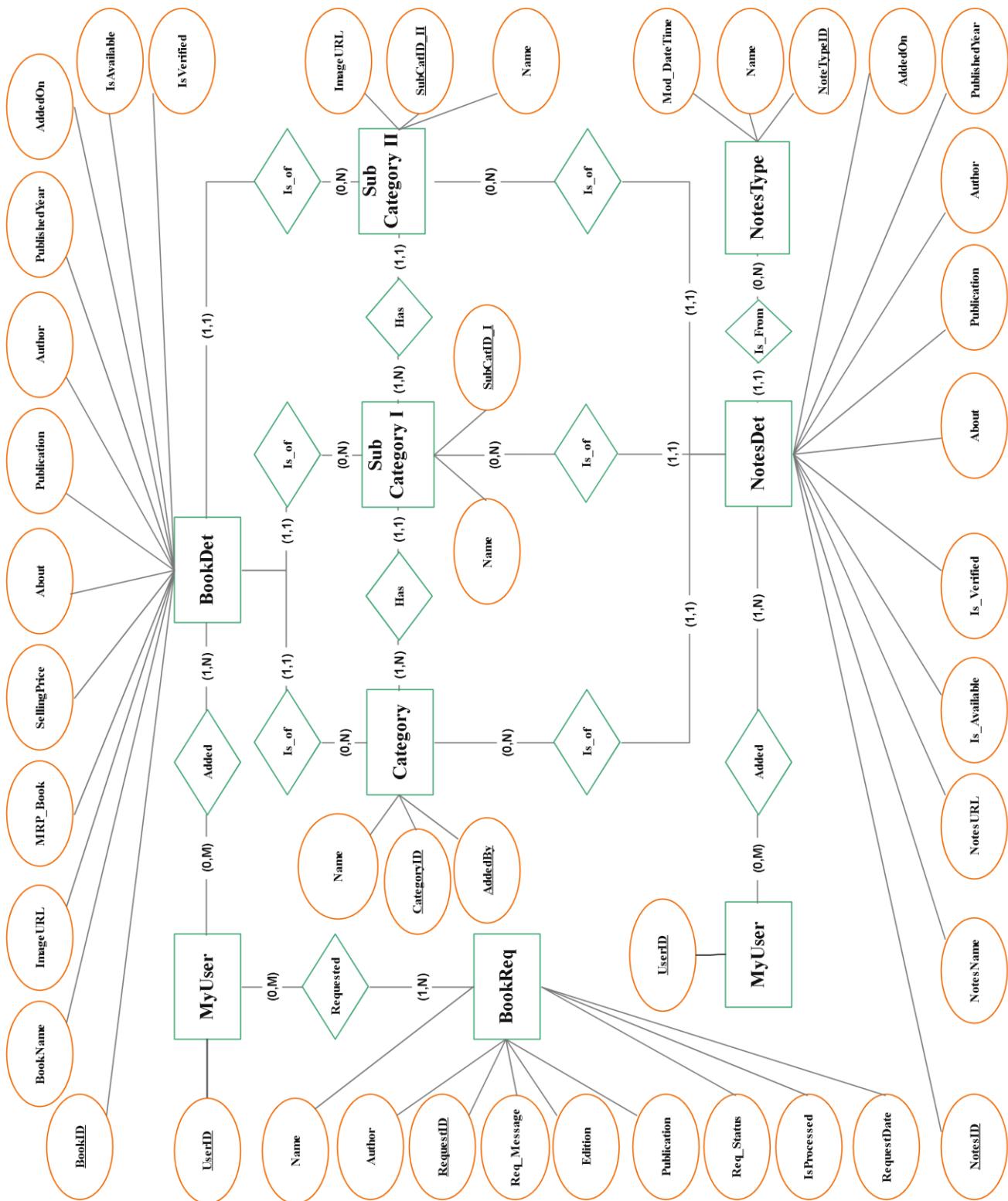


Fig. 3. ER Diagram for Book Details and Note Details Models

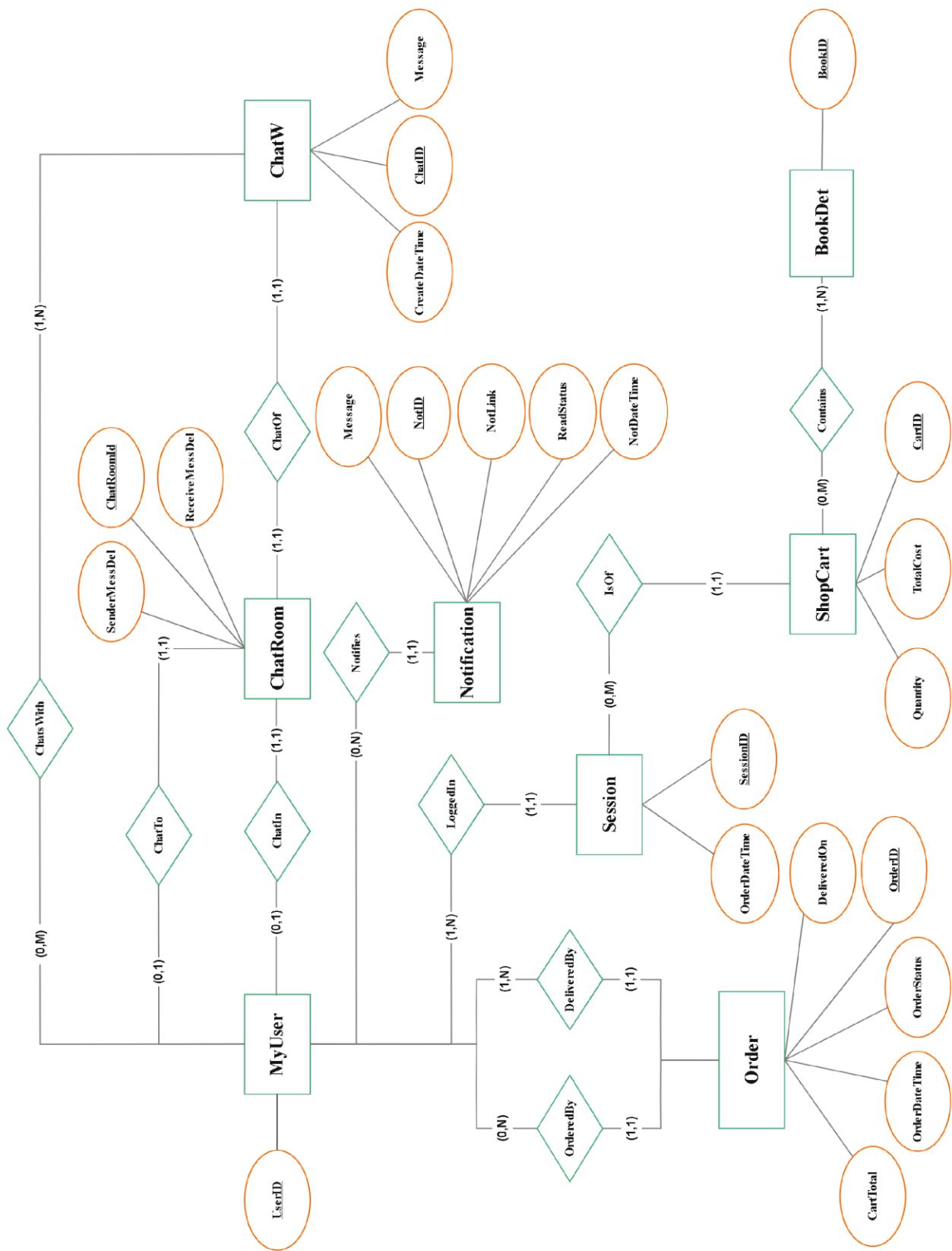


Fig. 4. ER Diagram for Order Details and Notification Models

## 2) Back End Technologies

### a) Python

Python is an interpreted, high-level, general-purpose programming language. Created by Guido van Rossum and first released in 1991 (Kuhlman, 2011), Python's design philosophy emphasizes code readability with its notable use of significant whitespace. Its language constructs and object-oriented approach aims to help programmers write clear, logical code for small and large-scale projects.

In this website, python is used as backend language to code database part and all functionalities that the website can perform. The version of Python used in this development is Python 3.6.

### b) Django

Django (Holovaty & Kaplan-Moss, 2008) is a high-level Python Web framework that encourages rapid development and clean, pragmatic design. Built by experienced developers, it takes care of much of the hassle of Web development, so we can focus on writing our app without needing to reinvent the wheel. It's free and open source. Django's primary goal is to ease the creation of complex, database-driven websites. The framework emphasizes reusability and "pluggability" of components, less code; low coupling, rapid development, and the principle of don't repeat yourself. Python is used throughout, even for settings files and data models. Django also provides an optional administrative create, read, update and delete interface that is generated dynamically through introspection and configured via admin models. The version of Django used during development is Django 2.1.5.

### c) SQLite

SQLite is a C-language library that implements a small, fast, self-contained, high-reliability, full-featured, SQL database engine. SQLite is the most used database engine in the world. By default, Django used SQLite3 as its default database. Django provides a specific way to define our database using the python programming language.

### d) Jinja2

Jinja2 (Lokhande et al, 2015) is one of the most used template engines for Python. It is inspired by Django's templating system but extends it with an expressive language that gives template authors a more powerful set of tools.

It adds Sandboxed execution mode i.e. every aspect of

the template execution is monitored and explicitly whitelisted or blacklisted, whatever is preferred. Some features of Jinja2 are enlisted below:

- Powerful automatic HTML escaping system for cross-site scripting prevention.
- Template inheritance makes it possible to use the same or a similar layout for all templates.
- Optional ahead-of-time compilation and Configurable syntax i.e. we can reconfigure Jinja2 to better fit output formats such as LaTeX or JavaScript.

The version of Jinja2 used as a templating language in this project is 2.10.

## B. Hardware and Software Requirements

The project developed satisfies all the functional and non-functional requirements enlisted. The following specifications are required for the project to run on any device.

### 1) System Specifications

Processor: Intel(R) Core (TM) i5-5005U CPU @ 2.00GHz  
RAM: 2 GB  
System Type: 32-bit/64-bit operating system, x32 or x64 based processor  
Operating System: Windows 7/8/10.

### 2) Software Interface

Front End: HTML, CSS, Bootstrap, JQuery  
Backend: Django  
Local Access Link: localhost:8000  
Global Access Link: <https://www.shreic.com/home/>

## C. Methodology

The Project is developed via multiple steps. The major steps are enlisted here:

1. Installing Python and adding it to the windows path.
2. Creation of Virtual Environment (Following commands are written in Command Prompt)
  - pip install virtualenvwrapper-win
  - mkvirtualenv environmentname (any name can be given)
  - workon environmentname
3. Installing Django
  - pip install Django
4. Go to Destination Place where you want the project to be kept, using cd command.
5. Create Project as follows
  - django-admin startproject someprojectname
  - cd someprojectname
6. Create App of the project as
  - django-admin startapp appname
  - python manage.py makemigrations
  - python manage.py migrate
7. Copy the Template Folder (if Front End Template is

downloaded) to the project folder created.

#### 8. Run Server (localhost:8000)

- `python manage.py runserver`

The Flow Chart (Figure 5) illustrates the steps that are required in order to install the prerequisites of the project and then the steps involved in the development of project. Commands written in bracket are to be run on Command Prompt. They are the steps that are required to install virtual environment and to run local server on the system project is to be developed on. The code of backend and frontend can be coded in any code editor (Sublime Text was used in this project).

All the changes that were made in the project can be seen on the local server. The Data was stored on online cloud service Cloudinary.

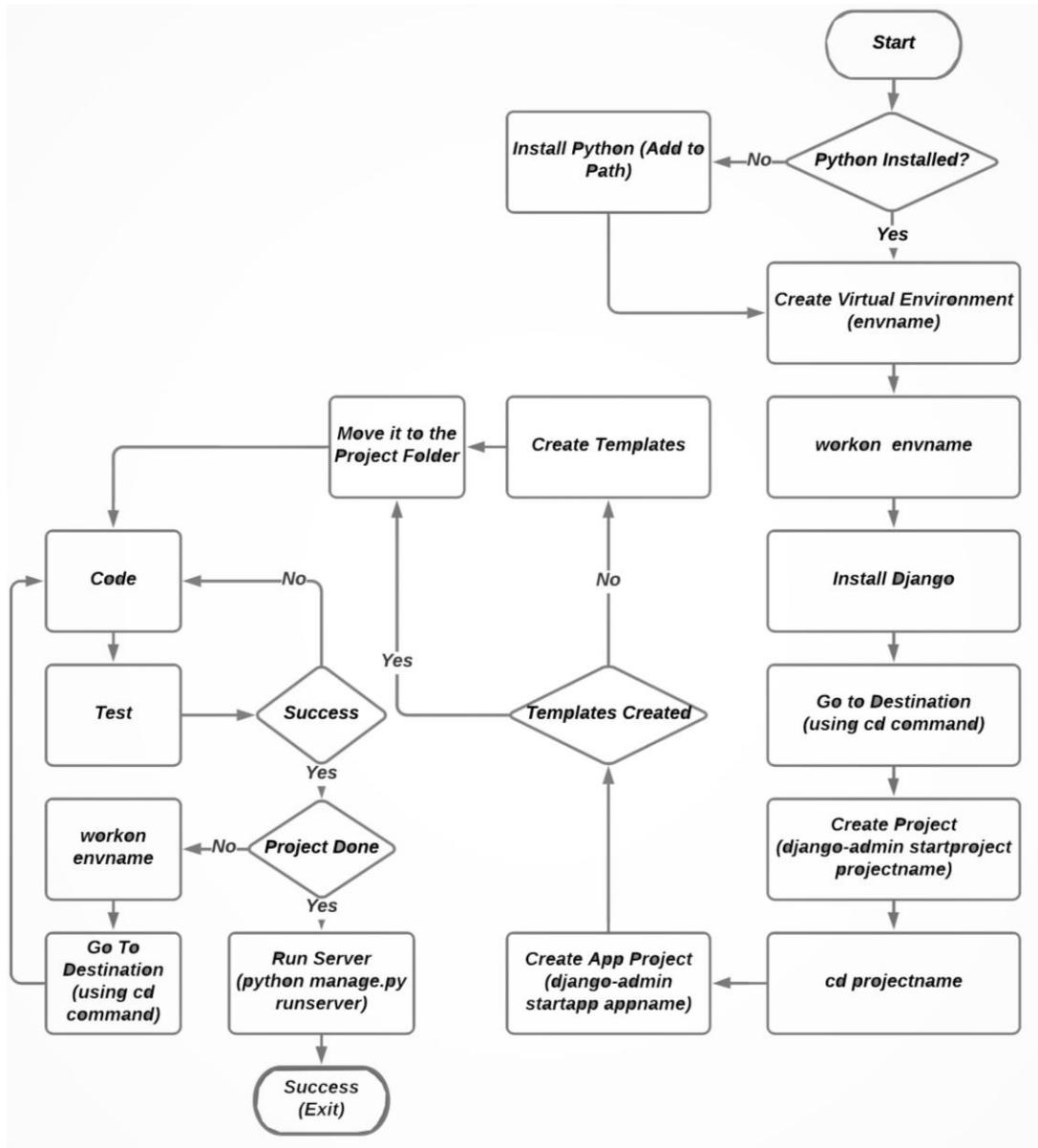


Fig. 5. Flow Chart of the Methodology

## V. RESULT

Few snaps of the website are shown here showing the main functionalities of the project.

The Home Page (Figure 6) has the top bar consisting of the website logo, the drop-down menu of categories, sell books

button, add notes button, request an educational resource button, a dynamic search bar and the signup/login option. Below the top bar is the banner representing the main motive of the website. After that there is stats of the total number of books, notes and users of the website. On the bottom right corner is the recent chat button which shows the recent chats the user had done.

Figure 7 shows the dynamic search bar developed for simplifying the searching option for users of the website. A dynamic search bar possesses the feature of typing suggestions and helps the user to autocomplete the searching process. A form is created in HTML code of the home page and a function is coded in the views.py page that retrieves all books and notes uploaded, filters it and return the names on the basis of letters typed in the search box and an URL is written in urls.py to refer to the function created.

An Add a book form (Figure 8) is created for adding a book to sell or donate through the website. On clicking the Sell Button on the top bar following form will open. The form consists of Book Name, Dropdown menu for Category and Subject, Author Name, Publication Name and Year and MRP, Description and the Cover Image of the book. On Submit, the record will be added to BookDetails Model created in models.py. And Figure 9 shows the form created for uploading notes (question papers/class notes/syllabus/ebooks) on the website. On clicking the Add Button on the top bar following form will open. The form consists of Notes Name, Dropdown menu for Notes Type, Section, Category and Subject, Publication Name and Year, Description and the file (pdf format). On Submit, the record will be added to NotesDetails Model created in models.py.

The dropdown menu (Figure 10) that appears on the screen when the mouse is hovered over the Category Button shows all the Categories created and their subcategories. The dropdown menu is divided into categories and each category consists of different subcategories. These Categories and their corresponding Subcategories are retrieved with the help of functions written in views.py and called in the HTML page.

The Computer Science subcategory (Figure 11) of Science under Academics Section (Academics/Science/Computer Science) is a sample for a Particular Subcategory Page. The side bar consists of filters based on the type of notes. Function selectedproducts in views.py filters the notes and books of the selected category with the help of ID of the subcategory created using get () and filter (). Figure 12 illustrates the chat-box created for chatting between the User and the Seller of a Book. By the help of chat and mutual understanding the transaction can be done successfully between the two. The sidebar shows the persons the user recently chatted to and the right side shows chat of the particular person the user is chatting to. The Chat Box can be opened by clicking the Recent Chats button shown in the Figure 3.

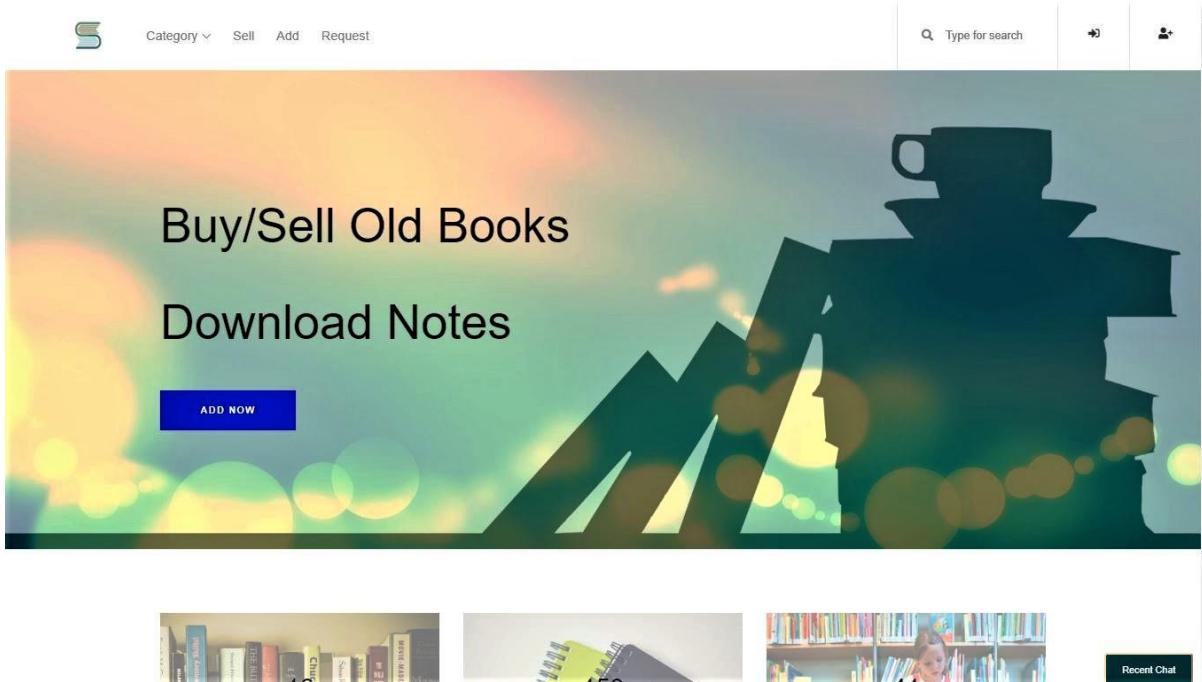


Fig. 6. Home Page

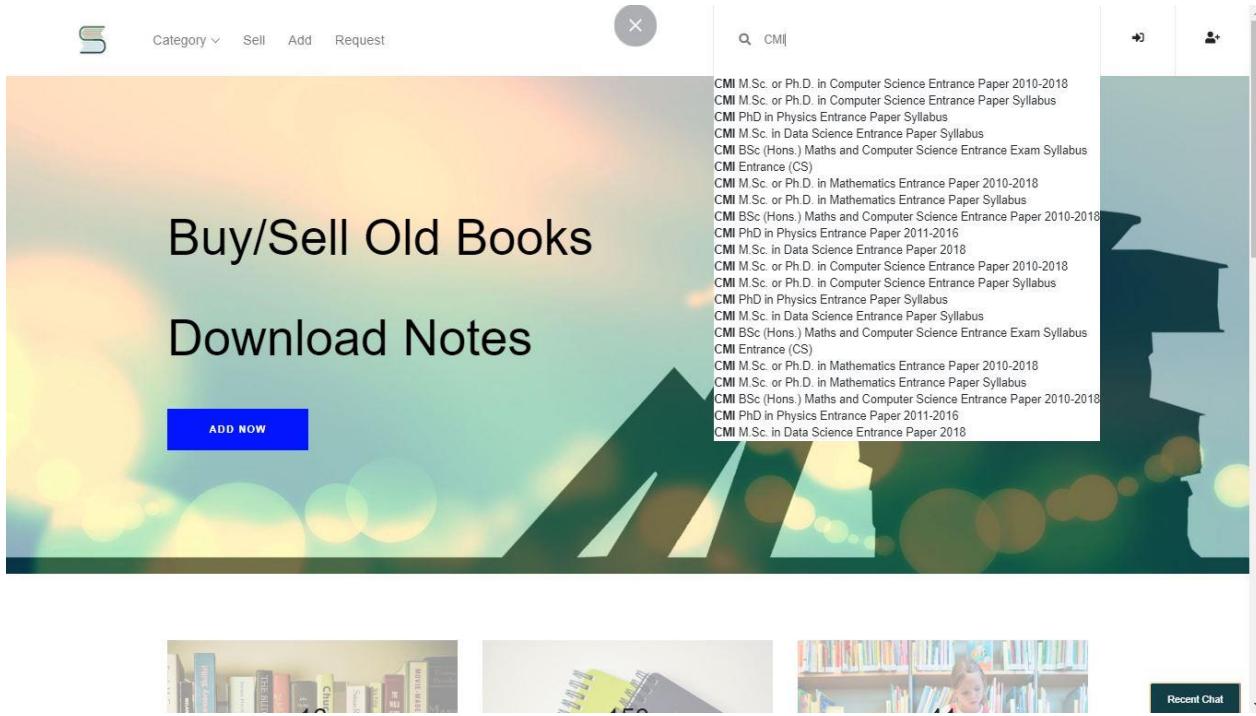


Fig. 7. Dynamic Search Box

This screenshot shows a detailed form for listing a book for sale. The form includes fields for Book Name, Select a Section, Select a Category, Select a subject, Author Name, Publication Name, Publication Year, Your Selling Price, About Books, and an Upload Book Cover Photo section with a 'Choose File' button. A 'SUBMIT' button is located at the bottom of the form. The top of the page features a header with 'Category', 'Sell', 'Add', 'Request', a search bar ('Type for search'), and user profile icons.

Fig. 8. To Sell A Book

Category Sell Add Request

Have some old Books? [Sell here](#)

Notes Name

Select Notes Type

Select a Section

Select a Category

Select a subject

Publication Name

Publication Year

About Notes

Upload Notes Here\*

No file chosen

Fig. 9. To Upload Notes

Category ▾ Sell Add Request

Entrance Exams	Recruitment Exams	Fun Zone	Academics
Management	Teaching	Fiction	Science
Engineering	Banking	Non-Fiction	Medical
Law	Railway	Poetry	Agriculture
Medical	SSC		Management
University Exams	Insurance		Engineering
Science	UPSC		Commerce
Pharmacy and Nursing	Defence		Education
	Power Corporations		Law
	Medical		Performing Arts
	PSU Recruitments		Visual Arts

Recent Chat

Fig. 10. Different Categories and Sub-Categories

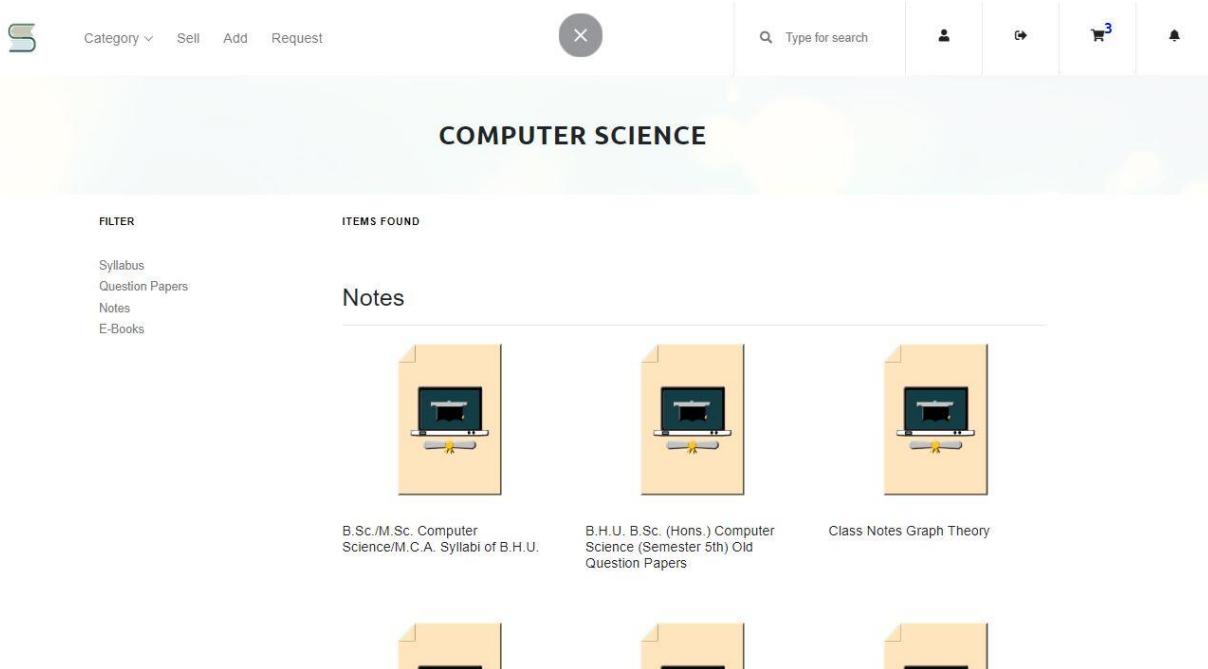


Fig. 11. Particular Page of a Category (Academics/Science/Computer Science)



Fig. 12. Chat Room

## VI. TESTING

In this project the testing (Thakur, 2017) has been done as follows:

### A. Black Box Testing

Black Box Testing is a software testing method in which the internal structure/ design/ implementation of the item being tested is not known to the tester.

In this testing process, ten Users were selected. Firstly, they

were said to Sign Up on the website. After successful registration of each user, they were asked to upload notes (the samples were given) in pdf format in which 8 of them succeeded. Two of the Users were unable to upload the notes. This issue was resolved and then further process took place. Following the note uploading testing, each User was provided an old Book, which they uploaded on the server to test the functionality of the book adding feature.

Further, the users were asked to fill the “request a note” form where the user can request a book or note to be made available

on the website. After that, the users were said to chat with each other to check the simplicity and functionality of the chat-box which was found satisfiable.

At last, in the process of Black Box Testing, Users were requested to review the whole website and each functionality and their feedback was recorded. According to which, corrections and better implementations were made on the website.

#### *B. White Box Testing*

White Box Testing is a software testing method in which the internal structure/ design/ implementation of the item being tested is known to the tester.

The White Box Testing is done by the developers only. There are many kinds of White Box Testing. In this project, Unit Testing was done i.e. each unit of code was separately tested and was integrated lastly. The testing of source code involved

- Internal security holes
- Broken or poorly structured paths in the coding processes
- The flow of specific inputs through the code
- Expected output
- The functionality of conditional loops
- Testing of each statement, object, and function on an individual basis.

Different test cases were made for each unit of source code and were tested. For each test case, the desired output was expected. When the desired output was not encountered it led to the bug. Each error was removed from the source code and all units were integrated at last. The benefit of unit testing was that errors/bugs were identified at the initial level of development thus avoiding any big error to occur at a further level of development.

Also, in the testing process, the security issues have been resolved. The CSRF middleware and template tag in Django provides easy-to-use protection against Cross-Site Request Forgeries. This type of attack occurs when a malicious website contains a link, a form button or some JavaScript that is intended to perform some action on your website, using the credentials of a logged-in user who visits the malicious site in their browser. A related type of attack, 'login CSRF', where an attacking site tricks a user's browser into logging into a site with someone else's credentials, is also covered. The CSRF middleware is activated by default in the middleware setting in the Django framework. Ajax Forms are used in the project and each form is tagged with the token to secure the forms from unwanted inputs that can corrupt the database. The web application is made to exchange data with the webserver securely by deploying the web application behind HTTPS.

#### CONCLUSION

After analyzing the results obtained, the project developed can be considered satisfiable. It can be concluded that the website will be very helpful to students in their educational life as it provides all educational resources required in a college or school life. As the project works as an Educational cum E-Commerce Website and thus students can donate or sell their old books too.

To conclude, the project is developed using the proper Software Engineering process, following the Iterative Model of SDLC. A Project Control List was created after doing the feasibility study for functionalities as well as non-functional requirements. Then proper schema and tables that were supposed to be required in the development process were made and relationships between each table were drawn. For this ER Diagram was made which has been illustrated in the paper. Also, the flow chart was created so that each process can be done sequentially. After that, each task from the project control list was coded, tested using White Box Testing and implemented separately as per the Iterative Model. At last every unit was integrated and users were selected for Black Box Testing. Each user was asked to run the project and test each functionality of the project. After the testing, feedback and suggestions were recorded and accordingly the amendments were made. Security issues were resolved with the help of CSRF tags given by the Django Framework and by deploying the Web Application behind HTTPS.

The approach used in the System Development Model can act as a roadmap for the development of similar kinds of Web Applications efficiently.

Also, for future works few more features can be added to the project. Some of them that have been enlisted are using the platform as an online assignment submission platform, creation of a chatroom consisting of teachers and students of particular university/college and adding digital payment methods for easier transactions.

#### REFERENCES

- Buy Second Hand Books, Old Books, Used Books Online in India. (n.d.). Retrieved from <https://www.usedbooksfactory.com/>.
- Viorica-Torii, C., & Carmen, A. (2013). The Impact of Educational Technology on the Learning Styles of Students. *Procedia-Social and Behavioral Sciences*, 851-855.
- About Company. (n.d.). Retrieved from <http://www.tutorialspoint.com/>.
- The Physics Classroom. (n.d.). Retrieved from <https://www.physicsclassroom.com/>.
- Kelly, L., & Breault, K. (2006). Developing Educational Websites: Investigating Internet Use by Students and

- Teachers. In *Proceedings of Thinking, Evaluating, Rethinking, ICOM-CECA Conference*, Rome.
- AglaSem Admission. (n.d.). Retrieved from <https://admission.aglasem.com/>.
- Sachan, N. (2019, February 20). Welcome to BHU Student Club, BHU Student Club. Retrieved from <http://bhustudentclub.in/>.
- Jalote, P. (2003). *An Integrated Approach towards Software Engineering*. Narosa Publishing House.
- Musciano, C., & Kennedy, B. (1996). *HTML, The Definitive Guide*. O'Reilly & Associates.
- Powell, T. A. (2010). *HTML & CSS: The Complete Reference*. The McGraw-Hill Companies.
- Flanagan, D. (2006). *JavaScript: The Definitive Guide*. O'Reilly Media, Inc.
- Shenoy, A., & Sossou, U. (2014). *Learning Bootstrap*. Packt Publishing Ltd.
- Kuhlman, D. (2011). *A Python Book: Beginning Python, Advanced Python, and Python Exercises*. Platypus Global Media.
- Holovaty, A., & Kaplan-Moss, J. (2008). *The Definitive Guide to Django: Web Development done right*. Apress.
- Lokhande, P. S., Aslam, F., Hawa, N., Munir, J., & Gulamgaus, M. (2015). Efficient way of Web Development using Python and Flask. *International Journal of Advanced Research in Computer Science*, 54-57.
- Thakur, M. S. (2017). Review on Structural Software Testing Coverage Approaches. *International Journal of Advance Research, Ideas and Innovations in Technology*, 281-286.

\*\*\*



# DEPARTMENT MANAGEMENT SYSTEM [WEB-BASED APPLICATION]

Jhanvi Agarwal, Renuka Singh, Mansi Singh, Mansi Raghav

Student IMS Engineering College  
Ghaziabad, India

**Abstract:** This work done is aimed at developing an Online Web-based “Department Management System” that is of importance to a specific department of a college. The system is a web-based application that can be accessed throughout the department of an organization. This system may be used for monitoring the overall activities as well as performance of the students.

This work is being developed for an engineering to maintain and facilitate easy access to information. For this the users must be registered with the system after which they can access as well as modify data as per the permissions given to them. DMS is a web based application that aims at providing information to all the levels of department in an organization. This system also contains department yearly magazine “BYTE” and all other books in the library module which are related to the department. For a given student/faculty can access the system to either upload or download some information from the database.

**Keywords—**Admin, Department system, Feedback, Information, Management System, Student

## I. INTRODUCTION

The title of the work is “Department Management System (DMS)”. DMS is defined as an application build on web that is useful in providing information at all levels of a department. For the users of this system the administrator creates login IDs and respective passwords from which student/staff can easily access the system. This work is basically a website which includes attractive designs and proper arrangements of links and images.

From department library to department yearly magazine, from staff rating to student’s feedback, every notice and upcoming events is showcased in this system. Placement and rooms/labs record are also stored in the system.

## II. LITERATURE SURVEY

In this section we present reviews of related research papers. In [1] Abhinav Sekhri (2020) proposed School Management System which is introduced mainly for a School. This system includes functionality like holidays, classes, accounts, reports etc. On the other hand it do not contain library management module from where students as well staff can issue books related to their interest.

[6] Another similar system, College department Management System (2018) proposed by Ms.A.V.Sinhasane, Ms. A.N. Kashid, Ms. P.J.Kumbhar, Ms. P.R.Shirpale, Prof. S.L.Mortale from International Research Journal of Engineering and Technology which is introduced to reduce the stress and efforts of a staff as well as students. This system have functionalities like voting event details, feedback, newsline etc. This system is basically useful for students as they get the event details through SMS. But there are no basic modules which are important to both staff as well as students such as marks, assignments, notes etc.

[8] Author Kartiki Datakar (2016), from International Journal of Computer Science and Mobile Computing, quoted that Online Attendance and Feedback System is software developed for daily student attendance in schools, colleges, and institutes. It facilitates to access the information of a particular student in a particular class. It is concluded that a graduated approach to result monitoring is the most effective response, in which sanctions have a place, although only as a last resort. Online Attendance and Feedback System are software developed for daily student attendance in schools, colleges, and institutes.

[5] Author ‘‘Lalit Joshi’’, “A Research Paper on College Management System” (2015), International Journal of Computer Applications, referred that the system utilizes user authentication, displaying only information necessary for an individual’s duties. Additionally, each sub-system has authentication allowing authorized users to create or update information in that subsystem. All data is thoroughly reviewed and validated on the server before actual record alteration occurs. In addition to a staff user interface, the system plans for



student user interface, allowing users to access Information and submit requests online thus reducing processing time.

### III. METHODOLOGY

This document plays a vital role in the development of life cycle (SDLC) as it describes the complete requirement of the work done.

Any changes made to the requirements in the future will have to go through formal change approval process.

The methodology we used for designing the system is “SPIRAL MODEL”. Spiral model was mentioned in 1988 article by Barry Boehm, “A spiral model of Software Development and Enhancement”.

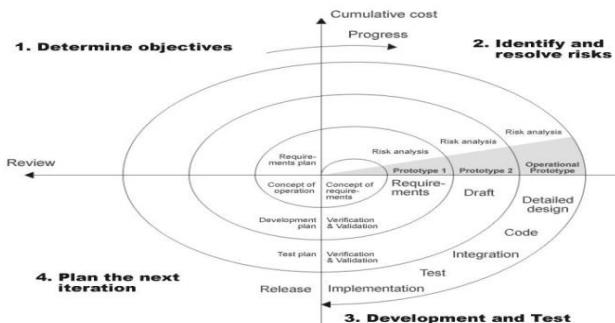


Figure 1. Methodology

### IV. PROPOSED WORK

#### A. USER CHARACTERSTICS

The target audience for implemented work is the department students/staff.

The users for this system are

1. ADMIN- System administrator is the one who create, update, delete as well as manages the database of the whole system. In this module some of the activities done by the admin are managing library, keeping records of placements, rooms and labs etc, adding faculty details in the system as well as updating the same.
2. STUDENT- In this module, students can login and can get various information and notices through notice board module, can also give feedback about teachers through feedback module, download assignment provided by teachers, can also download and read the departmental magazine available online and can also issue books online from library module.
3. STAFF - In this module, the faculties updates the attendance of students on daily basis through attendance module, uploads notes and assignments through upload document module, also

they can add room details through the room detail module and can also issue books through the library module.

### B. OVERVIEW OF FUNCTIONAL REQUIREMENTS

1. The administrator should govern the working of the system.
2. The staff can view the student details.
3. A mechanism to uniquely identify each student.
4. The students can view marks/attendance/exam schedules/upcoming events etc.
5. The system should have a login.
6. It should allow students to give feedback to the staff i.e. the system should have a rating and feedback feature.
7. Student/faculty have the functionality to the application where in admin can manage, add, update or delete the information

### C. NON-FUNCTIONAL REQUIREMENTS

Table 1. Hardware Requirements

Pentium-IV (processor)
512 MB RAM
Hard Disk 10GB
Microsoft Compatible 101 or more keyboard

Table 2. Software Requirements

Operating Systems	Windows
Programming language	C#
Web- Technology	.NET
Front-End	ASP.NET
Back-End	SQL SERVER

### V. SPECIFIC REQUIREMENTS

#### A. EXTERNAL INTERFACE REQUIREMENTS:

1. Simple, Attractive, User friendly.
2. Self-contained, consistent, self-explanatory
3. Robust.



## B. MAIN MODULES OF THE SYSTEM

**MAIN MODULE-** This module is referred as main because it is the starting page of our project.

Table 3 Home Page

1.	Home
2.	Login
3.	Registration
4.	Gallery
5.	About Us
6.	Contact us

**ADMIN MODULE-** Manage users, library, keep records of placements, rooms & labs etc.

Table 4 Admin

1.	Registration Teacher
2.	Info
3.	Schedule
4.	Library
5.	E-Magazine
6.	Rooms
7.	Placement Records
8.	Logout

**FACULTY MODULE-** Faculty can upload exam information, notes & assignments, etc. Can view library, etc.

Table 5 Faculty

1.	View profile
2.	Attendance
3.	Upload documents
4.	Room details
5.	Library
6.	e-magazine

7. logout

**STUDENT MODULE-** Can give feedbacks. Have access to download study material provided etc.

Table 6 Student

1.	Profile
2.	Notice Board
3.	Feedback
4.	Download assignment
5.	Library
6.	e-magazine
7.	logout

## VI. RESULTS AND DISCUSSION

### A. SYSTEM DESIGN

1. The system should be quite stable.
2. We tried to involve accuracy to enhance the efficiency of the system.
3. Aim for the system with minimum cost.
4. System should be modifiable depending on the changing needs of the user.
5. Security is the most important aspect which is followed in this designing phase

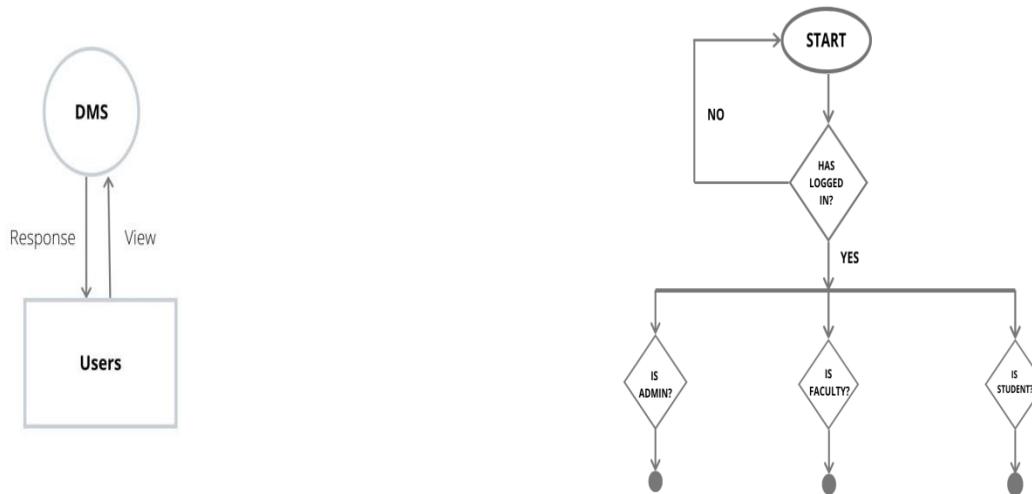
### B. ARCHITECTURAL STRATEGIES

#### DATA FLOW DIAGRAM:

DFD is a means of representing a system at any level of detail with a graphic network of symbols showing data flows, processes and their respective sources and destination. These diagrams are like a road map with different details on different hierarchical levels.

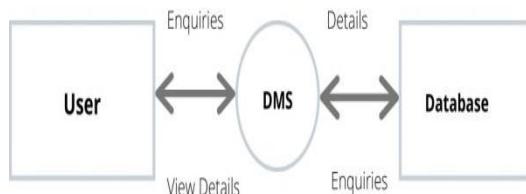
LEVEL-0 DFD also known as context diagram, shows a data system as whole and only emphasizes on the relation between the user and the system.

LEVEL-1 DFD is more detailed than level-0. It divides level-0 processes into sub-processes to make understanding much better.



**FIG.4 LOGIN AS?**

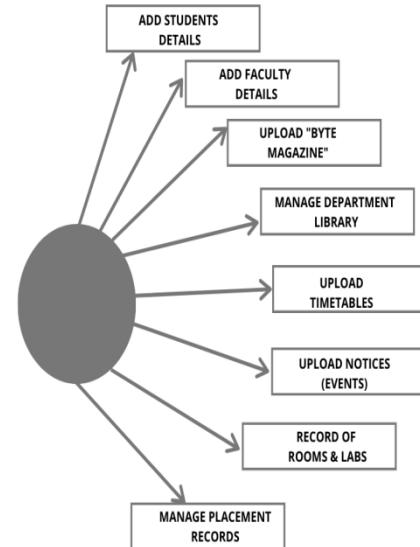
**FIG. 2. DFD LEVEL-0**



**FIG.3 DFD LEVEL-1**

**ACTIVITY DIAGRAM**

#### UML DIAGRAMS



**FIG.5 UML DIAGRAM FOR ADMIN**

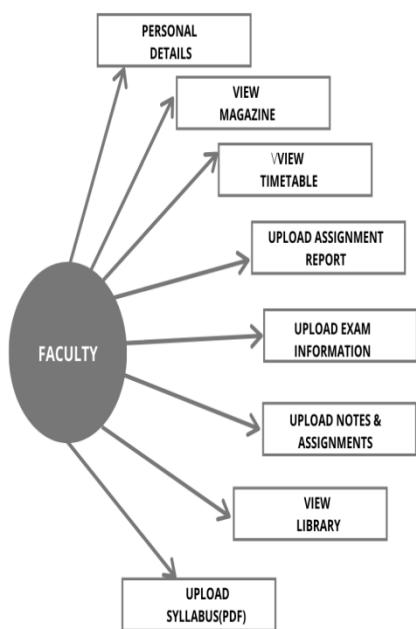


FIG. 6. UML DIAGRAM FOR FACULTY

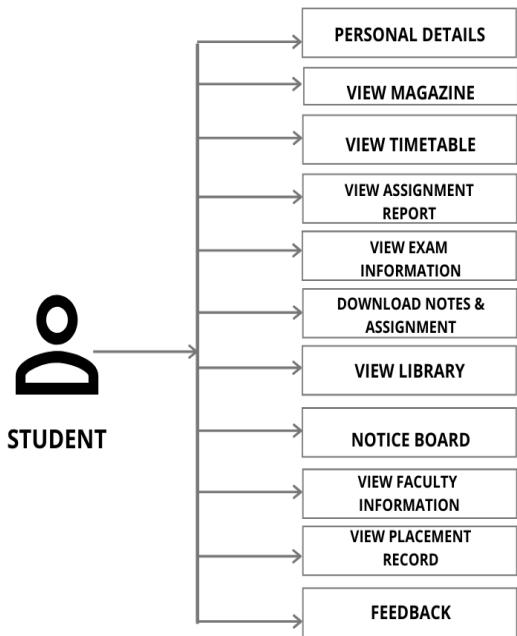


FIG.7 UML DIAGRAM FOR STUDENT

## VII. FUTURE WORK

1. Chatbot systems can be added for communication through applications
2. Development of Android app for the website.
3. Test for placement drives can also be added which will be designed according to the company requirements. (MCQ, Short questions etc).
4. Better animations with friendlier user interface.
5. Number of electronic devices (fans, lights or computer systems) in each class or lab will also be mentioned in room module.

## VIII. CONCLUSION

At present this system is only website based and do not have any such software for communication purpose.

It does not include information like how many computers are working within a lab or the defective ones.

Using the free express edition of SQL Server can limit how large your database files can be. SQL Server Standard edition has an upper limit of 524 petabytes, but it is not free.

If database reaches the limit of SQL Server Express Version, will begin to experience errors due to the inability of the database tables to accept new data.

## IX. ACKNOWLEDGEMENT

It gives us a great pleasure to present the report of the B.tech project undertaken during final year. We owe special debt of gratitude to professor SAPNA YADAV, Department of Computer Science and Engineering, IMSEC, Ghaziabad for her constant support and guidance throughout the course of our work. Her sincerity, thoroughness have been a constant source of inspiration for all of us. It is only her cognizant efforts that our endeavors have seen light of the day. We also take opportunity to acknowledge the contribution of PANKAJ AGARWAL, Head of Department of Computer Science and Engineering, IMSEC, Ghaziabad for his full support and assistance during the development of the project. We also do not like to miss the opportunity to acknowledge the contribution of all faculty members of the department for their kind assistance and cooperation during the development of our project. Last but not the least, we acknowledge our friends for their contribution in the completion of the project.



[https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=24604](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=24604)

13

## X. REFERENCES

- [1] Abhinav Sekhri, March 2020 Admission24  
[https://www.admission24.com/school-management?gclid=Cj0KCQjwwr32BRD4ARIaAJNf\\_0M\\_eQ808\\_8kEORNpUzdw12APKa2Dc6bF7FiYXk4h-Z4bUs9rLN5H6MaAjR9EALw\\_wc](https://www.admission24.com/school-management?gclid=Cj0KCQjwwr32BRD4ARIaAJNf_0M_eQ808_8kEORNpUzdw12APKa2Dc6bF7FiYXk4h-Z4bUs9rLN5H6MaAjR9EALw_wc)
- [2] Dino Espito, 2003, Programming Microsoft ASP.NET
- [3] Imar Spaanjars, March 2014, Beginning ASP.NET  
[www.w3c.com](http://www.w3c.com)
- [4] Microsoft Corporation, March 2009, Explore these tutorials to learn how to build C# programs and learn C# language features.  
<https://docs.microsoft.com/en-us/dotnet/csharp/tutorials/>
- [5] Lalit Mohan, June 2015, College Management System, International journal of computer applications, volume 122 issue no. 11  
[https://www.academia.edu/35401042/A\\_Research\\_Paper\\_on\\_College\\_Management\\_System](https://www.academia.edu/35401042/A_Research_Paper_on_College_Management_System)
- [6] A.V.Shivasane, Feb-2018, College Department Management System, International Research Journal of Engineering and Technology (IRJET), Volume 05 Issue 02  
<https://www.irjet.net/archives/V5/i2/IRJET-V5I250.pdf>
- [7] Suraj Jaiswal, 2019  
<https://thebytecse.000webhostapp.com/>
- [8] Kartiki Datarkar, April 2016, Online college management system, International Journal of Computer Science and Mobile Computing, IJCSMC, Volume 5, Issue no. 4, April 2016, pg.118 – 122  
<https://www.ijcsmc.com/docs/papers/April2016/V5I4201657.pdf>
- [9] Jigar Makhija, October 2015, IICT Department Mnagement website  
<https://www.slideshare.net/jigarmakhija/college-department-management-system>
- [10] Omkare Tiware, March 2018, College Activity Management system, International Research Journal of Engineering and Technology, Volume 05 Issue 03  
<https://www.irjet.net/archives/V5/i3/IRJET-V5I3205.pdf>
- [11] Archana R., June 2016, A NEW PRACTICAL APPROACH OF MANAGEMENT SYSTEM, International Journal of Engineering Applied Sciences and Technology, Vol. 1, Issue 7, ISSN No. 2455-2143, Pages 79-82  
<http://www.ijeast.com/papers/79-82,Tesma107,IJEAST.pdf>
- [12] S. Thuseethan, June 2014, Department Management System for Departments of Sri Lankan Universities, International Journal of Scientific and Technology Research 3(6), 173-175, 2014



# FITKIT ANDROID APPLICATION

Aashita Chhabra, Chitrang Tyagi

Department of Information Technology,  
Guru Gobind Singh Indraprastha University,  
Sector 16C, Dwarka, Delhi, 110078

**Abstract**— “Age is just a number” a quote that explains one can never get old if one follows proper healthy routine. With the initiatives taken by the government and various industries (Bollywood, Cricket etc) fitness is gaining popularity among the individuals. Smartphones and tablets are slowly but steadily changing the way we look after our health and fitness. Today, many high quality mobile apps are available for users and health professionals and cover the whole health care chain, i.e. information collection, prevention, diagnosis, treatment and monitoring. Our team has developed a mobile application called FitKit which is implemented using Android framework and is available for android users. Our app mainly focuses on fitness regimes inclusive of meals allotment, workout routine, chat support with experts from the fitness enthusiasts and tracking fitness activities like steps counter. Nowadays people ranging from teenage to adults i.e., from college students to even people in their old ages are becoming fitness freaks and are more concerned regarding their diets and fitness.

**Keywords**— Fitness, Android Application, Firebase, Steps Counter, Diet Chart, Workout Routine

## I. INTRODUCTION

“All progress takes place outside the comfort zone.” For a healthy life one has to plan everything in an organized manner i.e., placing meals at regular intervals, doing regular workout and exercises.

Fitness enthusiasts who follow fitness regimes uses various apps for tracking fitness activities like using workout routine app for designing their workout, using apps for designing their meals , using apps for tracking fitness like steps count and many people listen to music while doing workout hence using a separate app. **FitKit** provides all these features under one application only. Further our app also provides a chat with expert feature where one can ask for help regarding meals, designing custom workout routine and workout supplements. Our app uses the concept of BMI(Body Mass Index) for determining meals and workout. **BMI** is a person's weight in kilograms (kg) divided by his or her height in meters squared. The National Institutes of Health (NIH) now defines normal weight, overweight, and obesity according to **BMI** rather than the traditional height/weight charts.

### A. Application Fundamentals:

Android applications are written in Java programming language. However, it is important to remember that they are not executed using the standard Java Virtual Machine (JVM). Instead, Google has created a custom VM called Dalvik which is responsible for converting and executing Java byte code. All custom Java classes must be converted (this is done automatically but can also be done manually) into a Dalvik compatible instruction set before being executed into an Android operating system. Dalvik VM takes the generated Java class files and combines them into one or more Dalvik Executable (.dex) files. It reuses duplicate information from multiple class files, effectively reducing the space requirement (uncompressed) by half from a traditional .jar file. Dalvik was created to support the nature of lightweight mobile operating systems require because of the limited hardware capabilities compared to conventional desktops or laptops.

## II. LITERATURE SURVEY

Several applications have been developed regarding fitness. Applications like HealthyfyMe, GoogleFit are some of the popular apps related to fitness.

HealthyfyMe uses calorie counter, allocates diet plan, food tracker & calculator, eat healthy, lose weight. It aims at solving problems related to weight loss. Developed for both Android and iOS platforms, the **application** provides calorie tracking, water tracking and on-the-cloud fitness coaching. In addition to these, the **app** takes the gamified approach to keep users motivated.

**HealthyfyMe** works on a freemium model.

Google Fit is a health-tracking platform developed by Google for the Android operating system, Wear OS and Apple Inc.'s iOS. It is a single set of APIs that blends data from multiple apps and devices. It uses the sensors built into your device to automatically track activities like walking, biking and running. You can also use it to keep track of your **fitness** goals and weight-loss progress over the past day, week and month. The **Google Fit app** is available as a free download in the Play store.

Live a healthier, more active life with **Fitbit**, the world's leading **app** for tracking all-day activities, workouts, sleep and more. ... RECORD WORKOUTS: Use your **Fitbit** tracker to track your exercise, then check the **app** to see your stats, their impact on your day, and how your performance is improving.



**Nike Training Club** helps you reach your **fitness** goals. Get fit anytime, anywhere with free workouts across strength, endurance, yoga & mobility. ... **Nike Training Club** members love our short, bodyweight only workouts to get the results they want even when life gets in the way.

### III. METHODOLOGY

**FitKit** uses the concept of BMI for allocating workout and designing meals routine. BMI is calculated using the formula shown in fig. 1.

$$\text{BMI} = \frac{\text{Weight (Kg)}}{(\text{Height in metres})^2}$$

OR

$$\text{BMI} = \frac{703 \times \text{Weight (lb)}}{(\text{Height in inches})^2}$$

Fig. 1 BMI Formula

Further BMI is studied on the basis of four categories underweight, normal, overweight, obese.

TABLE I  
BMI CATEGORIES

Weight Status Category	BMI Range
Heavyweight	Below 18.5
Obese	18.5 to 24.9
Normal	25 to 29.9
Underweight	Above 30

Based on the categories mentioned in Table 1 our app shows to which category our user belongs to and then responds accordingly. However Steps Counter uses the concepts of sensors which can work if we place phone in our pockets or at any wrist bands so that it can sense our motion while we are moving because if we are going to place the phone in our bag or at any still position then our phone sensors won't work effectively. Meals will be allotted to users using the net calorific values of each item which will be then compared with the required calorific value content value which one must follow for being healthy and fit.

### IV. TECHNOLOGY

FitKit app is designed AndroidOS platforms and is designed using Android framework. We have implemented application using Android Studio which serves as IDE for android. As we know, Android is java based framework and uses XML for

frontend development. We have used the concepts like fragments, view pagers, floating action buttons, menu, splash screen etc. We have used **Firebase** Server for authentication and chat support. Firebase is a mobile and web application development platform developed by Firebase, Inc. in 2011, then acquired by Google in 2014. As of October 2018, the Firebase platform has 18 products, which are used by 1.5 million apps.



Fig. 2 Firebase

Firebase provides us a powerful tool, Firebase Authentication is most secured authentication among all servers like Php, Django. It provides us a concept of using Google Authentication, Email Verification, OTP based Mobile authentication and many more. Chat support is carried out using Real time Database and using database storage for sending pictures. For sending pictures over chat application we have used **Glide** library of github. For implementing the concept of Steps Counter we have used sensors and sensor manager. Steps Counter can work even when the app is in the background state.

### V. FUTURE SCOPE

There is always a scope of improvement in every application or industry practice that is carried out in the world however the need is to keep the practice as simple as possible so that even a non-technical user who doesn't have the technical knowledge regarding the field can adopt our practice.

In the future we can implement the concept of workout playlists in FitKit so that the retention of our app can improve. As we know about 90% of the people listen to music while doing workout so as of now user will use our app only when he/she is doing workout or when they want to check their meals but if we want to improve our app retention we can implement workout playlists so that whenever the person is doing workout they can use our app for listening music also thereby increasing the overall retention percentage of our app. We can involve various fitness enthusiasts to collaborate with us and work as an expert, so that they can guide our users more efficiently.

Also we can implement the concept of tracking user's record over the app so that he/she can compare their progress over



time. After implementing this feature one can decide their goals accordingly.

## VI. CONCLUSION

Few numbers of motivations has driven this research. **FitKit** application is designed to cater all the demands related to fitness like workout routines, diet allotment and tracking fitness activities like steps counter. Our app focuses more on developing core strengths by giving every individual the required maintenance range for Calories one the basis of their BMI. It is designed in such a way that even those having not sufficient knowledge of the domain can easily use it as its UI is very simple. Overall FitKit can guarantee of taking responsibility of each individual's fitness and healthy lifestyle.

## VII. ACKNOWLEDGEMENT

I would like to take the opportunity to acknowledge the support and help of all who have assisted me in the research. Without their contribution and advice, I would have never been able to progress with the work in the research. Firstly, I would like to sincerely acknowledge my research mentor Ms. Aashita Chhabra, for her guidance, support, technical knowledge and encouragement in the whole research process and work. The information and feedback provided were extremely helpful and useful for designing of mobile application.

## VIII. REFERENCES

- [1] Dawidowicz, Paula 2010 Literature Reviews Made Easy: A Quick Guide to Success. IAP
- [2] Gargenta, Marko 2011 Learning Android. O'Reilly Media, Inc.
- [3] ACSM Journal for Fitness and Workout Routines accessed on 19.6.2019.
- [4] Diet ,Nutrition and Workout related information from [www.bodybuilding.com](http://www.bodybuilding.com), [www.flex.com](http://www.flex.com) accessed on 19.6.2019
- [5] Android Related Information from <http://developer.android.com/guide> accessed on 15.6.2019.
- [6] Hello Android, Introducing Google Mobile Application Development Platform, ,Ed Burnette, Fourth Edition.
- [7] Developing Web Applications Using Firebase by <https://firebase.google.com/docs> accessed on 15.6.2019.
- [8] Goldberg, Kevin 2009 Visual QuikStart Guide. Berkeley, CA 94710 How to Display List of Images in ListView in Android? <http://stackoverflow.com/questions/459729/how-to-display-list-of-images-in-listviewin-android>, accessed November 4, 2013.
- [9] Jordan, Lucas, and Pieter Greyling 2011 Practical Android Projects. Apress.
- [10] Laycock, G. T. (1993). The Theory and Practice of Specification Based Software Testing. Dept of Computer Science, Sheffield University, UK.
- [11] Lee, B. W.-M. (2012). Android Application Development Cookbook. In Android Application Development Cookbook: 93 Recipes for Building Winning Apps. Indiana: John Wiley & Sons, Inc.
- [12] Parse. (n.d.). Parse documentation. Retrieved 2013, from Parse: [https://parse.com/docs/android\\_guide](https://parse.com/docs/android_guide)
- [13] St. Laurent, Andrew M. (2008). Understanding Open Source and Free Software Licensing. O'Reilly Media.
- [14] CnetJRE [http://download.cnet.com/Java-Runtime-Environment-JRE/3000-2378\\_4-10009607.html#ixzz2mLmJ28Kg](http://download.cnet.com/Java-Runtime-Environment-JRE/3000-2378_4-10009607.html#ixzz2mLmJ28Kg) accessed on 12.2.2019.
- [15] Android Architecture 2019[R/OL]. [http://www.cnmsdn.com/html/201003/1268713218ID2058\\_2.html](http://www.cnmsdn.com/html/201003/1268713218ID2058_2.html)