Report on the Web Tool

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Motivation for Developing Web Tool:

The public face of IASMiRT is through the conference. By 2007, most major associations had modernized their operations by using some form of a web portal for interacting with the authors and participants. SMiRT 19 hosted by NC State University was the first SMiRT conference in which an online system was used to collect abstract and allow the Division Coordinators to review the abstracts online. However, the system used was a commercially available system which had severe limitations other than collecting just the abstracts and allowing Division Coordinators to review them. The papers had to be still collected through email or fax or regular mail. The system was costly for the simple services it provided. Therefore, a plan was created to develop our own system customized to the needs of SMiRT Conference. It was intended to significantly cut down the manual work needed in organizing the conference. It was also intended to provide features that were difficult to do manually and also provide a collaborative environment for the entire team. Such a tool can bring consistency in the organization of conference for each 2-year cycle which improves the efficiency and it helps maintain an updated database for each 2-year cycle.

Salient Features:

Following are some of the salient and unique features of the web tool. These features are very rare to find in other commercially available tools. Even if they are available, the cost of using these features is extremely high. The following list gives just some examples.

- Creation of main website and flexibility to add and remove tabs as needed by SMiRT admin.
- Collection of abstracts and papers online.
- Online review by Division Coordinators and online feedback to authors.
- Creation of Sessions and Assigning of Papers.
- Customized automatic emails to authors and division coordinators and non-authors.
- Automatic Schedule Conflict check – this needs to be modified from its present form.
- Automatic creation of Schedules for posting online. Schedule tables are created by Author index, Division and Session index, and Chronological by day and time.
- Automatic creation of hyperlinked author index and hyperlinked table of contents.
- Single click of a button to save the final proceedings with all papers, hyperlinked table of contents, and author index on to the hard drive. The files from hard drive can then be

copied into a USB flash drive or CD or any other electronic media for creation of proceedings.

History / Timeline of Key Milestones

1. ***2008 – 2009*** : Various existing commercially available tools were explored. It was determined that none of the commercially available tools served the intended functions even close to what a SMiRT conference requires. Tools being used at that time by organizations like ASCE, ANS, and CNS were determined to be too primitive in their functionality. The only organization that seemed to have a truly powerful tool was ASME. However, the cost of using their tool was determined to be excessively high. Moreover, the tool used by ASME also needed modifications to customize it for SMiRT conference. During this time, the organizers of SMiRT 20 in Finland contracted the web tool services to a private party. This tool was either less powerful or just as powerful as that used in SMiRT 19 and its cost was high. Consequently, it was decided to create a detailed set of requirements for developing an independent tool. SMiRT 22 (2013) was awarded to Bechtel. It was agreed that SMiRT 22 Chairman Farhang Ostadan would work closely with Abhinav Gupta and NC State University in the development of Web Tool.
2. ***August 2009 – December 2010:*** Detailed set of requirements were developed for the desired web tool. These requirements were for only the Technical Program Management and did not include any financial aspects of registration and payments. During the August 2009 Board Meeting in Helsinki, Antonio Godoy of IAEA offered to explore the use of IAEA for hosting the web tool.
3. ***January 2010:*** Discussions started with IAEA contact Nebi Bekiri for possible hosting of the web tool at IAEA servers. The intent was that it would eliminate the server hosting fee and well qualified IAEA IT personnel will also provide high level of security for the web tool.
4. ***January 2010 – March 2010***: The requirements were passed on to two private IT companies. One by Abhinav Gupta to a company in North Carolina. The other by Farhang Ostadan to a company in San Francisco Bay area. Both companies were asked to submit their bids for the development and deployment of this tool. Interestingly, both independent bids were about the same price of $35,000. As mentioned earlier, this estimate was only for the Technical Program Management features. There was no consideration of financial aspects for registrations and payments. The company in North Carolina appeared to be a company with multiple staff/partners. The company in San Francisco was an individually owned single person company.
5. ***March 2010, Board Meeting in Goa, India:*** A presentation was made to the Board on the status of this progress as well as recommendations for future steps needed to accomplish the desired goal. The board recommended to proceed with the development and to request a contract from Skylamp which is based in Holly Springs, North Carolina.

6. ***Summer 2010:*** Skylamp provided a contract which was passed on to the Board for review and comments. Comments were received from Board and at least one Advisory Board member. These comments were addressed and a contract signed.
7. ***July/August 2010:*** Development work started by Skylamp. At this stage it was realized that the actual work was being done by developers in a company called SpectraForce which were partners with Skylamp. We also found out that the developers were actually based in India. Abhinav Gupta worked closely with the developers in creating the architecture and the design of the web tool.
8. ***August 2010:*** The IT person from IAEA visited NC State University for a meeting with NC State faculty and Skylamp team. The meeting was held on NC State University campus and the developers in India joined the call through teleconference facility.
9. ***November 2010:*** The architecture and design of web tool were presented by Abhinav Gupta at the Board Meeting in Mumbai, India.
10. ***November 2010- May 2011:*** Development and Testing of the web tool continued under the supervision of Abhinav Gupta. While Skylamp developers were doing the development, the students at NC State University spent significant time to do the testing at each stage. All the time spent on testing and supervision by NC State University's faculty and students was the volunteer work. During this time the SMiRT 22 Chairman, Farhang Ostadan, was kept informed. He volunteered to test the website at different stages. A beta testing was performed and he and his team were given the login details to the beta testing site. They evaluated the site and various features. They were quite impressed by the features and also found some bugs on their own. These were then communicated back to Skylamp for fixing and further development. Farhang Ostandan also recommended modifications to the already designed and built features based on what appeared to be a better/improved way of doing certain things. These modifications were implemented by Skylamp at no additional cost.
11. ***May 2011 – October 2011:*** It appeared that the progress with IAEA was stalled. The staff at IAEA did not anticipate the level of effort required on their part to implement the web tool and maintain security. Therefore, Abhinav Gupta and Farhang Ostadan in consultation with the Board decided to proceed with hosting the web tool on servers of Skylamp. An added benefit of doing so was that Skylamp would be involved in the first cycle of operation of web tool. In case of difficulties with operations, Skylamp would be able to have full access and resolve issues in a timely manner.
12. ***October-November 2011:*** The Chairman of SMiRT 22, Farhang Ostadan was requested for input on the material needed to make the SMiRT 22 website LIVE using the web tool. The contract for the 2-year hosting was signed with Skylamp.
13. ***November 2011:*** Progress report presented to the Board at the meeting in New Delhi, India. It was reported that most of the development was complete but some development especially that was needed towards the end of a conference cycle did not meet requirements after extensive testing by NC State University even though small scale initial testing had shown

that the work was complete. Skylamp had agreed to continue the work until fully agreed upon to the satisfaction of Abhinav Gupta and Farhang Ostadan.

14. ***November 2011:*** SMiRT 22 website was made LIVE using the web tool.
15. ***Spring 2012:*** At this stage, Farhang Ostadan also requested a proposal from Skylamp for developing the financial features in the web tool particularly for online registrations using credit card payments, automatic receipt generation, automatic bookkeeping, implementing shopping carts for Technical Tours and Additional Banquet Tickets, and connecting paper database to payment database. I evaluated the Skylamp proposal on technical merit and recommended changes. This development was valued at an additional $15,000 and it was a significant addition to the initially planned and developed web tool. It also required an interaction with the Bank and implementing the tool to meet the security requirements of the Bank's online system. The IASMiRT Board and SMiRT 22 chairman agreed on adding this functionality. At this very time, Skylamp changed the developers from SpectraForce to another company in India called Websoft. From this time on, it would be Websoft that would carry on future work. In this process, I had to spend enormous amounts of time in helping Websoft go through the learning curve about the design and architecture of the site so that they would understand the flow of data/information. It must be noted that the financial aspect of the website was secure and completely connected with bank's online system. Therefore, none of the personal financial information of the user was saved on the website. This is a high security design which is often ignored by businesses and organizations using online payment system.
16. ***Spring 2012 – November 2012:*** The website was in full use. Abstracts were being uploaded. Division Coordinators were reviewing abstracts and providing feedback to authors through the website. Division Coordinators were creating sessions using Abstracts. They were able to move abstracts from one division to another directly. A training was provided to Division Coordinators at the ISC Planning meeting in November 2012 on the features of the website. During this period of time, few minor bugs were encountered. For example, some text fields would not accept special characters in the name of users. These were taken care of by the developers as things were found out. The most important lesson learnt in this process was related to the emailing of an activation link sent by the site. Many users did not receive this email as their company servers rejected SMiRT 22 website fearing security violation. Such users were helped by the SMiRT 22 admin through a manual verification of such accounts. However, the percentage of such cases were less than 10% of the total users which were close to 2500 user accounts.
17. ***Spring-Summer 2013:*** Web tool started collecting papers as well as financial transactions. User's could select up to 5 papers that would count towards a single registration. They could buy technical tours, banquet tickets, etc. The bookkeeping was automatic. The receipts were being generated in a personalized customized form and were being emailed directly to the user without any work on part of the admin. The biggest lesson learnt in this process was related to a situation wherein the Bank would not immediately authorize the credit card

transaction of a payment particularly from third world countries. The payment would simply be withheld by the bank and so a manual cross check by admin was necessary to ensure that every transaction on the site matched the bank transaction and payment.

18. ***Summer 2013:*** It was realized that the activation link used for safeguarding against spam accounts did not work as intended and spam users were being created on the site. The user database was found to have about 8000 users which included more than 5000 spam accounts. In the interest of time and since SMiRT 22 dates were approaching, it was decided to manually delete the spam users and to continue doing so until the conference work was over. The long term solution would be explored after the conference.
19. ***June 2013:*** The web tool was used to create sessions, remove unpaid papers, create schedule, and with a click of a button or two – create hyperlinked tables of schedules by Day and time, schedules by Author Names, and schedules by Division. The Schedules could be posted online in a matter of minutes. Lesson learnt in this process was that conflict management feature needs work and modification. While it is implemented as per original thinking, we were not able to think deep enough to figure out all situations as identified in real life use. Yet, the tool helped in making the schedule "conflict free" for most part.
20. ***July 2013:*** The proceedings could be downloaded along with the hyperlinked table of contents on to the hard drive. These files were readily transferred to Barnes and Noble for further customization and uploading on the e-reader. The files were also uploaded directly on USB flash drive for distribution at the conference. While it required work to iron out bugs in the first cycle, the use of Web Tool was very successful.
21. ***Board Meeting, August 2013:*** The IASMiRT Board in consultation with I and Farhang Ostadan and based on our recommendation took few important decisions.
    1. IASMiRT should work directly with Websoft to cut the development cost in half. Ties with Skylamp were terminated.
    2. The servers should be moved to a service other than Skylamp.
    3. NCSU will manage the work with developers.
    4. Solutions to overcome the problem with activation link were discussed and an implementation of "Captcha" was agreed upon with the SMiRT 23 team.
22. ***September 2013:*** Based on discussions among IASMiRT Advisor General (Vernon Matzen), Farhang Ostadan, and I, a request was made to NCSU IT specialist (Margaret Hudacko) about finding a solution for hosting the Web Tool.
23. ***October 2013:*** Margaret offered to help in hosting the website. It was decided to go to a private large-scale hosting company HostGator. This company hosts millions of websites and is in commercial business. Margaret had a working relationship with HostGator.
24. ***October – November 2013:*** Margaret offered to create and setup the server for the Web Tool. She became the main administrator and allowed limited access to developers. This arrangement is good in principle but later on it was found to be quite impractical. The reason for impracticality was the fact that Margaret herself was not responsive to the request by myself or the developers. The developers needed her help to appropriately transfer the tool

completely to the new servers. Lack of availability and lack of responsiveness on part of Margaret made this arrangement difficult to manage.

25. ***November, 2013:*** The developers introduced "Re-Captcha" and removed the activation link which was found to be troublesome during SMiRT 22. Despite the problems with the working arrangement, SMiRT 23 website was made LIVE with input from SMiRT 23 team.
26. ***November 2013 – Summer 2014:*** SMiRT 23 team had a few requests for changes in the tool based on their experience. These were collected for some time and the developers were then asked to make these changes subsequently. One of the issues faced in this new cycle related to emails generated by the website and especially mass emailing. Most servers were rejecting the mass emailing from the website as SPAM. Sometimes during Spring 2014, the mass mailing was changed to an alternative and more robust way as per the new developments in the technology of mass emailing. A webmail-server was setup on the same servers that hosted the website. Then, this webmail-server was used to upload the email databases for general mass mailing and authors etc. This setup allows receiving mail servers to accept the mail and not reject it as SPAM. The downside is that the email lists have to be periodically updated but the effort is minor and so this was an acceptable solution. Abstracts were being submitted and the new cycle was working just fine. Lesson learnt in this duration was that every time a user does not follow instructions on making a user account or their system blocks SMiRT 23 user account access, the local organizing team considers it as a major fault of the web tool. Clearly there is learning effort for the new hosts and it is not trivial. Much of the difficulty is with blocked users and a manual effort is needed on part of the admin to unblock them.
27. ***October-November 2014:*** Unknown to us, HostGator did some updates on their server operating systems (as far as I know) which tripped all their servers. Millions of websites went offline including SMiRT 23. This "Server-Failure" event is described and discussed in a separate section in this report.
28. ***November Board Meeting 2014:*** The division coordinators used the site to review abstracts, create sessions, etc. Discussions were held with Matt Dawber of SMiRT 23 team to provide a feedback on his experience with the tool. The main feedback was that barring "server-failure" incident, the web tool is quite effective and makes the organization of the technical part quite efficient. He was very supportive and thought that the tool was doing a wonderful job. He actually learnt the usage of tool extremely well and was able to modify the default setups as an advanced user.
29. ***December 2015:*** The hosting arrangement was moved from the ownership of Margaret to Abhinav Gupta with official payment arrangement (no individual credit card payment as was originally setup by Margaret).
30. ***January-February 2015:*** SMiRT-23 website got Hacked! This event exposed major technical flaws in hosting arrangements, security maintenance, the setup of directory structure by Margaret. This event is described and discussed in detail later in a separate section of this report.

31. ***February 2015:*** SMiRT 23 decides to disassociate from the use of Web Tool.
32. ***March – June 2015:*** Websoft investigates the reasons for security breach and suggests both short-term and long term solutions for implementations.

Server Failure in October-November 2014:

Starting August 2014, the HostGator servers would often show signs of sluggishness. Often, the website would become extremely slow. The developers said that the problem was on the server side and since Margaret had not provided them complete access they were limited in their ability to manage the issue. Margaret on the other hand was not very responsive as always. She continued to convey that the developers should handle the problem and that the problem is with the coding of Web tool. She also indicated that originally she had thought of this activity to be simply providing us the server space and that she would not have to be involved in its running/operations. I could not communicate with HostGator as I was not set up as an administrator. I continued to ask for the admin rights but that did not happen. In this process, we found out that Margaret had setup the servers as "shared server" using her own personal credit card and not as independent IASMiRT server. Towards the end of October, Margaret finally talked to HostGator and emailed back indicating that she and HostGator had established the reason for sluggishness and that HostGator is acting on fixing the problem. Within the next day or two, the servers crashed. As usual, Margaret first blamed it on developers but then soon everyone found out that ALL the servers of HostGator crashed due to an operating system upgrade by them. This is an extremely rare event for a hosting service like HostGator and was unheard of prior to this event. Again, only Margaret could talk to HostGator and that communication was not taking place to push the HostGator on fixing the issue quickly – particularly for SMiRT 23 servers. When things were not resolved for more than 2 weeks and the site continued to be down, we asked Margaret to change the servers to what is called as "Dedicated Server." Prior to HostGator, Skylamp had setup the web tool on "dedicated server" and we also felt that HostGator's response to our requests for help would be quicker/faster in case of "Dedicated Server." Furthermore, we requested and everyone including Margaret agreed that the developers would be allowed a complete access to the server – unlike restricted access that was setup to begin with. The delay in restoring the website continued and once the dedicated server was setup, the developers helped move the complete site to these new servers. The site was finally restarted. Then, we initiated the setup of webmail-server and finally the process of transferring the administrator rights from Margaret's personal credit card to an official payment method with full access to IASMiRT team was also started. During this process, we also found out that Margaret had created space for a portion of IASMiRT website on the same server as the web tool. Prior to 2014, iasmirt.org website was completely hosted on NCSU servers and there was no link between iasmirt.org and web tool. This change in the iasmirt.org and its hosting on the same servers as the web tool (outside of NCSU servers) was a completely new knowledge.

Hacking of Website, January 2015 – February 2015:

Following certain politically charged events in Europe, a well known Turkish Hacker named "Alsancak Tim" hacked into the website and defaced it with political messages against European governments. Lessons learnt in this process:

- Maintaining fool proof security of a website is quite impossible particularly against targeted attacks. Big organizations like Google, Facebook, National Security Agency, Home Depot, Target, etc. have all been hacked within the last one year.
- HostGator took more than 3 days to respond and that too after many phone calls and wait times that lasted more than 2 hours long.
- The particular hacker has targeted major websites especially government websites around the world.
- I sent online links for news reports on the widespread hacking activities of this hacker. Here is one link: http://www.immortal.org/4650/ghana-government-websites-hacked-turker-hackers-alsancak-tim/
- Here is another news report from March 2015 which talks about how this hacker was creating chaos around the world: http://www.dailytech.com/Nationalist+Hackers+From+Turkey+Cause+Chaos+Deface+Dozens+of+Sites/article37247.htm
- According to online articles, this particular hacker uses inherent weaknesses in a website creating environment called WordPress to hack into websites. However, the web tool uses Jhoomla environment and not Wordpress. We then found out that the portion of IASMiRT website that was placed on the same servers by Margaret used Wordpress. The hacker used this weak link to enter the servers and from there access the web tool. Here is a link that directly connects the weaknesses in wordpress and this particular Hacker: http://www.viruss.eu/web-malware/my-wordpress-website-was-hacked/
- We realized the importance of server hosting company and their ability to provide timely support and their ability to maintain security.
- Developers continued to investigate the causes and paths of this hacking. They have sent me detailed report on possible alternatives.

Major Lessons Learnt and Recommendations:

- The biggest lesson learnt is that we need someone to host the tool and maintain security. Companies like HostGator are not a good solution. We are just way too small of an organization for them to handle our requests in a timely manner. They also charge us extra for maintaining security. Therefore, I would recommend that we find a permanent home to host the tool. Based on the discussions at the last Board meeting in November 2014, I would support Farhang Ostadan's proposal to host this tool at PEER especially if they can provide assurance for maintaining security and continuity of server operations and upgrade.

- I recommend that Websoft continue to be the developers of the site. They have shown a lot of support and resiliency to our requests for extensive help without asking us for additional payment. Websoft developers are very familiar with the coding and the architecture of the site. I would oppose changing the developers at this stage. New developers would need a lot of handholding to learn the architecture. There are other quality and security issues that can arise if a new developers implements a piece without fully understanding the complete architecture of the site.
- Websoft recommends that certain parts of the code be changed from php to dot-net technology. According to them, it would enhance the security tremendously. If the server hosting organization does not upgrade the necessary php versions on their servers, the site can become prone to attacks. This aspect of security will be eliminated by changing few modules to dot-net. The cost is quite minimal and can be absorbed in the next usage cycle of the web tool.
- The most difficulty in using the site relates to creation of user accounts and blocking the accounts due to mistakes by the users in most cases or due to their companies tight security. These accounts require manual unblocking. This activity takes just a few minutes and can be done once every week. The new host of the conference in each cycle considers this as a flaw and gets very worried. However, if we have one person (like a permanent admin) then that person will be able to handle such administrative requests quite easily.
- Another difficulty lies with the emails from websites going into user's spam/junk folder. There is no good solution with this. The users simply need to check their spam folders. The users can be advised to add smirt domains in their allowed emails but not everyone follows the instructions. This situation also requires an email communication with the user when they write back. The admin can handle these too without involvement of host organization or SMiRT Chairman.
- Updating and maintaining databases for email communication and advertisements can be handled by admin too.