“Preventing source water contamination is a practical and necessary approach to preventing waterborne cryptosporidiosis.”

-Dr. Kristen Jellison
MESSAGE FROM PITA CO-DIRECTORS
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This second issue of the PITA Newsletter marks the beginning of the latest round of PITA funded projects. We hope you enjoy the articles, which include collaborations with the Philadelphia Water Department, Bombardier, and several companies participating in the Enterprise-Wide Optimization program. These projects exemplify the university-industry partnerships that PITA helps to create and foster. Another example of PITA’s impact is an industry-academic alliance created this year to understand how social networking and virtual reality technology can be leveraged to strengthen Pennsylvania companies in an increasingly global business environment.

Last fall, we received 140 proposals for projects and we were able to award funding to 68 projects. These projects are the primary mechanism through which vibrant and active collaborations between Pennsylvania’s industry and university faculty members and students are formed. A list of our current PITA industry partners is included in this issue. We are particularly pleased to welcome several companies that are new to the PITA program and are looking forward to reporting on outcomes from these new projects in future newsletters.

Please consider submitting an article for the next issue in Fall 2008, whether you have news on an ongoing PITA project, new outcomes from a past PITA project, or want to advertise industry research needs to our program participants. And if you are not already involved in PITA, as you read the enclosed articles, please consider how your company or academic program may benefit from similar collaborations. Visit our web site at www.pitapa.org.

In closing, we wish to thank the Pennsylvania General Assembly, Governor Rendell, the Pennsylvania Department of Community and Economic Development (DCED) and our industrial partners for their continued support. Through their collective vision, PITA exists to advance Pennsylvania’s economy through our partnerships with industry.

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INDUSTRY – ACADEMIC ALLIANCE TO DEVELOP WHITE PAPER ON “SOCIAL NETWORKS AND VIRTUAL REALITY AS ENVIRONMENTS FOR BUSINESS DEVELOPMENT AND GLOBALIZATION”
BY DR. ROGER NAGEL

Hundreds of millions of people have embraced online social tools such as MySpace, Facebook, and Orkut to enhance and expand their social networks. These services have been particularly popular among students and young adults who want to see and be seen online and in general stay even more connected to their friends. At the same time professionals of all types and ages are using Linkedin, sharepoint, blogs, wiki’s and other web 2.0 tools for social and business purposes. Add to this mix the recent upsurge in the usage of virtual environments such as Second Life by Cisco, IBM, universities and others and it is clear a new form of community is emerging.

So how can social networking and virtual environments be used to create value within a business context? That is the focus of a new Lehigh University initiative facilitated by Prof. Roger Nagel, along with Professors Brian Davison and Emory Zimmers as co-investigators, recently funded by PITA and Pennsylvania companies such as Air Products.
This project began as an outgrowth of Nagel’s recent graduate course on “Open Innovation Networks” (partially sponsored by a PITA grant in 2007) that began to see the need for a white paper on how industry can benefit from social network software such as Facebook and virtual environments like Second Life. This realization grew out of studying how companies like Proctor and Gamble, Cisco, and IBM were beginning to use social networking tools to gain competitive advantage by extending and enhancing the effectiveness of intra- and inter-enterprise collaboration.

Through a series of conversations, including the PITA roundtable discussion at Carnegie Mellon in November, we found the concept of Social Networks and Virtual Reality as Environments for Business Development and Globalization to be intuitively appealing. We were challenged by several industry executives to develop a white paper that describes the landscape of social networks and virtual worlds and clarifies the enhanced value propositions of these environments for business development and globalization. This report would also provide an understanding of the current and potential benefits, as well as the constraints imposed by cultural, technological, and business trends and realities that must be dealt with in order to achieve sustainable strategic benefits.

This effort, informally called Birds of a Feather (http://www.bofproject.com/), now includes people from all over Lehigh, including a dozen faculty and more than twenty graduate and undergraduate students. A public kickoff event held on February 26th attracted more than sixty participants. Ideas generated by that process along with discussions from sponsors are being used to determine summer projects for many of the students that are supported by this effort.

We see value in the various formal and informal networks and communities in which a person participates. Every organization is, thus, highly interconnected through the social, professional, and interest-based networks of its members. Our work so far has found evidence that it is not only possible to mediate much of that environment of social communities, but that a business can generate tremendous advantage from doing so, and can point to examples in both large and small companies. Early observations by our team are that companies who have been isolating themselves behind firewalls restrict the participants of the community in which they can create value. For large international organizations such a restriction is not yet considered to be a problem as they are first trying to organize collaboration and a sense of community within their global operations.

In studying the leaders in the use of mediated community environments to create business value, we see an emerging trend. The firewall remains a key strategic factor, but organizational elements operate simultaneously inside the firewall, and in controlled collaborations outside of it. In the outside collaborations the organization connects with social and professional networks, partners, and suppliers, customers and others using web 2.0 tools, social and professional networks, and even virtual environments. The key to this new extended form of enterprise is to create a mediated community which creates value for the business or organization. The concept of mediated community is meant to include all forms of leading, facilitating and, directly or indirectly, causing elements of the community to understand the value-based goals of the enterprise and contribute to them.

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The Birds of a Feather project website.

The white paper will have two sections. The first section will use the integrated framework to develop a variety of alternative business social scenarios for each generation and the contribution which each can achieve. This analysis is directed at the reader who needs a conceptual understanding, and will focus on crafting value propositions, frameworks and

Article continued on back cover…
Cryptosporidium is a parasite associated with acute gastrointestinal disease that is self-limiting in otherwise healthy adults but prolonged and life-threatening for the immunocompromised. The parasite is transmitted via the fecal-oral route, with fecally-contaminated food and water serving as primary means of disease transmission. Oocysts of Cryptosporidium spp. in drinking water supplies are a challenge to water treatment plants because they are extremely hardy and resistant to chlorine disinfection and they are too small (4-8 um diameter) to be effectively filtered. Given these challenges, watershed management to prevent source water contamination is a practical and necessary approach to preventing waterborne cryptosporidiosis.

Professor Kristen Jellison at Lehigh University has been working with the Philadelphia Water Department since 2005 to identify the sources of Cryptosporidium spp. oocysts in the Wissahickon Creek watershed, an important drinking water source for the city of Philadelphia. Using molecular techniques, Jellison’s laboratory is able to isolate oocysts from water and fecal samples in the watershed, extract genomic DNA, and sequence a portion of the genome to identify the Cryptosporidium species or genotype in the sample. Certain genotypes are associated with wildlife, domesticated animals, and humans, respectively, so identification of oocyst genotypes can indicate where watershed management efforts should be focused to prevent oocyst contamination and achieve the highest level of human health protection.

Twice a month, Jellison’s laboratory analyzes water samples from two locations on the Wissahickon Creek (Wiss 140 and Wiss 410) as well as treated wastewater effluent from three wastewater treatment plants (Upper Gwynedd, Ambler, and Abington) in the watershed. Once per month, Jellison’s laboratory analyzes fecal samples from a variety of wildlife and agricultural animals living in the watershed. Project goals include the identification of oocyst genotypes (and likely sources) as well as temporal or climatic patterns of oocyst contamination in the watershed. Results to date show that human and wildlife inputs are dominant in the Wissahickon Creek watershed, and wildlife, particularly deer and geese, may serve as important reservoirs of potentially infectious Cryptosporidium. In addition, treated wastewater is a source of potentially infectious oocysts. Finally, there is no clear seasonal trend of oocyst detection in the watershed or of the detection of human, wildlife, or agricultural genotypes of Cryptosporidium in the watershed.

Data from Jellison’s laboratory is used by the Philadelphia Water Department to develop watershed protection strategies to minimize contamination of the raw drinking water supply with infectious Cryptosporidium oocysts.

This project has been partially supported by PITA since 2005; PITA funds have been used to support two graduate students as well as to offset the costs of laboratory supplies and reagents needed to conduct the molecular analyses.

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Enterprise-wide optimization (EWO) has become a major goal in industry due to the increasing pressure for remaining competitive in the global marketplace. EWO involves optimizing the operations of supply, manufacturing and distribution activities of a company to reduce costs and inventories. One of the key features in EWO is integration of the information and decision-making among the various functions that comprise the supply chain of the company. The EWO project, housed in the Institute for Complex Engineered Systems (ICES) at Carnegie Mellon, helps to strengthen the competitiveness of companies in Pennsylvania by reducing the costs and inventories in the supply chains of chemical manufacturing companies.

Director of the EWO project and Professor of Chemical Engineering Ignacio Grossmann says, “we have been able to develop new exciting modeling capabilities for the planning and scheduling of chemical manufacturing supply chains, and establish strong links with our industrial partners with whom we can validate our models with real world industrial problems.” The EWO project has also proved to be great success in attracting Pennsylvania and non-Pennsylvania companies to a unique research expertise hardly found in the rest of the U.S. It should also support and promote the creation of software companies in the area of enterprise optimization.

This collaborative research project was initiated in July 2005 and continues with the aid of Pennsylvania Technology Alliance (PITA) funding. It has also since received supplementary funding from the National Science Foundation (NSF).

The project consists of a multidisciplinary team from three Pennsylvania institutions: Carnegie Mellon, Lehigh University, and the University of Pittsburgh, as well as the University of Wisconsin. The team is composed of chemical and industrial engineers, and operations researchers who are developing novel models, algorithms, decomposition methods, and computational techniques to explore and analyze alternatives of the supply chain to achieve overall optimum economic performance and a high level of customer satisfaction. The project involves close collaborations with industry, including ABB, Air Products and Chemicals, BP, Dow Chemical, ExxonMobil, NOVA Chemicals, Praxair, and TOTAL.

Industry collaborators have reported that their companies have benefited from participating in the EWO project. Iiro Harjunkoski with ABB Corporate Research reports that his company has been “exposed to cross-scientific problems, networking with professors and other companies, as well as receiving modeling and optimization support into challenging large-scale industrial problems.” John Tao, Corporate Director of Technology Partnerships for Air Products and Chemicals, says that “Air Products looks forward to continued mutual benefit with these universities, and is eager to continue this relationship.”

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Bombardier has been an industry partner to ICES since 2000, providing financial support and creating working relationships with ICES researchers on projects that serve to enhance transit system manufacturing, monitoring, and servicing. ICES researchers have collaborated directly with Bombardier representatives from Bombardier Transportation, Total Transit Systems Division located in Pittsburgh.

Bombardier has a committed history to supporting PITA-funded ICES research. Recent projects include faculty from Civil and Environmental Engineering, Electrical and Computer Engineering, Human Computer Interaction Institute, and Computer Science working on transit-related infrastructure and monitoring products and processes for Bombardier. Director of Total Transit Systems Project, Advance and Civil Engineering James D. Chatham says: “Bombardier has successfully utilized the partnership that has been forged with ICES-PITA through the past several years. As an example, Bombardier in collaboration with ICES-PITA, has made great strides in researching the applicability of video analytics in the transit business. This research will assist Bombardier in addressing its clients’ needs in specific areas such as passenger safety and security.”

Encoding and wirelessly transmitting video/data from cameras located on trains is a data-intensive process which requires specialized algorithms and transmission methods. It is important to optimize the encoding and transmission elements in order to reduce hard disk storage, network bandwidth, and provide optimum video quality. Professors Asim Smailagic of ICES and Dan Siewiorek from the Human Computer Interaction Institute have been working directly with Total Transit Systems representatives on providing an analysis of the hardware and software required to optimize video/data capture and transmission a mass transit vehicle. Their analysis describes the performance and cost of various cameras, encoders and communications technologies.

Professors Irving Oppenheim from Civil and Environmental Engineering and David Greve from Electrical and Computer Engineering have also been working with Bombardier to develop and test wireless forms of sensing for structural monitoring. One technology under investigation is a novel, passively-powered, inductively-coupled (wireless) ultrasonic system for pulse-echo flaw detection that was recently developed at Carnegie Mellon, and another is a fluid-coupled system; these technologies are being studied for application to vehicle guideway condition monitoring. Bombardier will use the results of these experiments as it enhances its transit infrastructure and monitoring process.

Civil and Environmental Engineering Associate Professor Burcu Akinci and Robotics Scientist Dr. Daniel Huber have been working with Bombardier to evaluate the capabilities of different types of laser scanners and corresponding data processing software systems and develop a framework to assess the quality of running surfaces and guideway structures. This framework can be used to assess whether the structure is being constructed in compliance with the design drawings and whether the structure can be safely utilized after an event during its service life. The team has been using and experimenting with these technologies to assess their capabilities.
in meeting the functional requirements of a quality control system for Bombardier guideway structures and running surfaces.

Finally, Bombardier is committed to the process of training the next generation of engineers. Beginning in 2000 and especially in recent years, it has acted as one of the industry partners financially supporting and participating in the ICES-sponsored Engineering Design Projects Course, led by John Wesner, Adjunct Professor of Mechanical Engineering. The course links industry clients directly with an interdisciplinary team of upper-level and graduate students on a project that is jointly defined. The goal of the course is to emulate the industrial product development cycle and allow students the time to carry through designs to development and prototypes.

Recently, Bombardier has announced that it will continue to provide financial support to ICES and its PITA-related projects. As Matt Sanfilippo, PITA Co-Associate Director at ICES describes, “Bombardier has consistently supported PITA with time, expertise, and financial support.”

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PITA is a Pennsylvania Department of Community and Economic Development (DCED) program designed to provide economic benefit to Pennsylvania through knowledge transfer, the discovery of new technologies, and the retention of highly educated students.

It is a collaboration between the Commonwealth of Pennsylvania, the Center for Advanced Technology for Large Structural Systems (ATLSS) at Lehigh University, and the Institute for Complex Engineered Systems (ICES) at Carnegie Mellon University.

PITA’s research and education projects involve Pennsylvania companies, faculty, and students. PITA’s programs have led to the creation and implementation of numerous cutting-edge technologies in Pennsylvania companies and have also enabled several start-up companies to form within the Commonwealth.

The Pennsylvania Infrastructure Technology Alliance (PITA) welcomes the following 2008-2009 project partners. These partners will be working on projects funded in the new fiscal year with Carnegie Mellon University and Lehigh University.

ABB • Aesculap • Air Products and Chemicals • Airway Cam Technologies • AISI • Alcoa • Allegheny Energy • Allentown Area School District • Army Research Laboratory • Aruba Networks • Bally Block • Bayer • BBraun • Bethlehem Area School District • Binney & Smith • Bosch • BP Refining Technology • Caracal • CarMell • CISR • Clarus Medical • Concurrent Technologies Corporation • Constellation Energy Group • Cornell Iron • Dow Chemical • EcoTech Marine • ETAC • ExxonMobil • FHWA • Gentex • Glucose Sensing Technologies, LLC • Henson Products • High Concrete • High Steel • Highwood USA • InfraRed Imaging Systems • Insaco • Institute for Transfusion Medicine • Intel Research • Interdigital Communications Corp • IQE Inc. • ISAT Seismic Bracing, CA. • Just Born • Laservy Corp. • Lockheed Martin • Lord Corp. • LSI Industries • LV Plastics • Mack Truck • MEDRAD • National Energy Technology Lab • National Science Foundation • NEESInc • Neuro Kinetics • New Enterprise Stone & Lime Co., Inc., PA • Nova Chemicals • Novocell • Pharmachem Corp. • Philadelphia Water Dept. • PJ Dick Inc. • PJM Interconnect • PMC-Sierra, Inc. • PPL Corporation • Precast / Prestressed Concrete Institute • Purolite Co. • Seagate • SMS Demag • Solar Tech • Spang and Company • Strategic Minerals • Suntex International • Thales Communications Inc. • TOTAL France • Tray-Pac • Turner Construction • Tyco Electronics Corp. • University of Pennsylvania GRASP Laboratory • University of Pittsburgh Medical Center including McGowan Institute for Regenerative Medicine • Victaulic Company, PA • Vigon International • WavesInSolids • Weldship • ZetaMetrix Inc

Over the remainder of the year, we plan to learn more about the needs, successes and failures of these ideas, though projects, study of the literature, interviews, resulting in a white paper that will educate leaders and implementers in how they can benefit from social networking and virtual environment technologies.