

Extended Abstract: Analysis of nanoHUB.org from a Business Perspective

Lynn K. Zentner,* Network for Computational Nanotechnology, Purdue University; Michael G. Zentner, HUBzero, Purdue University; and Gerhard Klimeck, Network for Computational Nanotechnology, Purdue University

*Corresponding author address: Network for Computational Nanotechnology, Purdue University, West Lafayette, IN, 47907, USA; email: lzentner@purdue.edu

Abstract: *Science Gateways are typically implemented by scientists and cyberinfrastructure experts to serve a specific, externally-funded scientific focus. Sustainability of those gateways and the knowledge and tools they contain continues to be of strong interest to both the gateways and the funding agencies that support their creation and initial operation. nanoHUB.org is an established gateway entering its 15th year of operation and now serving over 1.4 million visitors annually. The leadership at nanoHUB have utilized a partnership with Purdue's Krannert School of Management to collaborate on examining nanoHUB from a business perspective. The results of these collaborations are outlined in this extended abstract and will be expanded upon in the corresponding presentation.*

1. Introduction

As individual science gateways mature, their focus expands from building and supporting infrastructure and community to continued growth and sustainability. Gateways often begin as part of a specific research project, which, by the nature of the research funding in the U.S. and elsewhere, have a set end date where the sustainability of the work product and of the science gateway itself becomes a concern.

1.1 nanoHUB Background

The science gateway nanoHUB.org [1] is funded through the U.S. National Science Foundation (NSF) award EEC-1227020 and operated by the Network for Computational Nanotechnology (NCN). Founded in 2002, NCN is now entering its 15th year of operation and nanoHUB has grown from a small community of users in 2002 to over 1.4 million visitors annually. It supports a global community of nanotechnology researchers and educators with over 400 easy-to-

access simulation tools linked to powerful computational resources and nearly 5000 other educational and supporting materials ranging from lectures and seminars to full-length courses including homework and exams. A gateway of this size and breadth can be said to have reached a certain critical mass and is also on the cutting edge of questions of continued community growth and participation as well as future operation and sustainability.

1.2 Intersection with Business Studies

Purdue University's Krannert School of Management [2] has several MBA programs involving a semester-long Experiential Learning Initiative (ELI) or Applied Learning Project (ALP) where students collaborate with a selected company on a specific problem. The companies submit proposals beforehand to the program faculty and vetted project opportunities are presented to student groups, who then select a project on which to work. NCN began participating as a company in these projects in Spring 2014 and has submitted three separate proposals in each of three terms, all of which were approved by the faculty and selected by students. An outline of those projects and their results are presented in this extended abstract.

2. The Studies

NCN has presented longitudinally designed projects to three MBA teams with each project theme crafted to build and expand on past work. Each team was provided with the final reports from the previous team(s), access to NCN leadership and necessary data, and guidance from the NCN team as to NCN goals and the scope of the current project. Recommendations from the MBA groups have been implemented or acted on where

appropriate.

1.3 Evaluate Monetization Strategies

In the first year's project, NCN began an exploration of sustainability from a financial standpoint. NCN asked the ELI team to evaluate the current content delivery model and develop options to monetize new or existing elements of the service model without alienating or significantly impacting services for existing users. This team analyzed content and competitors and surveyed users to craft a recommendation for a pilot premium membership option on nanoHUB.

1.4 Examine the Market

The second team of ELI students was asked to help determine nanoHUB's potential market. This is a key consideration for science gateways to understand how big they can potentially grow and whether they have saturated their market. This team approached the problem with a business-oriented mindset and decided to quantify market size not in terms of the number of potential users, but by the industry spending on education in nanotechnology. Based on this spending, and the assets available on nanoHUB, the team developed the analog of a "market capitalization" metric for nanoHUB. This way of thinking positions NCN to explore value not just in terms of scientific merit but also in terms of some potential monetary value.

1.5 Ongoing Investigation of Sustainability

In the third project, NCN partnered with a group of MBA students on a semester-long Active Learning Project (ALP). This project group was part of the Executive MBA (EMBA) program, which consists of high caliber students who are already working professionals with a wide variety of experience.

After reviewing previous work, this group put their focus on two main areas: determining how nanoHUB can grow into a sustainable society through engagement and expansion of its community, and providing a concrete marketing plan for engaging the community.

This group emphasized the importance of retaining users as well as the key role that new content plays in engaging existing users and attracting new ones. They reinforced the

importance of communicating with the community through online vehicles such as social media as well as in-person venues such as user conferences, workshops, and forums.

3. Results

Each project resulted in actions taken by the nanoHUB team to apply the knowledge gained. The result of the first project was the implementation of a "Pro" membership on nanoHUB that provided additional benefits for a moderate annual cost. The second project caused the team to further evaluate how to describe and think about users in terms of market reach. The last group provided ideas for continued engagement, growth, and marketing.

4. Conclusions

nanoHUB's strong presence in the nanotechnology community attests to the value it provides within that community, but like all science gateways, it needs to continue to evolve in order to remain vibrant and relevant to its community. Scientists and cyberinfrastructure experts who drive the development of science gateways may not have the expertise to examine them through a business lens when considering the future of the gateway. Bringing in business expertise can be expensive. Capitalizing on the breadth of student talent in existing business graduate programs can help provide needed expertise and out of the box thinking that will benefit both the gateway and the student team. NCN will continue to utilize this approach in the future to expand on the learning gained from the first three collaborations.

5. Acknowledgments

The operation and development of nanoHUB.org is supported through funding provided by the NSF under grant EEC-1227020. We also gratefully acknowledge the participation of the MBA student groups and Purdue University's Krannert School of Management for providing the opportunity for the collaboration described in this extended abstract.

6. References

- [1] K. Madhavan, M. Zentner, and G. Klimeck, "Learning and Research in the Cloud," *Nature Nanotechnology* **8**, pp. 786-789, 2013, doi:10.1038/nnano.2013.231.
- [2] <http://www.krannert.purdue.edu/>