USAGE OF ASP.NET AJAX
FOR BINUS SCHOOL SERPONG WEB APPLICATIONS

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ABSTRACT

Today web applications have become a necessity and many companies use them as a communication tool to keep in touch with their customers. The usage of Web Application in current time increases as the number of internet users has been rised. For reason of Rich Internet Application, the desktop application developer was moved to web application developer with AJAX technology. BINUS School Serpong is a Cambridge Curriculum base International School that uses web application for access every information about the school. By using AJAX, performance of web application should be improved and the bandwidth usage is decreased. Problems that occur at BINUS School Serpong is not all part of the web application that uses AJAX. This paper introduces usage of AJAX in ASP.NET with C# programming language in web application BINUS School Serpong. It is expected by using ASP.NET AJAX, BINUS School Serpong website performance will be faster because of reducing web page reload. The methodology used in this paper is literature study. Results from this study are to prove that the ASP.NET AJAX can be used easily and improve BINUS School Serpong website performance. Conclusion of this paper is the implementation of ASP.NET AJAX improves performance of web application in BINUS School Serpong.

Keywords: ASP.NET, AJAX, web application, BINUS School Serpong

INTRODUCTION

Website is commonly owned by each organization. The website functions vary adapted to the purpose and needs of the organization. One is able to obtain timely and accurate information related to the organization and the various things that may not have been known, such as organization address and contact. The website can also be used as a promotion. Promotion is done in various ways, either through videos, photos, or articles that include advantages and benefits of the organization.

Bina Nusantara (BINUS) is a private organization in Indonesia that stirs in the field of education. One of the BINUS Group main strengths in creating and operating activities and academic services to BINA NUSANTARA Group stakeholders is the implementation of IT (one of them is a web application) in every aspect of the process of academic and academic support. IT Directorate Established in 1981 under the name EDP. In August 2005, BINA NUSANTARA Foundation decided to change the status of the IT department of the Directorate. IT Directorate is responsible not only for supporting BINUS UNIVERSITY but also all business units in BINUS Group. IT Directorate is now led by the Director of IT. Currently, IT Directorate is located on the campus Syahdan. The office is located on the 2nd floor of Building H.

BINUS School Serpong is part of BINUS Group which accepts students from kindergarten to high school. BINUS School Serpong has three web applications for students, parents, and staff. The applications are BINUSMaya School Student, BINUSMaya School Parent and Staff Desk.

BINUSMaya Student usually used by students in BINUS School Serpong to see class schedules, announcements and score. There was also a private message feature that serves as a notification to a particular student (specific) and attendance to determine the list of attendance. Features in BINUSMaya Parent is not much different from the BINUSMaya Student, only, parent could see all the children who attend school in BINUS School Serpong. BINUSMaya parent can also be used to order books online at a specific time period, payment can be by credit card or ATM BCA. Staff Desk is the main application used by the staff in BINUS School Serpong and is the main application of the 3 existing applications. Staff Desk can use to enroll new students, upload a book list, set the score of the students, and many more. In the future, staff desk will be replaced with BINUSMaya School Staff.

BINUS School Serpong uses ASP.NET as the standard for web development because ASP.NET is a unified Web development model that includes the services necessary to build enterprise web applications with minimal coding and offers a free licensing agreement. ASP.NET AJAX is a set of extensions to ASP.NET developed by Microsoft to implement AJAX functionality. ASP.NET AJAX is released under the Microsoft Public License (Ms-PL). AJAX also includes some basic components of server side to support asynchronous call coming from the client.

This paper discussed about the implementation of ASP.NET AJAX web applications in BINUS School Serpong as a method that can improve the performance of the web page so access to the information will be faster. The purpose of this paper proves that the ASP.NET AJAX implementation can improve BINUS School Serpong website performance and can be used easily.

METHODS

This research uses method of literature study and development using ASP.NET. The methodology of application development uses incremental model. Some terms and technologies used in this study are: AJAX, ASP.NET, ASP.NET AJAX, and some default control from AJAX. Some literature used as references can be found in the Bibliography.

Incremental Software Development

According to Pressman (2009) there are many situations in which initial software requirements are reasonably well defined, but the overall scope of the development effort precludes a purely linear process. In addition, there may be a compelling need to provide a limited set of software functionality to users quickly and then refine and expand on that functionality in later software releases. In such cases, you can choose a process model that is designed to produce the software in increments.

Referring to Figure 1, the incremental model applies linear sequences in a staggered fashion as calendar time progresses. Each linear sequence produces deliverable "increments" of the software in a manner that is similar to the increments produced by an evolutionary process flow.
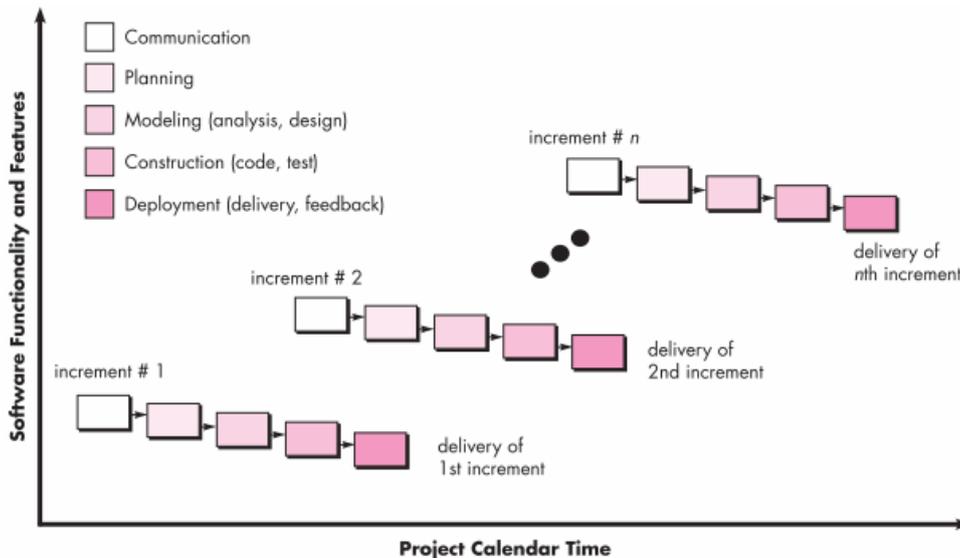
Figure 1 Incremental Process Model

For example, word-processing software developed using the incremental paradigm might deliver basic file management, editing, and document production functions in the first increment; more sophisticated editing and document production capabilities in the second increment; spelling and grammar checking in the third increment; and advanced page layout capability in the fourth increment. It should be noted that the process flow for any increment can incorporate the prototyping paradigm.

When an incremental model is used, the first increment is often a core product. That is, basic requirements are addressed but many supplementary features (some known, others unknown) remain undelivered. The core product is used by the customer (or undergoes detailed evaluation). As a result of use and/or evaluation, a plan is developed for the next increment. The plan addresses the modification of the core product to better meet the needs of the customer and the delivery of additional features and functionality. This process is repeated following the delivery of each increment, until the complete product is produced.

The incremental process model focuses on the delivery of an operational product with each increment. Early increments are stripped-down versions of the final product, but they do provide capability that serves the user and also provide a platform for evaluation by the user. Incremental development is particularly useful when staffing is unavailable for a complete implementation by the business deadline that has been established for the project. Early increments can be implemented with fewer people. If the core product is well received, then additional staff (if required) can be added to implement the next increment. In addition, increments can be planned to manage technical risks. For example, a major system might require the availability of new hardware that is under development and whose delivery date is uncertain. It might be possible to plan early increments in a way that avoids the use of this hardware, thereby enabling partial functionality to be delivered to end users without inordinate delay.

AJAX

According to Sabah (2011) Web applications refer to applications accessed via Web browser over a network and developed using browser-supported languages (e.g., HTML, JavaScript). For execution, Web applications depend on Web browsers and include many familiar applications such as online retail sales, online auctions, and webmail.

The recent explosion of Web 2.0 applications have changed user expectations regarding web experience. Users now expect web pages to behave like desktop applications, react to mouse movements and key strokes individuals and update only a small portion of a web page at a time. While a number of existing technologies to create Rich Internet Applicaton of the most popular and widely used is AJAX (Luce, 2008).

According to Dissanayake and Dias (2014), RIA applications can be described as a hybrid of desktop applications and web applications, inherit the good features of both types of application. Since web giants like Google and Facebook began offering a very rich feature set with increased interactivity and user experience through their RIA, user currently expects to feel the same wealth of features, in other web applications they use too. Environment has created a good demand for RIA design and development tools and techniques.

According to Kumar and Aravazhi (2013), in the International Journal on Recent and Innovation Trends in Computing and Communication, Asynchronous JavaScript and XML or AJAX, is a group of web development techniques interrelated used to create interactive web applications or rich internet application. With AJAX, web applications can retrieve data from the server asynchronously in the background without interfering with the display and behavior of the existing page. The use of AJAX has led to an increase in interactive animation on web pages. Data retrieved using the XML Http Request object, or through the use of Remote Scripting in browsers that do not support it. XML is a language that is defined by the World Wide Web Consortium, which is the body that sets standards for the Web. XML replace other markup languages, such as Hypertext Markup Language (HTML). In HTML all HTML elements that can be used is predetermined, whereas XML is a meta-markup language because it allows making our own Markup Language.

ASP.NET

According to Mishra (2014), ASP.NET is a unified Web development model that includes the services necessary to build enterprise web applications with minimal coding and offers a free licensing agreement. This is event-driven programming model and part of the .NET Framework. ASP.NET pages have access to the .NET Framework classes and web applications can be coded in any language that is compatible with the Common Language Runtime (CLR), including C # and VB.

ASP.NET AJAX

ASP.NET AJAX is a set of extensions to ASP.NET developed by Microsoft to implement AJAX functionality. ASP.NET AJAX is released under the Microsoft Public License (Ms-PL). One of the main changes AJAX Web programming brought is that it depends on the browser take a more active role in a process. Besides the browser only render HTML stream and execute special small block script, AJAX has some client-script library for facilitating new a synchronous call back to the server. AJAX also includes some basic components of server side to support new a synchronous call coming from the client. In fact there is a community supported AJAX Control Tool kit is available for ASP.NET AJAX implementation. In Figure 2 we can see the comparison and ASP.NET AJAX Library Extension for AJAX.
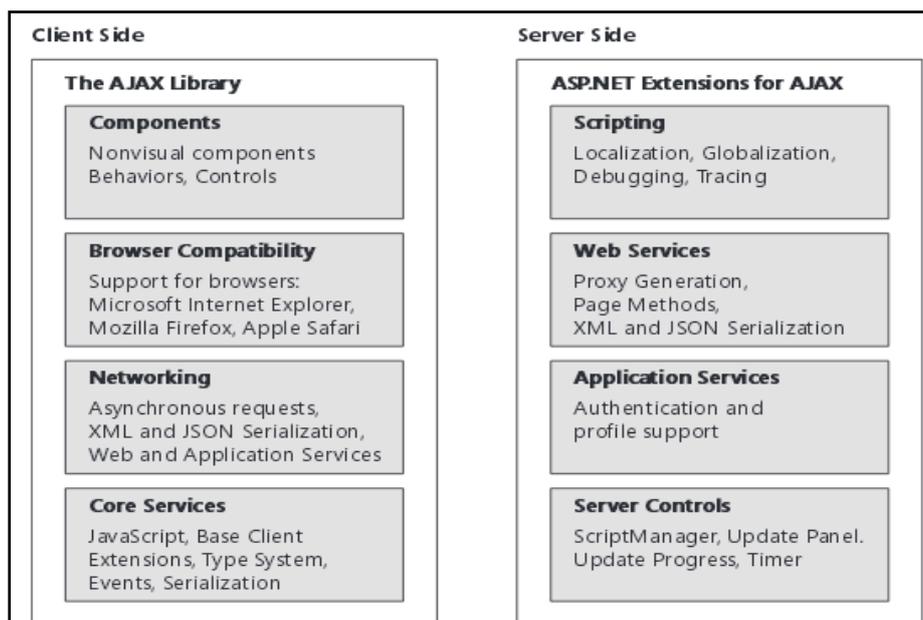
Figure 2 AJAX and ASP.NET AJAX

ASP.NETAJAX runs on the browser: (1) Microsoft Internet Explorer (Versi>= 6.0), (2) Mozilla Firefox (Versi>= 1.5), (3) Opera (Versi>= 9.0), (4) Apple Safari (Versi>= 2.0) and (5) Google Chrome. At first, AJAX seems to introduce some new complexities into ASP.NET programming. However, AJAX promises to produce a richer experience for the user. Due to the support of ASP.NET AJAX is almost no problem, additional complexity is reduced well. When building a website, there are several reasons that may be selected to use the ASP.NET AJAX.

First, ASP.NET AJAX UI introduces elements of website that is usually found in desktop applications, such as rectangle rounding, callouts, progress indicators, and popup windows running on different browsers. Second, AJAX introduces a partial update web page. With some of the refresh web pages that have been updated, the user waiting time is significantly reduced. This brings Web-based applications much closer to desktop applications related to the perception of the performance of the UI.

Third, AJAX supported by most popular browsers, not just Internet Explorer. AJAX runs on Mozilla Firefox and Apple Safari. Although it still requires some effort to balance the richness of UI and the ability to reach a wider audience, the fact that AJAX depends on the features available in most modern browsers to make it easier to balance is achieved.

Fourth, AJAX introduces a large number of new capabilities. While ASP.NET controls and page-rendering standard model provides great flexibility and extensibility to the web site programming, AJAX brings a new concept, namely the control extender. Attaching the extender control server-side controls that exist (such as TextBox, ListBox and DropDownList) at run time and add a new client-side appearance and behavior to control. Sometimes control extender can even call a Web service that has been established to obtain data to populate the list box. (eg, AutoComplete extender). Fifth, AJAX improves authentication, profiling and personalization services in ASP.NET Form. ASP.NET support for authentication and personalization gives a great advantage for Web developers.

Many ASP.NET AJAX support to be in a collection of server-side control output for AJAX-style rendering to the browser. The whole process ASP.NET page-rendering applications are broken down into small pieces. Each individual bit rendering is handled by a class derived from System.Web.UI.Control. The wholework of server-side control is to create an HTML element that puts output in the output stream so that they appear correctly in the browser. For example, the control ListBoxcreatea<select/>tag. TextBoxcontroltomakean<input type ="text" />tag. ASP.NET AJAX server-side control makes AJAX-style scripts and HTML to the browser. ASP.NETAJAXcontrols support consist of server-side script code along with the client.

Script Manager Control

Script Manager control manages the text source for the page. The main task is to register Script Manager control script AJAX Library with the page so that the client script can use system extensions. Script Manager also allow partial webpage rendering and supports localization and customuser script. Every site that wants to use the ASP.NET AJAX must include an instance of the Script Manager control on any page that uses AJAX functionality.

This is the most important in the case of the master page. Master page typically use Script Manager Control. However, ASP.NET throws an exception if there is a second Script Manager object found on a particular page Script Manager control through a proxy. Of course, as mentioned, this also applies to user control as well.

Update Panel Control

Update Panel is ASP.NET server control that update on a specific part of a web page without reloading. Through a mechanism called a synchronous postback, HTML webpage on the area covered by the control and then sent by the server a synchronously through the AJAX request.

ASP.NET controls that have been defined as the content in the Update Panel postbacks can cause both synchronous (traditional) or asynchronously, using the trigger/triggers. Trigger is an event that comes from ASP.NET control which causes the Update Panel to refresh the content of the update panel. Through the trigger, an asynchronous postback with the controls can be started also expressed outside the area covered by the ASP.NET page Update Panel control. ASP.NET code example with update panel:

```
<asp:UpdatePanelrunat="server">
<ContentTemplate>
<asp:ButtonID="btnPrintAttendance"runat="server"CssClass="button"Text="Print Attendance Form"
onclick="btnPrintAttendance_Click"/>
</ContentTemplate>
<Triggers>
<asp:PostBackTriggerControlID="btnPrintAttendance"/>
</Triggers>
</asp:UpdatePanel>
```

In the above code, there is a button inside update panel with id btnPrintAttendance, and to be able to download files from the server, it is necessary to trigger that triggers the update panel to update/refresh its content so that the file can be downloaded.

Update Panel control supports partial page updates by tying certain shared server side controls and the events that cause them to make. Update Panel control causes some parts of a webpage to refresh instead of whole pages (as happens during a typical HTTP postback).

Update Progress Control

Update Progress control provide status information on the page in the partial renewal of the Update Panel control. You can customize the Update Progress control default content and layout. To prevent flashing when partial-page updates are very fast, you can specify the delay before the Update Progress control is displayed (Shepherd, 2010).

RESULTS AND DISCUSSIONS

Figure 3 shows the software development process, where in the first increment, AutoCompleteExtender and ScriptManagerControl implemented, in the second increment, CalendarExtender and UpdatePanelControl, and the last is ModalPopupExtender.
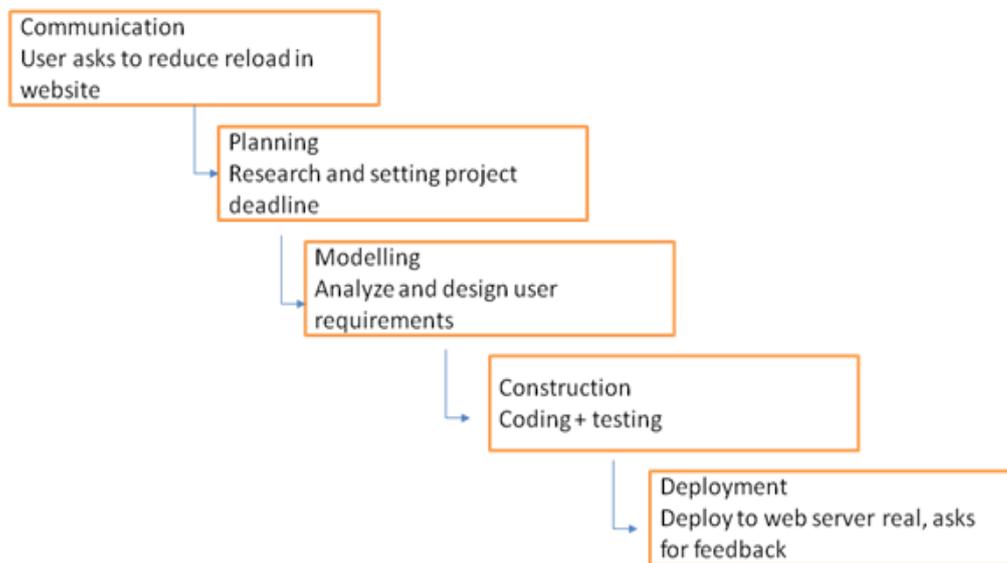
Figure 3 Software Development Process

As seen in Table 1, there are some features that can be used easily to improve website performance in BINUS SCHOOL Serpong Web Application.

Table 1 BINUS SCHOOL Serpong Web Application Line of Code

Feature	Line of Code
AutoCompleteExtender	30
CalendarExtender	15
ModalPopUpExtender	15
ScriptManagerControl	5
UpdatePanelControl	15

AJAX Control Toolkit

AJAX Control Toolkit which are used in BINUS SCHOOL SerpongWeb Application is Modal Pop Up Extender and some Auto Complete Extender. At the staff desk at this time, there are still many usage of Calendar Extender, but in BINUSMaya School Staff, calendar extender will be replaced with a new design and not using the AJAX Control Toolkit anymore.

Auto Complete Extender

Auto Complete Extender only used on some of the modules in BINUSMaya School which is quite a lot of data. Its use is associated with its autocomplete Text Box and look much like google search, it's just that the design using the BINUSMaya School design. Here is an example of using the Staff Desk website, namely the use of the staff desk Auto Complete Extender(Figure 4) and the BINUSMaya School Staff (Figure 5).

Figure 4 Example Usage of Auto Complete Extender in Staff Desk Website

Figure 5 Example Usage of Auto Complete in BINUSMaya School Staff Web Page

Calendar Extender

Calendar Extender usually used in conjunction with a TextBox, so that when the date has been chosen in Calendar Extender then the date will appear in the predetermined TextBox. Its format could be arranged, the staff desk to usedd/MM/yyyyformat, ie day, month, and year. The date format needs to be considered because, it technically will change how background code reading the date format if the date format changes. The following example of applicability Calendar Extender BINUS School Serpong staff desk website (see figure 6).
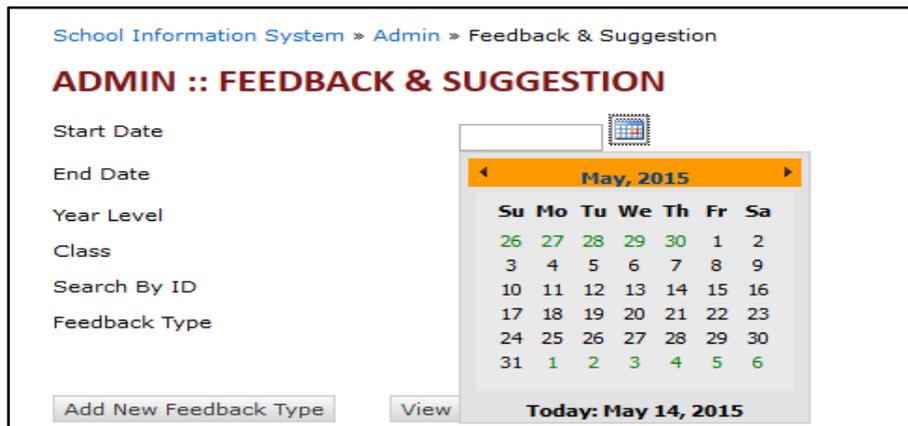
Figure 6 Usage of Calendar Extender at Staff Desk Website

Modal Pop Up Extender

Modal Pop Up Extender normally used associated with button/link button and ASP.NET Panel. So when the user click on a button/link button, then a Modal Pop Up Extender can be displayed. The example can be seen in Figure 7 (staff desk website) and in Figure 8 (BINUSMaya School Staff website)
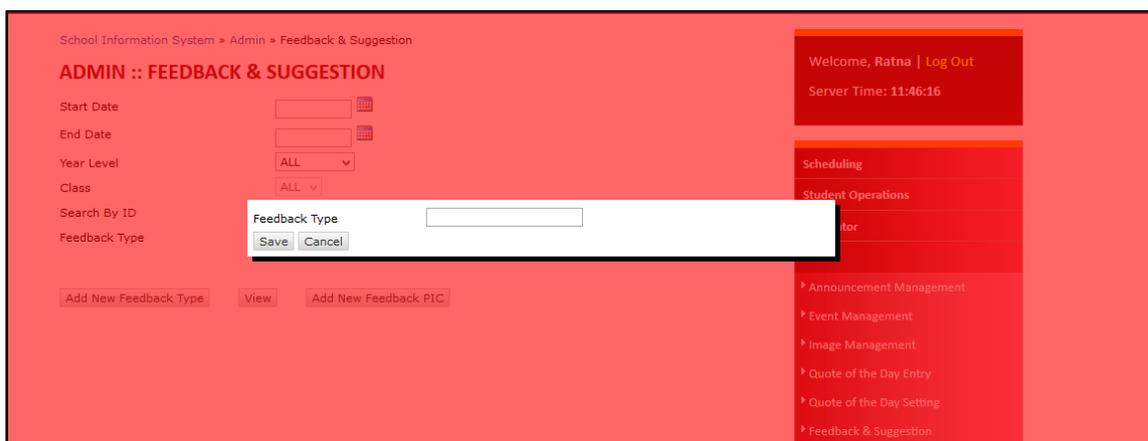
Figure 7 Usage of Modal Pop Up Extender at Web Staff Desk
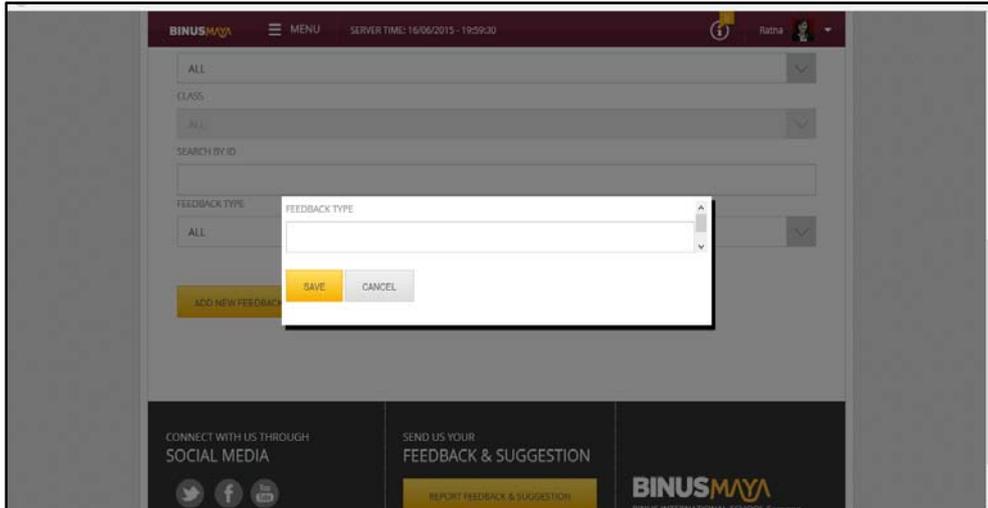
Figure 8 Usage of Modal Pop Up Extender at BINUSMaya School Staff

Script Manager Control

Script Manager Control used in the master page on BINUSMaya School and is used to register all the scripts that will be used on the master page in BINUSMaya School so that the entire page that uses the master page will automatically use the scripts that have been registered in the Script Manager Control. Usually these scripts are scripts that are used to design a website that would be used on any webpage in BINUSMaya School.

Update Panel Control

Update Panel Control is also used in the masterpage so that every postback on the page, the Update Panel will be updated/refreshed. Its use is followed by Content Template tag which is useful to determine which parts of which will be updated when the Update Panel is running. Also, Trigger is normally used when there is a function associated with the file download /upload. Without Trigger, files can not be uploaded/downloaded. In Figure 9, it can be seen loading display on the BINUSMaya School Staff web page.
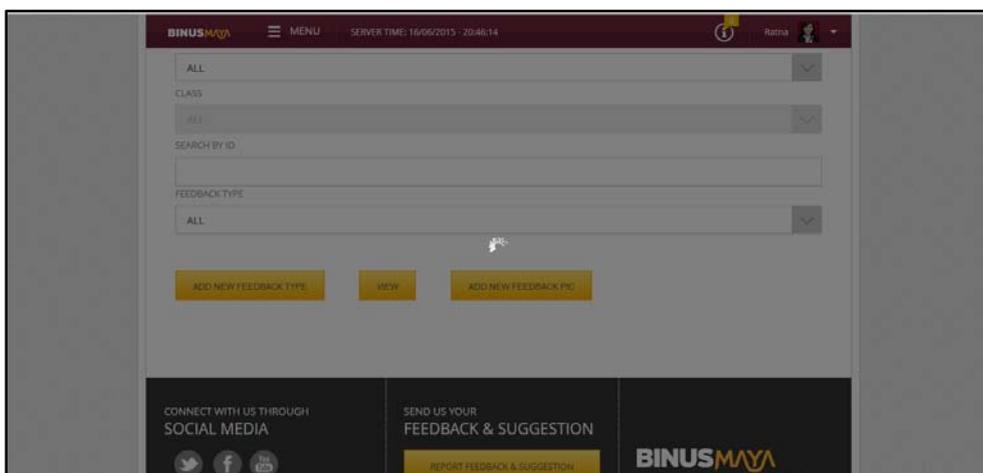
Figure 9 Loading after Button Click and Usage of Update Panel at BINUSMaya School Staff

CONCLUSIONS

BINUS School web applications uses many AJAX Control Toolkit features, among others Auto Complete Extender on the module and the SCP Create Create Exploration Week, Calendar Extender on Feedback and Suggestion and Modal Pop Up Extender on Feedback and Suggestion. Besides, it can use other features such as Update Panel on the master page to save bandwidth and speed.

By using Auto Complete Extender on BINUS School web application, then when the user uses the Create SCP and Create Exploration Week modules, users only need to remember one keyword only to input the data so it does not need to look further names will be input because there are auto complete the serves as a suggestion to the data in the input. Another feature is Calendar Extender the one used on the Feedback and Suggestion module. Calendar Extender allows a user to select a date without confusion with the date format should be in input and also minimizes typing errors, because with the calendar, the user can more thoroughly by looking at the calendar month and year. Next is the Modal Pop Up Extender feature of the AJAX Control Toolkit which enables the use of popup on the BINUS School web page.

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