

The “Bleeding Edge” of SMS/PSM Technology

Tom Drake
Chief Executive Officer
The Drake Group/MESHsystems
Prosper, TX

Introduction

The author has purchased, implemented, designed and built Safety Management Systems (SMS) and Process Safety Management Systems (PSMS) for over 30 years as part of his field and corporate HES/PSM responsibilities. Additional experience with the implementation of SAP and EPA systems also brings an understanding of systems.

As a result of this experience, the author has revealed many important SMS/PSM system features and issues. This paper provides an overview of the technology available to develop a SMS/PSM system utilizing the latest “bleeding edge” technology.

Evolution of SMS/PSM Systems

Building an incident reporting system in the late 1970s with Fortran and using punch cards produced results that actually worked well because the program was fairly simple and not yet loaded with copious amounts of code. As programming languages got more complex, the features increased, but so did the complexity. This complexity made systems limited and fragile.

It seems that the components of any SMS/PSM system exist to have “features” added, or as it is sometimes called “feature creep.” Features are great until they start to provide so much complexity that the system crashes or is hard to use.

Simple and complex systems exist today but all fall into one of three general categories:

Off-The-Shelf – The prices of these systems range from low to high, but the universal issue is they typically cannot be modified to fit the organization’s needs. In essence, the organization must adapt to the software.

Custom – Getting exactly what is needed is best when the program is custom, but the time and expense are high.

Hybrid – A hybrid system provides the best features of Off-the-Shelf and Custom. This approach provides sufficient content and design to reduce development time, but also allows for custom features that meet the specific needs of the organization. This is analogous to buying a house and getting to pick the cabinets, color, etc.

Newer systems have advanced code that allows custom or hybrid programming to be done much easier than in the past. This is especially true of applications that utilize the Internet. There are

Database Technology

The database is the key component for managing information and many exist from simple ones such as Microsoft Access or FileMaker to advanced ones like SQL Server or Oracle.

Choosing the proper database from the many that are available is oftentimes a choice of what is supported by the company. Other important considerations are the maximum database size and number of concurrent users. Databases have matured, and when programmed properly are robust, stable and perform their computations rapidly.

SMS/PSM systems contain substantial amounts of data so the choice of the database is very important. An undersized and poorly designed database can cause major problems as the system grows. This is especially true of Process Safety information for larger facilities where the sheer volume of equipment, processes and activities provide massive data requirements.

Internet Technology

The Internet has opened a whole world for capabilities to the SMS/PSM enterprise, and facilitates interconnectivity and interactivity of information. While the Internet originally was a medium to present websites and email, it has matured to provide critical business applications.

There are many powerful software solutions used for developing Internet applications, such as Ajax, ASP, Perl, PHP, and DreamWeaver, and they have been a vital part of the Internet revolution. But what technology is the right one for a large and expanding SMS/PSM system? The answer may come in a “Flash.”

Flash and Rich Interface Applications (RIA)

Probably the most exciting progress has been with the RIA, which are popular because they deliver improved user satisfaction that keeps pace with increasing user expectations. As we become more sophisticated computer users, there is always a need for better operating and visual design.

Adobe Flash was introduced in 1996 and has added animation and interactivity to web pages. The Flash Player needed to view flash files is installed in 99% of all Internet-enabled computers. With the success of Adobe Flash, Adobe released Adobe Flex 3.0 in 2008, which is essentially Flash for applications. It has been used for sites such as Sony Ericsson, Yahoo and Sherwin-Williams. There are also other RIAs available such as Microsoft Silverlight.

Rich Interface Applications is the “bleeding edge” technology available today. I believe the advantages of the Adobe Flex RIA are the future. The immediate acceptance and activity are proving that this platform can effectively manage the needs of an enterprise level SMS/PSM system.

Any Computer, Any Browser with the Flash Player

One of the major irritations of using websites is that different browsers handle html differently. For example, if you have experienced viewing a website in Internet Explorer and then tried to view it in Firefox, Safari, Opera, etc., you may have noticed that words and pictures do not look the same. Each of these browsers reads the html code used to build the website in different ways.

Flash and Flex do not have this problem because they use the free Flash Player to display information. This means the application can play on ANY computer and ANY browser and is a major advantage of this technology.

Speed

It is all about speed and no one likes to wait for a slow-loading web-based application.

Early attempts to use web-based applications were oftentimes disappointing, as slow loading was disruptive to the user experience. Broadband service has expanded and every year the connections get faster and more reliable.

Slow performance can also be caused by the application. When incident information is entered, it is sent to the application on the server, then manipulated. The new page is constructed and sent back to the browser. This can mean that everything on the page will be reloaded again; text, pictures, etc.

A significant speed increase occurs when only the information that needs to change will change. This is especially important when the Internet connection is poor. The SMS/PSM system utilizing Flash and Flex will refresh only the items on the page that have changed and uses a very smart loading/streaming approach to content delivery. This ensures quick delivery of content to speed up the upload and download of information.

Interactivity

One of the problems, especially with Off-The-Shelf software, is the failure to interact with each other. In a SMS/PMS system, this is especially important.

As an example of interactivity, “Actions” may come from many sources, such as incident investigations, audits, inspections, hazard analysis, management of change, etc. These actions come to a single place and then can be communicated and managed by email, desktop notification, etc.

If the systems are operating independently, they probably cannot coordinate their data.

User Experience

User experience design is increasing in importance as users become more sophisticated.

Morville (2005) describes the User Experience Honeycomb that shows what users expect from a system. These are valuable objectives if the systems are to be a success.

Useful – Always evaluate the systems and be able to develop innovative solutions to make them more useful.

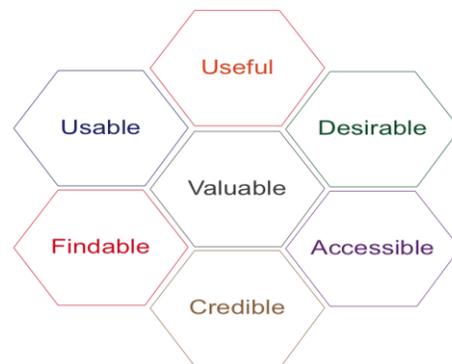
Usable - Usability, ease of use, is necessary.

Desirable - Image, identity, and brand are all parts of emotion design to keep in mind before sacrificing for efficiency.

Findable - Build navigable sites that help users find information easily and quickly.

Accessible - It's the ethical and legally required thing to do.

Credible - Design elements do influence whether or not a user will trust and believe the



information presented.

Valuable - The user experience must advance the mission of the organization.

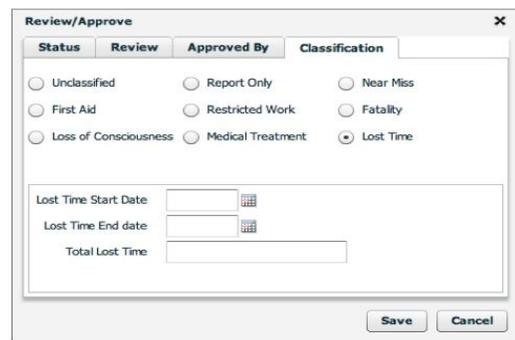
Navigation is one of the main usability elements and must work simply and efficiently. Whatever navigation design is chosen, it must be consistent across the entire system.

The use of Flash can provide some dramatic and fast navigation styles that are not only efficient, but can be visually appealing.

Real Time

Data needs to be displayed in “Real Time.” When an incident is classified as a Lost Time or other classification, all charting and reports need to be instantly updated.

Automatically keeping all incident rate calculations and other metrics in real time allows monthly, annual, or other reports to be available on the date needed or on an ad hoc basis. This is a great time saver when departments must manipulate data from many locations into the “management reports.”



The screenshot shows a 'Review/Approve' dialog box with a close button (X) in the top right corner. The dialog has four tabs: 'Status', 'Review', 'Approved By', and 'Classification'. The 'Classification' tab is active. It contains three rows of radio button options: 'Unclassified', 'Report Only', and 'Near Miss' in the first row; 'First Aid', 'Restricted Work', and 'Fatality' in the second row; and 'Loss of Consciousness', 'Medical Treatment', and 'Lost Time' in the third row. The 'Lost Time' option is selected. Below the radio buttons are three input fields: 'Lost Time Start Date' with a calendar icon, 'Lost Time End date' with a calendar icon, and 'Total Lost Time'.

Modular Design

A modular design allows an organization to select the modules they need, mix and match modules and add new modules as needed. With a comprehensive SMS/PSM system, the implementation may need to be done in stages, so a modular design is a crucial capability of the system.

Interactivity of modules is an important feature so the modules need to work together, no matter when or in what order they are added.

An example involves providing project information to contractors. The Contractor module can benefit from procedures obtained from the procedures module and from MSDSs obtained from an MSDS library. These important modules can be very effective when synchronized.

Notifications

Important actions require timely notification of individuals.

When a user logs onto a system, information requiring attention must be prominently displayed. These actions are extremely important in timely resolution of issues that could lead to incidents.

One method is to have the system send email to inform a person of a pending activity. However, a common complaint is that users are receiving too many emails and adding SMS/PSM actions makes the number being managed worse.

A better solution is to use Desktop Notification where the action is sent to the desktop. This is a very convenient way of managing notifications and also has the advantage of allowing actions to be managed without having to log into the SMS/PSM system. By making this activity easy, the actions will be managed more effectively, thus increasing safety and decreasing “smoking guns.”

Internal and External System Access

While users from the company obviously need to log into the systems, there are occasions when an external user may need to log in. An example of this is with contractors. The contractor can use a secure login to enter and update “Pre-qualification Information.” This can be a major time saver for companies managing many contractors. It also makes it easier for the contractor to keep information up-to-date.

The company can also prepare all contractor project information, and the contractor can access it through the same login. Not only does this increase the efficiency of the contractor management process, but also provides an efficient “paper trail.”

Using Off-line

RIA systems, such as Adobe Flex, have the ability to operate online and offline where the Internet connection is slow or non-existent. Adobe Integrated Runtime (AIR) runs outside the browser in a very light application that has all the features of the Flex application. When an Internet connection is made, the data is synchronized. AIR applications are currently being used by eBay, Yahoo, Nickelodeon, NASDAQ to name a few.

An example is when conducting an Audit where the Auditor will run the Audit AIR application in the field. Before doing the audit the application updates all questions and other data. The audit is conducted using the same screens as the live system and the information is uploaded as soon as the connection is made.

Another example is with eLearning where the AIR application can be installed on a desktop or laptop, and the eLearning session is conducted without logging in. This makes all slides, movies, and sound play instantly, so it is not only convenient, but provides speed.

Enterprise-Grade Hosting Facilities

Enterprise applications delivered through the Internet require powerful and efficient hosting facilities and equipment. While some companies will host systems within their own facilities, many companies prefer to host externally. These modern facilities provide enhanced security, firewalls, power, air conditioning, fire prevention and Internet services.

IT Departments can make outstanding partners but some do not come on board for various reasons. An externally hosted system can be an answer where the group using the system wants to do so without interference by their IT department.

Globalization

Many companies have a global presence, so the system must accommodate other languages with different alphabets and characters.

A computing standard called UNICODE is used to facilitate multi-languages, which allows a single SMS/PSM system to be used. Without this capability, a system would have to be

developed for each language. The ability to have users in various countries utilize the system in their native language greatly helps with acceptance and accuracy of the information being entered.

Mobility

The use of mobile devices, such as Tablet PCs and Smart Phones, should be a part of any advanced system. All these devices need is a Flash Player and the system can run on them and greatly enhance their use in field locations.

GPS, RFID and Satellite Communications

There are many new technologies being introduced and being able to integrate them into the SMS/PSM system is becoming increasingly more desirable. Tracking of assets with GPS, RFID and Satellite systems is especially exciting.

An example is the use of employee badges with GPS and RFID chips. When an emergency occurs, all employees and contractors can be tracked for an evacuation count in real-time. This would virtually eliminate the problems associated with a manual evacuation or muster count.

There are also chips developed to do noise dosimetry and toxic gas monitoring. With these badges the Industrial Hygiene sampling program can be greatly expanded as well as the real-time monitoring of hazards. These new technologies are providing opportunities not possible only a couple of years ago.

In Summary

The SMS/PSM Enterprise systems can be complex and contain vast amounts of data. There is redundancy between a Safety Management System and a Process Safety Management system so thought must be given to utilizing the best applications and design. The Rich Internet Application (RIA) provides the bleeding-edge system needed to manage these vast enterprises, especially in an Internet environment. Adobe Flex and Microsoft Silverlight are leaders in this exciting technology and are available today. With staff reductions and other business reductions, SMS/PSM information management must be powerful, yet frugal. Fortunately, there are solutions that meet these challenges by utilizing “bleeding edge” RIA technologies,

Bibliography

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