Broader Impacts for Research and Discovery Summit: Evaluation Data

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Broader Impacts for Research and Discovery Summit (BIRDS), funded by the National Science Foundation (NSF) aimed to notify the computing community that NSF Program Managers and Division Directors are serious about enhancing the broader impacts that occur on each funded NSF grant in the computing area. The specific goals were to provide the computing community with examples, discussions, and materials on ways that computer scientists can have broader impact on their research, education, and wider communities.

During BIRDS, the Principal Investigators (PIs) presented several examples of projects with superior broader impacts and facilitated breakout groups in each broader impact criterion. The goal of the breakout groups was twofold: (a) to discuss and document ways that investigators may participate in broader impacts (both existing opportunities and new innovative ideas) and (b) to discuss and document ways in which infrastructure can be established to make it easier for NSF investigators to improve the broader impacts of their work.

In order to evaluate BIRDS, an evaluative tool was developed to examine the effectiveness of the program outcomes. The evaluative tool was designed to capture the participants' knowledge of Broader Impacts (BIs) before the summit and after the summit. Success for BIRDS was defined by the extent the summit informed the participants about BIs and their importance, whether it better prepared the participants for writing proposals, and equipped the participants with examples of BIs that can be replicated in their own projects. Data were collected using on-line survey data collection after the completion of BIRDS.

Overall, the evaluation assessed the quality and effectiveness of BIRDS. Findings from the BIRDS evaluation demonstrate that the event was successful with increasing knowledge-base and confidence of participants regarding the implementation of Broader Impacts in their respective work. Three areas emerged as opportunities for improvement with future efforts. First, participants did not grasp how to measure their BI outcomes. Second, participants felt that materials should have been provided in advance in order to have a common starting point for discussions. Third, participants identified (through their qualitative responses) design elements of BIRDS that could be reshaped to improved program outcomes.

Evaluation Summary Results

- 87 participants completed BIRDS surveys (50.6% male, 49.4% female) (13.6% African American/Black, 2.5% Hispanics, 63.0% White. and 21.0% Asian/Pacific Islander).
- Prior to attending BIRDS, approximately 97.7% of the participants had not attended workshops that provided information on Broader Impacts.
- 85.9% of the participants recorded understanding or high understanding for BI criteria: broaden participation of underrepresented groups.
- After attending BIRDS, approximately 87.8% of the participants were confident about their knowledge of NSF standards for Broader Impacts.
- Unfortunately, only 58.4% of the participants recorded confident or high confidence that they could measure their BI outcomes.
- Upon completion of BIRDS, 82.1% of the participants felts that they had increased their network of individuals who could assist them with BI activities.
- Though most participants appreciated the individualize breakout sessions, many participants expressed the desire to experience additional sessions aside from the ones they attended.
- Participants asserted that better defined recommendations for reviewers would aid them in understanding NSF's expectations.

Characteristics of Participants

Of those who attended Broader Impacts for Research and Discovery Summit (BIRDS), eighty-seven completed the survey instrument. Regarding gender, approximately 50.6% of the participants were male and 49.4% were female. With regards to participation by race/ethnicity, approximately 13.6% were African American/Black, 2.5% were Hispanic, 21.0% were Asian/Pacific Islander, and 63.0% were White. The average age for participants was 42. The professional status of participants varied greatly, with the majority falling into the "Other" category (39%), followed by Associate Professors and Graduate Students (16.9%), Full Professors (11.7%), CI Fellow/Postdoctoral (6.5%), Research Associate/Faculty (5.2%), and Assistant Professors (3.9%).

Gender of Participants

	Frequency	Valid Percent
Females	43	49.4
Males	44	50.6
Total	87	100.0

Race/Ethnicity of Participants

	Frequency	Valid Percent
African American/Black	11	13.6
Hispanic or Latino	2	2.5
White	51	63.0
Asian or Pacific Islander	17	21.0
Total	81	100.0

Age of Participants

N	Mean	Std. Deviation
69	42.06	13.020

Professional Status of Participants

	Frequency	Valid Percent
Graduate Student	13	16.9
CI Fellow/Postdoctoral Researcher	5	6.5
Research Associate/Faculty	4	5.2
Assistant Professor	3	3.9
Associate Professor	13	16.9
Full Professor	9	11.7
Other	30	39.0
Total	77	100.0

Broader Impacts Knowledge

Prior to attending BIRDS, approximately 97.7% of the participants had not attended workshops that provided information on Broader Impacts. However, after attending BIRDS participants expressed high levels of knowledge acquisition. Namely, 80% of the participants recorded understanding or high understanding for BI criteria: advance science while promoting teaching, training, and learning. Also, 85.9% of the participants recorded understanding or high understanding for BI criteria: broaden participation of underrepresented groups. Likewise, 75% of the participants recorded understanding or high understanding for BI criteria: enhance infrastructure for research and education. Moreover, 83.5% of the participants recorded understanding or high understanding for BI criteria: provide broad dissemination to enhance scientific and technological understanding. Lastly, 78% of the participants recorded understanding or high understanding for BI criteria: highlight the benefit to society.

Prior to BIRDS, have you ever participated in an information-based workshop geared towards clarifying NSF broader impacts review criteria?

	Frequency	Valid Percent
Yes	2	2.3
No	85	97.7
Total	87	100.0

After attending BIRDS, please indicate your level of understanding regarding the following five NSF broader impacts criteria:

Advance science while promoting teaching, training and learning

	Frequency	Valid Percent
No Understanding	0	0.0
Some Understanding	4	4.7
Neutral	13	15.3
Understanding	26	30.6
High Understanding	42	49.4
Total	85	100.0

Broaden participation of underrepresented groups

	Frequency	Valid Percent
No Understanding	0	0.0
Some Understanding	1	1.2
Neutral	11	12.9
Understanding	25	29.4
High Understanding	48	56.5
Total	85	100.0

Enhance infrastructure for research and education

	Frequency	Valid Percent
No Understanding	0	0.0
Some Understanding	3	3.6
Neutral	18	21.4
Understanding	28	33.3
High Understanding	35	41.7
Total	84	100.0

Provide broad dissemination to enhance scientific and technological understanding

	Frequency	Valid Percent
No Understanding	0	0.0
Some Understanding	5	5.9
Neutral	9	10.6
Understanding	28	32.9
High Understanding	43	50.6
Total	85	100.0

Highlight the benefit to society

	Frequency	Valid Percent
No Understanding	0	0.0
Some Understanding	3	3.7
Neutral	15	18.3
Understanding	28	34.1
High Understanding	36	43.9
Total	82	100.0

Confidence in Broader Impacts Knowledge

After attending BIRDS, approximately 87.8% of the participants were confident about their knowledge of NSF standards for Broader Impacts. Namely, 76.5% of the participants recorded confident or high confidence that they could describe what makes a BI project successful. Also, 89.2% of the participants recorded confident or high confidence that they could implement a successful BI activity into their research. Unfortunately, only 58.4% of the participants recorded confident or high confidence that they could measure their BI outcomes. Lastly, 76.2% of the participants recorded confident or high confidence that they could write a successful BI request.

After attending BIRDS, are you confident about your knowledge of NSF standards for Broader Impacts (BI)?

	Frequency	Valid Percent
Yes	72	87.8
No	10	12.2
Total	82	100.0

After participating in BIRDS, please indicate your level of confidence regarding the following:

How confident are you that you can describe what makes a BI project successful?

	Frequency	Valid Percent
No Confidence	0	0.0
Little Confidence	1	1.2
Neutral	19	22.4
Confident	36	42.4
High Confidence	29	34.1
Total	85	100.0

How confident are you that you can implement a successful BI activity into your research?

	Frequency	Valid Percent
No Confidence	0	0.0
Little Confidence	0	0.0
Neutral	9	10.8
Confident	35	42.2
High Confidence	39	47.0
Total	83	100.0

How confident are you that you can measure your BI outcomes?

	Frequency	Valid Percent
No Confidence	0	0.0
Little Confidence	7	8.3
Neutral	28	33.3
Confident	36	42.9
High Confidence	13	15.5
Total	84	100.0

How confident are you that you can write a successful BI request?

	Frequency	Valid Percent
No Confidence	1	1.2
Little Confidence	0	0.0
Neutral	19	22.6
Confident	42	50.0
High Confidence	22	26.2
Total	85	100.0

Usefulness of BIRDS

Upon completion of BIRDS, 82.1% of the participants felts that they had increased their network of individuals who could assist them with BI activities. Concurrently, 83.5% of the participants felt that BIRDS was either useful or highly useful. Most importantly, 97.6% of the participants stated that they would attend another BIRD.

After participating in BIRDS, do you now have a network of professionals who can assist you in your BI activities?

	Frequency	Valid Percent
Yes	69	82.1
No	15	17.9
Total	84	100.0

Please indicate the usefulness of BIRDS

	Frequency	Valid Percent
Not Useful	0	0.0
Somewhat Useful	2	2.4
Neutral	12	14.1
Useful	34	40.0
Highly Useful	37	43.5
Total	85	100.0

Would you participate in a future BIRDS summit?

	Frequency	Valid Percent
Yes	83	97.6
No	2	2.4
Total	85	100.0

Qualitative Responses: Opportunities for Improvement

While there were varying opinions regarding BIRDS, overwhelmingly, the participants thought the summit was useful and very good at informing participants about BI activities. Additionally, the participants thought there were good resources provided during the summit. Though many participants entered the summit with some view of BI, most being a narrow view and attributed to their limited experiences with BI, the summit expanded their outlook on BI projects and endeavors. This outcome is exemplified in this participant's iterations:

> My own definition of broader impacts has now been expanded to be more inclusive of society at large.

Though most participants appreciated the individualize breakout sessions, many participants expressed the desire to experience additional sessions aside from the ones they attended. These participants were interested in BI activities in various research areas and felt that additional time to network would have helped to satisfy this desire. One participant stated, "It would have been nice if all the groups posted where they were going and if you could sign up for another group to join." An example of where to insert this option to engage a different group was around dinner. In the current summit format, groups were invited to meet with each other during dinner. Some participants expressed the desire to have been informed where each group was meeting so they could join another group, as some groups chose not to meet during dinner, leaving those who wanted to continue to engage in discourse with nowhere to go.

While presented activities and examples aided participants in their understanding of BI, the summit did not necessarily clear up NSF's expectations for many participants. Participants asserted that better defined recommendations for reviewers would aid them in understanding these expectations. Some participants felt that the breakout sessions were more so brainstorming sessions, which lacked clear and concise syntheses. Consequently, some participants felt that, "it is difficult to say that the Summit came to a clear consensus on what constitutes a successful BI component." This assertion is also exemplified in the following participant's statement:

> It is not clear to me what the NSF standard is and how BI is going to be evaluated.
> A clear and official guideline will be helpful.

Another participant stated this:

> The concept of a national infrastructure into which individual projects could
> contribute to ensure broader impact needs to be encouraged.

Additionally, participants felt that as a result of the wealth of information they received at the summit, more written materials, including a synthesis of the summit, would aid in their understanding of BI, as well as the position of NSF. The participants suggested the information presented at the summit, including the presenters' power point presentations, be made available in physical documents and on the website, as they expressed the difficulty of retaining all the information provided, even having taken notes.

The participants also expressed that preemptive measures could have been taken to promote a more fruitful summit. In other words, many participants made mention of how the time it took participants to get on the same page regarding BI, could have been better used for more fruitful discussion. The participants stated that the summit organizers could have "provided a framework for what we would like to accomplish and getting our thoughts around the issues might make for better feedback and collaboration." Another participant stated this:

I think it would have been good if we had all been sent the 2007 BI document ahead of time and asked to read it. My sense was during the summit that people tend to think of BI as being only those things that they do within the context of their own work, and are less aware of the other categories. So we did not all come in with the same fundamental understanding of the breadth of BI categories and possible activities. Some discussions would have reached the fruitful stage faster if we had all started more on the same page.

Though most participants felt this summit was indeed useful to them personally, the participants also hoped for a clearer understanding of NSF's expectations regarding broader impact project and activities. The participants desire a clearer and concise format, outlining exactly what NSF is looking for in an effort to expand the participant's current and future projects to encompass broader impact initiatives and endeavors. The participants felt the summit comprised of those involved in large scale BI projects, but lacked examples from smaller scale projects. In either case, the expectations of current and future CISE and BI projects and initiatives still needs to be more thoroughly delineated with regards to NSF requirements.