Extending the solicitation management system: User interface improvement and system administration support

Kun-Che Chen

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EXTENDING THE SOLICITATION MANAGEMENT SYSTEM: USER INTERFACE IMPROVEMENT AND SYSTEM ADMINISTRATION SUPPORT

A Project
Presented to the
Faculty of
California State University,
San Bernardino

In Partial Fulfillment
of the Requirements for the Degree
Master of Science
in
Computer Science

by
Kun-Che Chen
June 2008
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Approved by:

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Dr. David Turner, Chair, Computer Science
Dr. Arturo Concepcion
Dr. Ernesto Gomez

Date: June 3, 2008
ABSTRACT

Solicitation Management System (SMS) is a system built to facilitate the processing of grant proposal solicitations. The SMS was first built in 2004 and was primarily used by the Office of Technology Transfer and Commercialization (OTTC), CSUSB for its solicitation activities. This time, for the 2008 Solicitation, which officially opened on 28 Jan 2008, SMS was extended and maintained to support not only OTTC, CSUSB, but also the Center for the Commercialization of Advanced Technology (CCAT), San Diego State University. This system is built with five user roles in mind. They are the administrator, officers, staff members, evaluators, and applicants. The administrator creates officer member accounts; the officer creates staff member accounts; evaluators and applicants register themselves into the system.

In addition to basic Web page form processing, the system contains a document conversion server that converts Word documents to post script documents. The document conversion service is implemented in Windows, and is accessed from the Web application using TCP sockets. In this system, we use the Oracle database server to maintain persistent data.
ACKNOWLEDGMENTS

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CHAPTER ONE
INTRODUCTION

1.1 Purpose

The main purpose of this project is to develop new functionalities for the Solicitation Management System to support OTTC, CSUSB and CCAT, SDSU for the 2008 solicitation, which opened on 28 Jan 2008. The new version of the SMS is more user friendly, so that it is easier for users to use and comprehend. The new functions include uploading solicitation announcements, instructions and proposal templates during the creation of new solicitations. Also, new functionality includes the generation of various reports in PDF format, and the development of additional attributes for submitted proposals. Implementation of this project was coordinated with Chia-Ming Chang's M.S. project.

1.2 Scope

The scope of this project includes creation of new PDF reports, addition of tracks and classes, re-organization of the user interface and upload facilities for solicitation announcements, instructions and proposal templates. So, the revised SMS will include all the functionalities of the current system plus additional functionality. These new
functions have been requested by CCAT and OTTC staff. Additionally, the scope of work includes re-factoring code to improve maintainability.

1.3 Definition and Abbreviations

SMS - Solicitation Management System.

OTTC - Office of Technology Transfer and Commercialization. It is an office that assists in transitioning promising new technologies from government and academic laboratories alike into full commercialization.

CCAT - Center for the Commercialization of Advanced Technology. It is a program that offers clients a number of services designed to expedite the transition of new technologies to the marketplace or to the government for defense or homeland security-related acquiring purposes.

Apache - An open source Web server. The source code is freely available, anyone can adapt the server for specific needs, and there is a large public library of Apache add-ons. In many respects, development of Apache is similar to development of the Linux operating system. The original version of Apache was written for UNIX, but there are now versions that run under OS/2, Windows and other platforms.

API - Application Programming Interface.

HTML - Hyper Text Markup Language.
**Java** - An object oriented language developed by Sun Microsystems, Java programs can run on most popular computer platforms without recompilation.

**Java Servlet** - A Java application that runs in a web server or application server. It provides server-side processing which usually is used to access a database or perform e-commerce processing.

**JSP** - Java Server Page, an extension of the Java server technology from Sun that provides a simple programming vehicle for displaying dynamic content on a web page.

**JDBC** - (Java Database Connectivity) is a programming interface that allows Java applications to access database through the SQL language.

**MySQL** - MySQL is a software that delivers a very fast, multi-threaded, multi-user, and robust SQL (Structured Query Language) database server.

**Tomcat** - Tomcat is an application server from the Apache Software Foundation that executes Java servlets and renders Web pages that include Java Server Page coding. Described as a “reference implementation” of the Java Servlet and the Java Server Page specifications, Tomcat is the result of an open collaboration of developers and is available from the Apache Web site in both binary and source versions.
UML - Short for Unified Modeling Language, a general-purpose notational language for specifying and visualizing complex software, especially large, object-oriented projects. UML builds on previous notational methods such as Booch, OMT, and OOSE.

Use Case Diagrams - A diagram provided by the UML to facilitate the process of requirements gathering. The use-case diagram models the interactions between the system’s external clients and the use cases of the system. Each use case represents a different capability that the system provides to its clients.

1.4 Overview

The Solicitation Management System (SMS) was built to facilitate the processing of grant proposal solicitations. The system created within this project comprises the third version of SMS, and was developed collaboratively with Dr. David Turner, Yu-Luen Lin, Xinsheng Chen, and Lu-Yi Wu.

Version one of the SMS was built by Dr. Concepcion, Dr. David Turner, Rajiv Sadagopan and Sathya Prasad. This version was used in a small demonstration project by the Office of Technology Transfer and Commercialization (OTTC) to run a grant proposal solicitation. The subsequent version, version 2, was built by Dr. Concepcion, Dr. David Turner, Rick Pallow and
Jonathan Wang. SMS version 2 was the system in production at the time this project started, and is used to run regular grant proposal solicitations.

Version 2 has been in production for some time now and some feedback has been given by the users for improvement. The work defined in this project is designed to satisfy user needs expressed in this feedback.
CHAPTER TWO

OVERALL DESCRIPTION

The purpose of this software is to aid the processing of a solicitation for organizations that conduct solicitations for grant proposals. It has been specifically build for the Office of Technology Transfer and Commercialization, CSUSB and the Center for Commercialization of Advanced Technology, SDSU.

2.1 Product Perspective

This system was initially built to aid the solicitation procedure for OTTC. Within this project, we have expanded the system, so that it also serves the needs of the OTTC's sister organization CCAT. In fact, SMS has the potential to serve as a general purpose solicitation management system that can be used by other organizations as well.

This system is currently being used by OTTC to manage the submission and evaluation of grant proposals. An improvement in processing speed along with newly added functionalities can make this system more user friendly and more productive.

2.1.1 System Interfaces

The deployment diagram of the SMS is shown in Figure 1. It consists of four components. These are: the client machine, the web server, the database server and the Word-to-
post script conversion server. When the user wants to access our system, the client machine connects to the Web server through the HTTPS protocol. The Web server then connects to the database server through the TCP protocol to verify login and process information. The Web server also connects to the document conversion server through the application-specific protocol when the user uploads a Word document.

![Deployment Diagram](image)

Figure 1. Deployment Diagram

2.1.2 User Interfaces

Each user logs in using a user name and password, and is redirected to his home page according to his role. From his home page, the user can access functions of the system that are specific to his role. The user interface consists of roughly 150 Web pages due to the large scale of this system.

2.1.2.1 Login Page. The main user login page, shown in Figure 2, is the main entry to the Solicitation Management
System. The main page simply consists of a login page for all users. On top of the login page, there is a banner that shows the agency logo. Users of the Solicitation Management System can log themselves into the system through this page. After a successful login, users are redirected to their homepage according to their user role. In situations that users forget their password, they can use the “forgot password” link to reset it.

Figure 2. Solicitation Management System Login Page
2.1.2.2 Registration Page. Registration is the page shown in Figure 3 where potential applicants and evaluators can register themselves to the solicitation management system. The user is prompted to fill in some personal information during the registration process. After the user successfully registers, the user will be redirected to his home page.

Figure 3. Registration Page

Figure 4 and 5, as shown below, is the page of the evaluator registration. On this page the user is asked to enter his personal information, such as name, address, phone,
etc. Then an email, username and password. For precautions, the user is asked to type his password twice in case a typo occurs.

Figure 4. Evaluator Register Wizard
Figure 5. Evaluator Register Wizard (continued)
Figure 6 shows the first page of the evaluator selecting Areas of Expertise sequence. The user will be asked to specify whether he is a technology reviewer, a business reviewer, or both a technology and business reviewer before he starts the evaluation.

Figure 6. Evaluator Selecting Areas of Expertise Wizard, Page 1
Figure 7 is the second page of the evaluator selecting Areas of Expertise sequence. The user is asked to specify his technical areas of expertise on this page.

Figure 7. Evaluator Selecting Areas of Expertise Wizard, Page 2
Figure 8 is the last page of the evaluator selecting areas of expertise sequence. The user is asked to specify his business areas of expertise in the case that he identified himself as a either a business reviewer or both a business and technical reviewer.

Figure 8. Evaluator Selecting Areas of Expertise Wizard, Page 3

2.1.2.3 User Home Page

The home page is the first page that the user sees after he logs in. From this page, the user can find links to all the functions that are provided for his user role.
Figure 9 is the administrator home page. From this page, the administrator can access all the functions that are available to him.

**Figure 9. Administrator Home Page**
Figure 10 is the officer home page. From this page, officers can access functions that are specific to their user role. On this page, the officer sees a list of all solicitations in the system.

Figure 10. Officer Home Page
Figure 11 shown below is the staff home page. From this page, staff members can access functions that are specific to their user role. On this page, the staff member sees a list of all solicitations in the system.

Figure 11. Staff Home Page
Figure 12 shown below is the evaluator home page. From this page, evaluators can access functions that are specific to their user role. On this page, the evaluator sees a list of work assigned to him.

![Evaluator Home Page](image)

Figure 12. Evaluator Home Page
Figure 13 shown below is the applicant home page. From this page, applicants can access functions that are specific to their user role. On this page, the applicant can see all open solicitations that he can apply.

Figure 13. Applicant Home Page

2.1.3 Hardware Interfaces

The system does not require specific hardware interfaces. The only requirement is that the client has a computer that can access Internet. Therefore, any operating system running
on any hardware architecture will be available to access the system.

2.1.4 Software Interfaces

The system is designed to run on the Windows server 2003 with Microsoft Office 2003 installed and the document conversion server also.

2.1.5 Communications Interfaces

The project is a Web-based program, and the interface could be open from any Web browser such as Mozilla Firefox and Internet Explorer.

2.1.6 Memory Constraints

The primary memory for the solicitation management system should be at least 256 MB. The size of the secondary storage depends on the software installed and the database that will hold all records. An initial estimate indicates that at least 20 GB will be needed.

2.1.7 Operations

The scheduler will operate 24/7. Backups can be done of the database using the Oracle export of the database once a month. Maintenance will be done on call, and mostly remote.

2.1.8 Site Adaptation Requirements

The solicitation management system does not have any site adaptation requirements.
2.2 Product Functions

This product includes several functions. This section provides the use cases to illustrate the interactions between the active users and the system.

![Use Case Diagram]

Figure 14. Solicitation Management System Use Case Diagram
2.3 User Characteristics

The SMS system facilitates the processing of a solicitation. It serves users from five different role groups. These roles include applicant, evaluator, admin, officer, and staff.

2.4 Constraints

The constraint for this project is that the system can handle 70-80 solicitations at the same time but we don’t know if it can handle 100 or more. More capacity testing is needed.

2.5 Apportioning of Requirements

No requirements specified in this software can be delayed until a future version without prior permission of the client.
CHAPTER THREE
SOFTWARE REQUIREMENTS SPECIFICATION

3.1 External Interface Requirements

3.1.1 User Interfaces

Five different users: administrator, officer, staff, applicant and evaluator. The officers will be able to access all data and functionality of the system. This means they will have complete control over the functions. The staff only can access their own information and view the information but not modify it. The administrator will be able to add and delete officer.

3.1.2 User Interfaces

Two Dell Server computers are used as servers.

Each server has at two network connectors and four USB connectors.

The servers are connected to the Internet. The IP address is: https://sms.csusb.edu/ottc7.

3.1.3 Software Interfaces

SMS operates through the users Web browser. The user must user one of the following we browsers: Internet Explorer 6.x or higher, Fire fox 1.5.x or higher and must have JavaScript enabled. The server must have Linux, Tomcat, MySQL and JSP installed.
3.1.4 Communications Interfaces

The System uses TCP/IP (Transmission Control Protocol/Internet Protocol) to communicate over the Internet.

3.2 Functions

The administrator is responsible for managing the officer user. He can create, view, edit and delete the accounts and information of the officer users.

The officer can operate most of functions in the system including management of applicant and evaluator accounts, the whole operation of solicitations, and awards, the ability of uploading applicant’s proposal, the selection of assigning evaluator and globe report generations.

The staff only can do the view and list functions that an officer can do and generate reports for a specific solicitation.

The evaluator can evaluate the applications that are assigned to him and read proposals during evaluation and view the evaluations after finished.

An applicant can submit applications according to open solicitations, upload the latest proposal to replace the old one and perform view or delete action of his own applications.
The following are activity diagrams showing some functionalities. Figure 15 shows how an officer creates a solicitation.

Figure 15. Activity Diagram: Officer Creates a New Solicitation
Figure 16 shows how an applicant submits an application.

Figure 16. Activity Diagram: Applicant Submits an Application
Figure 17 shows how an evaluator is assigned.

Figure 17. Activity Diagram: How an Evaluator is Assigned.
Figure 18 shows how an evaluator evaluates an application.

Figure 18. Activity Diagram: An Evaluator Evaluates an Application.
Figure 19 shows how a visitor registers as an evaluator or applicant.

Figure 19. Activity Diagram: A Visitor Registers As an Evaluator or Applicant.
3.3 Performance Requirements
The loading of most Web pages should take less than 5 seconds. The exceptions to this include generating reports, document conversion, and file uploading.

3.4 Local Database Requirement
The local database requirements for this system are the requirements for installing and running the Oracle database. Oracle 10g database requires at least one gigabyte memory.

3.5 Design Constraints
The programmer, during its design, should use only currently available computers as a server. The developer should use the most recent and/or most reliable technology to design the system.

3.6 Software System Attributes

3.6.1 Reliability
A Web server with the capability to run both JSP and Java will be required to assure that all codes are fully functional.

3.6.2 Availability
Stored on a server with World Wide Web access, the scheduling tool will be available 24 hours a day, 7 days a week.
3.6.3 Security

SMS will encrypt any password information. The server will be placed in a secure location where personnel will not have permission to access it.

3.6.4 Maintainability

This system is built with most configurations allocated in one place so that it will be easy to make changes and maintain when needed.

3.6.5 Portability

This system is built with as less dependencies as possible to gain portability.
CHAPTER FOUR
SYSTEM ADMINISTRATION

4.1 The System Design of the Web Server

The detail deployment diagram of the SMS is shown in Figure 15. It consists of four 4 components. These are: the client machine, the web server, the database server and the Word-to-post script conversion server. When the user wants to access our system, the client machine connects to the Web server through the HTTPS protocol by either Microsoft Internet Explorer or Mozilla Firefox. The Web server then connects to the database server through the TCP protocol to verify login and process information. In this project, we can use either MySql or Oracle database. The Web server also connects to the document conversion server through the application-specific protocol when the user uploads a Word document. Figure 20 shows the detailed deployment diagram.
4.2 Setup of a Windows Development Machine for SMS

4.2.1 Setup Development Tools

This section explains how to install and configure various tools needed to develop the system.

4.2.1.1 Eclipse Installation. Eclipse is an open source IDE for programmers. Following are the instructions to install eclipse.


Figure 20. Detailed Deployment Diagram
2. Install eclipse by unzipping the eclipse archive into c:\.

3. Replace the default workspace with c:\workspace when the first time you run eclipse.

4.2.1.2 Subclipse Installation. Subclipse is a plug-in for Eclipse to use Subversion. Subversion (SVN) is a version control system used to maintain current and historical versions of files such as source code.

1. Locate “Find and Install” from the Eclipse Help menu as illustrated in Figure 21.

Figure 21. Subclipse Installation, Step 1
2. Choose "search for new features to install" on the coming window (Figure 22).

Figure 22. Subclipse Installation, Step 2
3. Click the "New Remote Site" button in Figure 23.

Figure 23. Subclipse Installation, Step 3
4. In the screen shown in Figure 24, fill in the Name with Subclipse and URL with http://subclipse.tigris.org/update_1.2.x when your version of Eclipse is 3.2 or higher. Otherwise, fill in the URL with http://subclipse.tigris.org/update_1.0.x. Then press OK.

Figure 24. Subclipse Installation, Step 4
5. Be sure to select Subclipse in Figure 25 and click Next.

![Subclipse Installation, Step 5](image-url)
4. Figure 26 shows all of the features to install.
5. Click the button to accept the agreement and click Next (Figure 27).

Figure 27. Subclipse Installation, Step 7
6. Figure 28 shows the feature to install, and click Finish.

Figure 28. Subclipse Installation, Step 8
7. Figure 29 shows that the feature is unsigned, but it is ok to continue. Click Install.

Figure 29. Subclipse Installation, Step 9

You have to restart Eclipse after installation.
4.2.1.3 Check out the Project.

1. After restarting Eclipse, navigate to Window->Open Perspective->Other. Choose "SVN Repository Exploring" and click OK (Figure 30).

Figure 30. Check out the Project, Step 1
2. Right click on the blank space around the left side like Figure 31. Navigate to New and then Repository Location.

Figure 31. Check out the Project, Step 2
3. Type https://repo.ias.csusb.edu:8443/svn/sms2 in the URL shown in Figure 32.

Figure 32. Check out the Project, Step 3
4. Click "Accept Permanently" when alert window shows (Figure 33).

Figure 33. Check out the Project, Step 4
5. Enter the username obtained from the administrator and password. It is suggested to check the "Save Password" box in order to avoid checking repeatedly (Figure 34).

Figure 34. Check out the Project, Step 5
6. Expand the newly added repository and right click the ottc7 and click checkout. Figure 30 shows the project name that will be under your folder, and the default will be c:\workspace (Figure 35 and 36).

Figure 35. Check out the Project, Step 6
Figure 36. Check out the Project, Step 6 (continued)
7. You can see otc7 with a red cross when switching to Java perspective. Right click on it and click on Properties (Figure 37).

Figure 37. Check out the Project, Step 7
Click "Java Build Path" and choose the Source tab and remove the folder shown inside (Figure 38).

Figure 38. Check out the Project, Step 7 (continued)
Click "Add Folder" and expand ottc7, check the src folder (Figure 39).

Figure 39. Check out the Project. Step 7 (continued)
Replace the "Default output folder" with ottc7/web/WEB-INF/classes (Figure 40).

Figure 40. Check out the Project, Step 7 (continued)
Switch to Libraries tab and click “Add External JARs”. Locate the lib folder under your tomcat folder, add “jsp-api.jar” and “servlet-api.jar” (Figure 41).

![Image](image_url)

Figure 41. Check out the Project, Step 7 (continued)

Expand the lib folder under the WEB-INF folder and add the following files to build path: activation.jar, commons-codec.jar, commons-fileupload.jar, itext-1.1.jar, log4j-1.2.11.jar and mail.jar. You will see the red cross on ottc7 will disappear.
4.2.2 Setup Local Document Conversion Service

1. Install Microsoft Office 2003 or more recent version, and install updates.

2. Copy the windows-development-setup.zip under the sms-doc-server folder, and unzip it into c:\, so that c:\sms is created.

3. Run the winsteng.exe under c:\sms. It is the Adobe Universal PostScript Windows Driver. When the user is prompted for the filename, enter "output.ps" and assign "sms" as the printer name.

4. Configure windows firewall to open port 10000 for access for local processes. In the firewall setting screen, click on the Exception tab. Select add a Port. Enter Document Conversion Service for the name and 10000 for the prot number. Click on scope and select custom list. Specify 127.0.0.1 in the custom list box, so that only processes running on local machine can access the service.
You can start the conversion server either manually or run it as a window service.

4.2.2.1 Start Local Document Conversion Service Manually.

Run the following command to start the conversion server manually.

```
java -classpath c:\sms\classes \\
sms.docserver.DocumentconversionServer 10000
```

Press Ctrl-C to shutdown the server.

4.2.2.2 Run Local Document Conversion Service As a Windows Service. Run the following command to install the program as a Windows service.

```
C:\sms\wrapper\bin\wrapper.exe -i c:\sms\wrapper10000.conf
```

To uninstall the program as a Windows service, just replace -i(for install) with -r(remove).

4.2.3 Setup Postscript to Pdf Conversion

Go to http://miktex.org/ and download the latest Miktex. You have to install Miktex in order to convert postscript to pdf documents.

4.2.4 Configure Deployment File

Copy ottc7.xml under conf\Brent to the localhost folder under conf\Catalina in your tomcat folder.
4.3 Setup Database

4.3.1 Install Oracle Database

The version of Oracle Database that this system is currently using is 10.2.0.1. Locate the file OracleXEUniv.exe on the book CD, or download from the Oracle website. The installation process involves several steps. A documentation is available on how to install Oracle 10g at http://www.oracle.com/technology/software/products/database/xe/htdocs/102xewinsoft.html. Set the password of system as root during the installation.

4.3.2 Import Test Database

Log in your oracle database by typing "sqlplus system/root@127.0.0.1:1521" in the windows command prompt window. After log in your oracle database, create user sms with password sms123 by typing "create user sms identified by sms123;". Grant the access permission to user sms by typing "grant connect,resource to sms;". Then disconnect from your oracle database by typing exit. Finally import the test database by typing "imp system/root file=c:\workspace\database\sms.dmp fromuser=ottc5 touser=sms" in the windows command prompt window.
4.4 Test System

First, create a folder "temp" under c:\. Start tomcat, and then go to http://localhost:8080/ottc7/. The system should redirect you to http://localhost:8080/ottc7/visitor.

Login as admin with password admin.
In this chapter, the system requirements along with the installation of this system are explained.

5.1 Software Requirement

In order to install the Solicitation Management System, several prerequisites are needed. The installation of these required software will make sure that the system will be able to operate as expected. The prerequisite softwares for the main program body include Java Runtime Environment, Oracle database, Tomcat. For the document conversion server, the prerequisites needed are Microsoft Windows XP, Microsoft Office 2003, and the Adobe Universal PostScript Windows Driver.

5.1.1 Java Runtime Environment

The Java Runtime Environment (JRE) provides the Java Environment in which this system needs to run. The JRE can be installed once the Java SE Development Kit (JDK) is installed. Locate the file jdk-6u4-windows-i586-p.exe, which is on the book CD. Or download from Sun’s website. The installation instructions for the JRE also vary among different machines. A list of installation instructions can be found on Sun’s
website at

5.1.2 Oracle Database

The version of Oracle Database that this system is
currently using is 10.2.0.1. The configure instructions can be
found in Section 4.3.

5.1.3 Apache Tomcat Server

The version of Tomcat that this system is currently using
is Tomcat 5.5.25. Locate the file apache-tomcat-5.5.25.exe,
which is on the book CD. Or download from the apache website
The instructions for installing and setting up Tomcat can also
be found on the apache website at

5.1.4 Microsoft Windows XP Professional

The document conversion server is run on top of the
Microsoft Windows XP Professional Platform. The Microsoft
Windows XP Professional is a commercial operating system that
can be purchased from various suppliers. An introduction of
how to purchase a licensed copy of Microsoft Windows XP
Professional is shown on Microsoft’s website at
CHAPTER SIX

CONCLUSION AND FUTURE DIRECTIONS

6.1 Conclusion

This new version of Solicitation Management System is more easy to maintain and modify as a result of re-factoring the code.

The new interface is more friendly for all the users. There is a static menu on the left side that highlights the area the user is located.

For officers, the new added tracks and classes offer them more detail in the field they want to specify. They can view applicant information in PDF format which is more convenient to file and print. They can upload solicitation announcements, instructions and proposal templates when creating new solicitations. It will be much more efficient for the process of applications.

For applicants, they can download the announcement, instruction, and proposal template for each open solicitation. Following the given information will save time when they apply for specified solicitations.

Our experience in doing this project is very challenging and helpful. We had to improve and modify the system according
to the request by OTTC and CCAT staff. The available time was short, but we were able to meet the requirements.

This version of Solicitation Management System is currently being used for CCAT 2008 solicitation, which officially opened on 28 Jan 2008.

6.2 Future Directions

The future direction is to implement the e-mail acknowledgement mechanism. When an officer creates a new solicitation, the system will automatically send a notification e-mail to the applicant. After the applicant submits an application, the system will automatically send a notification e-mail to the officer. Similarly, when an officer assigns an evaluator to do an evaluation, the system will automatically send a notification e-mail to the evaluator. After the evaluator finishes the evaluation, the system will automatically send a notification e-mail to the officer. This will make the interaction between officers and applicants or evaluators more efficient.

Additionally, the new improvements can include extending the SMS to support the panel review process, it can support for the top 5-6 proposals funding decision. Also, integrating more of the requirements from CCAT, SDSU and capacity testing of 100 or more applicants are concerned in the future.
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