Annual Report - 2014

Watson Institute for Systems Excellence
An Institute for Advanced Studies

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Dean and SUNY Distinguished Professor
Thomas J. Watson School of Engineering and Applied Science

Binghamton Faculty Associated with Institute

Mohammad Khasawneh
Systems Science and Industrial Engineering

Sung Hoon Chung
Systems Science and Industrial Engineering

Nagen Nagarur
Systems Science and Industrial Engineering

Peter Borgesen
Systems Science and Industrial Engineering

Daryl Santos
Systems Science and Industrial Engineering

Sarah Lam
Systems Science and Industrial Engineering

Chun-An Chou
Systems Science and Industrial Engineering

Sangwon Yoon
Systems Science and Industrial Engineering

Paul Chiarot
Mechanical Engineering

Susan Lu
Systems Science and Industrial Engineering

Zhanpeng Jun
Electrical and Computer Engineering

Ross Havens
Watson Institute for Systems Excellence

Binghamton Students (Graduate and Undergraduate) Associated with Institute
(December 2014)

Ph.D. Students: 39
Current MS Students: 35
Undergraduates: 0
Total Number of Students in WISE: 74
Institute Description and Activity Review

For over seven years now, starting in 2007, the Watson Institute for Systems Excellence (or WISE) has functioned as an Institute for Advanced Studies under the umbrella of our Research Division. The concept that is espoused by today’s WISE has its genesis in 1989, when our team’s first sponsored research award was received (in May 1989). Today, after 25 years, WISE continues to be a robust research and educational organization. During this period, that has spanned over two decades, our WISE faculty and staff have been able to initiate, grow and sustain sponsored research activity. While the growth of sponsored research has been a goal, perhaps the more important goal continues to be education and scholarship. If one were to take a longer term view, say for instance a decade, WISE has more than doubled. For the past three years, WISE (has on average) over 70 graduate students with 50% of them being doctoral students. This growth could not have been sustained without a superb team, which is indeed a trademark of WISE.

The WISE Team of today continues the traditions that have been built up over the past 25 years. They are illustrated by (i) a continuous drive to expand our academic horizon, (ii) fund graduate students, both doctoral and MS level students, and (iii) simultaneously focus on doctoral student growth. To fund its research and scholarship related activity, WISE continues to focus on garnering externally sponsored research. While the preponderance of research sponsors (for WISE) have been from industry, the past year witnessed sponsored research from the US Department of Veterans Affairs and from New York State (Division of Motor Vehicles).
efforts of faculty such as Professors Borgesen and Khasawneh in this regard need to be highlighted.

Our WISE Team is always looking for collaborations across campus, including working with faculty and other research centers across campus (and on other campuses, both in the USA and abroad). Professor Zhanpeng Jin (of our ECE Department) and Professor Paul Chiarot (of our Mechanical Engineering Department) have both become an integral part of WISE, while we are strengthening our longstanding collaborations with faculty such as Distinguished Professor Bahgat Sammakia (Director – S3IP). Another example could be Professor Daryl Santos, who currently functions as the Director of the IEEC too. Professor Santos has been an integral part of WISE (or its precursors) for over 20 years now. In addition, WISE faculty have also initiated partnerships with faculty in CCPA, Harpur College, and the Decker School of Nursing, with specific focus on seeking federal grants, such as from the Agency for Healthcare Research and Quality (AHRQ), the NSF, and DARPA.

Today, faculty, staff and research associates under the WISE umbrella are working with approximately 20+ sponsors, located all over the USA, located from Cambridge, Massachusetts to Ontario, California. In addition, as mentioned above, WISE has projects from sponsors abroad (such as Analog Devices General Trias in the Phillipines and Samsung Techwin in Korea). WISE is working to expand its international footprint. In the past, WISE has tried to obtain projects from sponsors in countries such as Singapore, Canada, and Mexico; however, these pioneering efforts have not yet been successful. For over six months now, WISE has been trying very hard to secure sponsored research from Infosys (www.infosys.com). In the past, WISE had
tried to obtain funding from Wipro (www.wipro.com), and despite our best efforts, we were not successful.

A note about our relationship with Samsung Techwin. This relationship (principally through the efforts of Professor Sangwon Yoon) has grown significantly over the past 30 months. Thanks to Professor Nagarur’s and Mr. Ross Havens’ efforts, we (WISE) successfully completed our first sponsored project (sponsored by ADGT) in the Phillipinnes. The second project that has been sponsored by ADGT is led by Professor Sangwon Yoon (given that the project was inline with his academic credentials). This is inline with the culture at WISE, wherein a project is led by a faculty member whose background is inline with the need of the project (and the baton for projects with ADGT was passed from Professor Nagarur to Professor Yoon, with Mr. Havens continuing to serve as the lynchpin for this effort). Professor Borgesen is leading efforts with Brazil. Another example is Professor Mohammad Khasawneh working with colleagues located at VIT in Pune, India and at the Hebei University of Technology in Tianjian, China. And our efforts with Infosys are spearheaded by Professor Sunghoon Chung.

The areas that WISE works includes (i) electronics manufacturing and electronics packaging, (ii) health care delivery systems engineering and management, (iii) systems analysis and modeling, (iv) the use of “big data” in enterprise systems, and (iv) distribution and logistics. In addition, in the past, the WISE organization has worked on multiple projects for our campus.

The WISE Team would like to (i) build on existing strengths and (ii) grow into new areas. This strategy has always been an inherent part of who we are. These (new) areas will help us expand
our research reach, and potentially open up new areas of scientific inquiry that would also help garner external support.

The primary mission of WISE has not changed. It continues to be (i) to foster academic endeavors that are interdisciplinary in nature and (ii) is focused on advancing the educational experience of our students, principally at the graduate level. In recent years, the focus has been on doctoral students, and this trend continues to grow. The number of doctoral students under the WISE umbrella has grown substantially over the past five years. For the calendar year 2014, the number of PhD students has ranged between 34-38, constituting approximately 45-50% of WISE. In contrast, a decade ago, PhD students were around 20% of WISE. Over the past three years, this number (percentage) has ranged between 40-60% (this is a metric that we carefully review, since enhancing the number of PhD students is critical to our campus’ overall academic mission).

By including faculty members whose research expertise spans diverse but inter-related domains (mentioned above), WISE effectively promotes externally sponsored interdisciplinary work. Today, eleven faculty members actively participate in WISE. In addition, detailed discussions were held with faculty from departments ranging from Computer Science, Mechanical Engineering to Electrical and Computer Engineering and Biomedical Engineering, with the explicit goal of enhancing WISE’s span of research interests. WISE often funds graduate research associates from multiple departments in the Watson School.

The principal focus of WISE continues to be student-centered research and education. A phrase that epitomizes our outlook is that we are “student centered and customer focused”. The
student is central to our educational (including research) mission. In addition, WISE has extensive externally sponsored research. WISE-related faculty have obtained at least 25 externally sponsored research contracts in the past year. This Institute has significant impact on economic-development, in as much as we get external resources that are spent in our community. We also continue to provide significant “return on investment” for our sponsors. It is noteworthy that MS students under the WISE umbrella work on a research-intensive thesis.

Over the past three fiscal years, WISE has garnered over 7.0 million dollars in external sponsorship for research under its umbrella. Faculty associated with WISE are always submitting proposals to sponsors, and are continuously seeking to (i) build on current research sources while (ii) identifying new sources for research support. Aggressive plans are currently being executed to increase this number (of sponsors). Over the past year (2014), WISE has initiated sponsored research with US Express, SMTC, VERC, Cooper Health, Sanmina, Google, ADGT, Team World along with new sources of funding at existing sponsors such as SMART Modular Technologies and Innovation Associates. This growth in “WISE Sponsors” has been significant (since January 2014). It is good to note that in Spring 2015 (period not covered by this report), WISE has been successful in securing funding from Bennett Logistics and from an additional source within a long time sponsor, namely UHS. We are also working hard to secure funding from Infosys (www.infosys.com).

In addition, WISE faculty have submitted several proposals to federal agencies, with many more in the pipeline. We will continue to aggressively pursue different modes of funding for our research, and to fund our graduate students. With over 500 alumni in the high-tech industry, faculty and students associated with WISE have helped to increase BU’s visibility. In addition,
WISE faculty and students are active in research publications, both in leading peer-reviewed journals and conferences. This, once again, helps to enhance BU’s visibility.

**WISE From An Operational Perspective**

WISE is a collaborative and team-oriented Institute. The management of WISE is transparent and collegial, with lively meetings of the WISE team that allow for a free flow of ideas while concurrently ensuring that these meetings are very productive. WISE serves as the catalyst for many, if not all, of our research proposals. All proposals have involved multiple faculty members. For example, our work with Innovation Associates is directed and mentored by a team that includes faculty and research staff. This is true for many other research efforts ranging from the Montefiore Medical to Analog Devices and Innovation Associates. WISE-related work is never a solo effort.

WISE is a catalyst for interdisciplinary student-centered research. In addition, WISE is a one-stop shop for our industrial partners. Consequently, as an Institute, WISE plays a critical role in enhancing our research spectrum, and in the effective execution of sponsored research activities.

**Future Directions**

The plans for this Institute are as follows:

- To increase our span of research in five domains, namely (i) electronics packaging and manufacturing, (ii) health systems, (iii) systems analysis and modeling, (iv) logistics and supply chain management for the food service industry, and (iv) business analytics.
• To expand into research areas such as supply chain management, logistics and transportation, business intelligence, human factors and ergonomics, and potentially information systems and data modeling.

• “Spin-off” the health systems segment of WISE as a self-supporting, independent organization that would still be under the overall WISE umbrella. This has occurred, and a new ORC has been set-up on-campus. At the current time, this new ORC functions under the WISE umbrella, and is led by Professor Mohammad Khasawneh.

• In addition, WISE has pilot-plans and discussions underway to establish an organization that focuses on business analytics, continuous process improvement” in academia, and software engineering.

• Enhance our recruiting efforts, from a sponsor and student perspective. While we need to attract new sponsors and retain our current research sponsors, given the size of WISE, student recruiting is a continuing challenge. Considerable resources are expended in this activity.

• Increase the breadth of faculty members who are actively associated with WISE. This activity would be measured by metrics such as participation in sponsored research efforts, publications, mentoring of students, and recruiting new sponsors.

Metrics that will be used to assess and evaluate WISE’s success are (i) sponsored research obtained (goal of 3.00 million for the year 2016-2017); (ii) number of graduate students under the WISE umbrella (stabilize at around 80+ over the next calendar year, namely 2016); (iii) number of faculty members actively involved with WISE (12+ by January 2016); and (iv) publications in peer-reviewed journals and in leading (high impact) conferences. These are the same goals (and metrics) that were enunciated when WISE was initiated as an institute over five
years ago. We (WISE) have met and surpassed all of our stated goals and, as apparent from the narrative above, we are increasing our expectations as our (WISE) team continues to grow. In addition, continuous process improvement is an inherent part of WISE’s psyche.