Project Report: Delivery of Organic Materials to Planets

NAI S Further Development as a Virtual Institute

NAI as a virtual institute is intended to catalyze and support scientific collaboration among its geographically dispersed member scientists through the promotion of communication and collaboration best practices and state−of−the−art electronic tools and technologies. The development of this virtual dimension of NAI is occurring within a larger national and global context in which many organizations in both the private and public sectors are exploring work practices and technologies that effectively support collaboration among distributed groups or teams. However, thorough understanding of the social and technical requirements for successful virtual organizations designed specifically to promote scientific collaboration across disciplines, institutional boundaries and time zones is still in its infancy. The design and implementation of such organizations is emerging in recent years as an important interdisciplinary field of research.

Within this arena, NAI is unique in its large size as well as the complexity of its research agenda and its multiple institutional components. Thus it is important to periodically document and review the steps taken by institute administrative staff in support of virtual collaborative research as the institute continues to evolve. This information is not only relevant to furthering NAI s development; it is also potentially important to theory and practice regarding virtual collaboration beyond NAI.

Overview of This Year s Progress

During the course of this past year, NAI Central s Collaborative Research Support Group undertook a number of projects intended to further develop the virtual institute. An overall design cycle for the virtual institute was first articulated, and then specific projects were planned and implemented. These projects were also informed by the recognition that to effectively promote virtual collaboration across the institute, there are several overlapping arenas of social interaction and electronic linkage that need to be addressed simultaneously.

Seven specific projects in support of virtual collaboration were completed during this year. They include:

- The NAI member Needs Assessment
- The Collaborative Tools Comparison Study
- Vendor demonstrations of the most promising communication and collaboration tools for NAI, based on member needs and best practices criteria
- Plans for collaboration tools pilot projects with NAI members to begin in the fall of 2002
- The launching of two NAI video seminar series
- Strengthening of IT support and expertise at the local NAI team level
- Extensions to NAI s videoconferencing capabilities in support of educational exchange and scientific collaboration through deployment of conferencing equipment to two Pennsylvania State University collaborating sites, the State University of New York at Stony Brook and the University of Pittsburgh.

Virtual Institute Design Cycle

The design cycle guiding further development of the virtual institute contains four phases: discovery, design, development and deployment. The discovery phase, including the institute−wide assessment and the research on commercially available collaborative tools, was completed as of May, 2002.

The design phase, during which vendors were invited to NAI Central to demonstrate the tools that appeared to most meet NAI s needs, was also completed, as of June 2002. This phase resulted in the identification of a small number of collaborative tools selected for potential piloting with NAI members. Vendors were invited to submit proposals for these pilots, out of which the most attractive packages will be implemented during the development phase beginning in Fall, 2002 and running for six to eight months. Pilot outcomes will then be evaluated and a plan made for the deployment phase. This final phase will include a full roll−out of those tools that the NAI community members deem most beneficial to their collaborative research agendas.

Organizational Approach: Three Arenas of Social Interaction and Electronic Linkage

In order to achieve a robust and effective virtual NAI, the Collaborative Research Support Group has identified the importance of successfully addressing the social and technical challenges of linking people together within the NAI community for communication and collaboration in three distinct arenas. The identification of these overlapping virtual institute domains serves as a useful analytical framework for the development of NAI s technology architecture. This framework has increased NAI Central s ability to assess where NAI is succeeding in supporting remote communication and collaboration and where further work is needed.

These arenas include:

1. Lead institutional site to lead institutional site:
enabling one−to−one and multi−site videoconferencing, data sharing, knowledge building and other collaborative work among PIs, CO−Is and other team members located at the lead institutional sites. The technology utilized for this level includes the Polycom room−based videoconferencing systems and NetMeeting collaborative tools operated via SmartBoards.

2. Distributed teams/focus groups/small group collaborations:
enabling videoconferencing, data sharing, knowledge building and other collaborative work among NAI members who do not reside at lead institutional sites as well as people at lead sites who want to engage from the desktop rather than the conference room, and/or who want to collaborate with colleagues who are not at other lead institutions. The best technology to use for this level has been a primary focus of research this year. Large−scale pilot projects are being designed for implementation in late 2002, to enable real−time meetings and asynchronous collaborative work spaces along with knowledge management capabilities where information can be stored, shared and accessed.

3. NAI community−wide events, conferences, seminars:
enabling large groups of people at different geographical locations to meet together virtually for presentations and exchanges of various kinds. These groups may also include the larger Astrobiology community beyond the NAI itself, and/or interested members of the public. The technology used for this level includes both the room−based videoconferencing and data sharing components as well as web−casting with interactive chat capabilities to the desktops of both NAI

members and non−members.

Specific Projects Completed during this Last Year

" NAI Member Needs Assessment

As part of NAI s efforts toward continuous improvement and ongoing self−review, a comprehensive Member Needs Assessment was conducted throughout 2001 with a report issued to the NAI Director in April 2002. The assessment began with site visits to the original lead institutions as well as two of the four new member institutions. This initial step in the assessment process was reported in last year s Annual Report. The research culminated in a community−wide electronic Needs Assessment Survey distributed in September−October 2001 to all NAI lead team members. Responses were received from 164 of the 572 NAI members invited to participate. These responses came from members of every team, from all 15 PIs, and from significant numbers of Co−Is, Postdoctoral Fellows, graduate students, collaborators, and administrative, educational/ public outreach and information technology staff. The only role category of NAI membership not responding was undergraduates.

The data from the PI and other team member interviews conducted during the site visits, as well as the data collected through the electronic survey, were analyzed and a report was submitted to the NAI Director, Dr. Blumberg, in April, 2002. With his approval, this report is available to any interested NAI members for on−going input and discussion via the web. Please click here to view the link.

tThe purpose of the needs assessment was threefold: first, to identify current methods of communication/collaboration among NAI members; second, to identify NAI member needs and wishes for future communication and collaboration; and third, to elicit feedback on NAI s current effectiveness as a virtual institute and input regarding its continued development.

The data from the interviews with team members conducted by the Collaborative Research Manager during her site visits, and the data from the electronic survey, were analyzed for key project findings. Among these findings was clarification of the specific social and technical challenges to virtual collaboration identified by the NAI members who responded to the survey.

Social challenges included differences in language, shortage of time, uneven access to collaborative opportunities, varying degrees of common research interests and/or goals, intellectual property and attribution issues, varying degrees of enthusiasm about virtual collaboration, and differences in individual learning curves regarding shared knowledge.

Technical challenges included platform incompatibilities, differences in available bandwidth, uneven access to collaboration tools, issues regarding ease of use, uneven local IT support, and differences in individual learning curves regarding technology.

Additionally, the specific categories of electronic tools most desired by NAI members were identified. These were the following:

- internet presentations/real−time meeting tools
- desktop videoconferencing tools
- document and data sharing tools
- knowledge management tools

The assessment research also clarified NAI member user requirements with regard to technology.

Important in this list were cross−platform compatibility, easy of use, tools accessible from the desktop, web−based access, high−speed, reliability, security and reasonable cost.

These and other findings resulted in a number of general, high−level recommendations included in the report. As the findings and recommendations from the assessment became available, the Collaborative Research Support Group proceeded to define and implement specific action steps addressing identified institute needs and challenges. One such step was the NAI Collaborative Tools Comparative Study.

" NAI Collaborative Tools Comparative Study

The specific needs and user requirements articulated by member scientists pointed to the need for some new collaboration tools for NAI. It became clear that a research project to identify and compare commercially available tools meeting NAI s needs was an important undertaking. Researchers from the San Francisco−based consulting company, University of the Future, were asked to conduct this study, which resulted in a report to the Collaborative Research Manager in April, 2002.

In this study some 90 packages and vendors were initially identified as purporting to fit NAI criteria. Through further research, approximately a dozen packages were identified as falling into one or more of the collaboration tool categories defined as important by NAI members. These were the tools reported as most promising for NAI and recommended for vendor demonstration to NAI Central staff.

" Vendor Demonstrations

During the Spring of 2002, a number of different collaboration tool demonstrations were organized. Several tools were eliminated in the course of planning these meetings, because they failed to sufficiently meet NAI key criteria when explored further with the vendors directly. Others were eliminated through comparison as the demonstration meetings were evaluated. As a result of this design phase, WebEx was chosen as the candidate for a pilot test. A pilot test for a knowledge management tools is also in the early stages.

" Pilot Projects

In the final analysis WebEx was the only package that sufficiently met NAI key user criteria for real−time meetings involving data and application sharing. It also includes a limited videoconferencing component such that one participant can be visible to other participants at any given time. This capability can be transferred from one participant to another during a meeting.

A short−term meeting site was set up by WebEx for a limited group of NAI users during the months of May and June. This site was used to conduct six meetings with small groups of NAI PIs and NAI Central staff focusing on preparations for this year s Annual Report. The meetings also served as an opportunity to demonstrate WebEx s functionality to the PIs and solicit their feedback. Given the extremely enthusiastic PI response, the Collaborative Research Support Group entered into negotiations with WebEx for a 60 seat five month pilot project to begin in December, 2002. This will allow a large group of NAI members to utilize WebEx for meetings during that time.

In the knowledge management category one strong candidate for an NAI pilot emerged during the vendor demonstration phase. The features of this tool are currently being reviewed and a pilot project is planned for early 2003.

" NAI Video Seminar Series

During the autumn of 2001 planning proceeded for two monthly NAI video seminar series, The Director s Science Seminar Series and the Astrobiology Research Video Forum Initial presentations were held in October and November as pilots for each these series. In January, 2002, the Director s Science Seminar Series was launched, featuring senior astrobiology research scientists drawn from NAI teams and Focus Goups. In February the Astrobiology Research Video Forum was initiated, showcasing presenters from among NAI Postdoctoral Fellows as well as graduate students associated with NAI lead teams.

To date, the seminars have been held as multi−point videoconferences hosted at one of the lead institutional sites and utilizing their conference room videoconferencing equipment. For any given conference a number of other NAI sites, as well as occasional additional sites with compatible conferencing technology, have joined the multipoint conference as a distributed audience, and have participated in the question and answer period following the presentations.

Additionally, the seminars have been webcast by the technical team at Ames Research Center, so that any interested viewer can download the slides and view the presentation live at his or her desktop. An interactive chat function has been used by these participants to submit written questions, which are then addressed by the presenter. All presentations are also archived and are available through the NAI website.

The Director s Science Seminar Series held monthly presentations through May and will resume in the Fall of 2002. The Astrobiology Research Video Forum, organized by a working group made up of student and postdoctoral representatives from several of the NAI lead teams and several staff from NAI Central, had two presentations to during the Spring.. The planning group intends to initiate regular monthly meetings in 2002−2003 and is soliciting presenters.

More information on both seminar series is available on the NAI website at:
http://nai.arc.nasa.gov/seminars/index.cfm

" Strengthening IT support at the Local NAI Team Level

The assessment research revealed that many of the NAI teams lacked sufficient IT support. There is a group of technical support staff at Ames Research Center, funded by the NAI Central budget, dedicated to support NAI members utilizing NASA deployed collaborative tools. However, each team also needs considerable local support if these distributed scientists are going to adopt and effectively utilize new technologies to facilitate their communication and collaboration.

A one−time $10,000 augmentation was offered to each team as seed money to further develop local IT support. Most of the teams accepted this augmentation in either January or June as part of the biannual augmentation process. The funding was largely used to add IT staff time at the NAI lead sites. In some cases this expanded already existing IT support, but for a couple of teams this provided funding for part−time IT staff where there had been none. Thus all fifteen teams now have an identified IT Point of Contact who is a member of the NAI IT Working Group, a virtual team that also includes the members of the Collaborative Research Support Group located at Ames.

The IT Working Group meets periodically via videoconference to discuss issues associated with the development of the virtual institute. Because virtual teams function most effectively when augmented by face to face meetings where people can come to know one another better as colleagues, it is important for members of the IT Working Group to have occasional in−person

meetings focusing both on team−building and on knowledge building. The first such face to face meeting was held this year when the Working Group members were funded by NAI Central to attend a five−day NAI IT conference scheduled to interface with the Astrobiology Science Conference held at Ames Research Center in April. IT Points of Contact came from all but two of the fifteen teams The formal sessions as well as other informal events throughout the five days were extremely productive, resulting in a new sense of team participation. Since this conference the Collaborative Research Manager has received several proposals for collaborative research support projects from IT Working Group members that would further scientific collaboration within their teams.

" Extension of NAI s Room−based Videoconferencing Capabilities

The Pennsylvania State University (PSU) NAI team includes Co−Is from the University of Pittsburgh and the State University of New York at Stony Brook. These three institutions also have students pursuing astrobiology−related studies that would be enhanced by shared learning opportunities across these three campuses. A proposal to extend the room−based videoconferencing and data−sharing equipment currently at PSU, as one of the 14 lead institutional sites, to these other two campuses, was submitted to NAI s Collaborative Research Manager by PSU s PI and IT staff person. The project was funded and implemented by the Collaborative Research Support Group as a way of supporting NAI s charge to function as a virtual institute supporting scientific collaboration as well as educational opportunities for the next generation of astrobiologists. With this new equipment the PSU team can now offer courses that bring together faculty and students in a distance learning context.

This year there have also been several instances where other non−lead sites have joined into NAI multi−point videoconferences using their own existing standards−based equipment and supported by the NAI technology group at Ames Research Center. (e.g. University of Arizona, University of North Carolina. As the Collaborative Research Support Group continues to work with Co−Is and other team members not located at the lead sites, to help them become more integrated into the virtual institute community as active participants, these types of videoconferences and collaborative meetings are likely to occur more frequently.

Conclusion

A successful virtual institute needs both an effective technology architecture and community members motivated to pursue virtual engagement and willing to explore new ways of working. The sociological/human issues in such an effort are as important to address as the technological ones. In this past year a number of projects have been implemented with the intent of evolving NAI s information technology base and providing support and encouragement to members. The Collaborative Research Support Group welcomes on−going member input. If you wish to communicate any feedback or recommendations regarding the development of NAI as a virtual research institute please contact Dr. Lisa Faithorn, NAI s Manager of Collaborative Research at lfaithorn@mail.arc.nasa.gov.