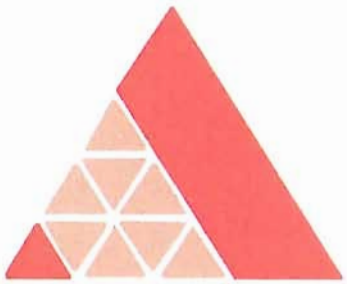

University of Nebraska's

The Peter Kiewit Institute

Self-Study
March, 2007

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Self-Study Planning Team

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Board of Policy Advisors

Walter Scott, Jr., Chairman of the Board
Chairman Emeritus – Peter Kiewit & Sons' Inc. and
Chairman – Level 3 Communications

Richard Bell
Chairman – HDR, Inc.

John Boyer
Partner - Fraser, Stryker, Vaughn, Meusey, Olson, Boyer & Bloch, P.C.

Winnie Callahan
Executive Director – The Peter Kiewit Institute

John Gottschalk
President and CEO – Omaha World-Herald Company

Jack McDonnell
President and CEO (Retired) – TD Ameritrade, Inc.

Anthony Raimondo, Sr.
President and CEO – Behlen Manufacturing Inc.

J. Richard Shoemaker
President - Pinpoint Communications, Inc.

Jim Strand
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Executive Partners of the University of Nebraska

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John Christensen, Interim Chancellor, UNO

David Lechner, Vice President, NU

Harold Maurer, Chancellor, UNMC

Harvey Perlman, Chancellor, UNL

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Peter Kiewit Institute Organizational Snapshot

An Overview of the Peter Kiewit Institute for Information Science, Technology and Engineering

The Peter Kiewit Institute for Information Science, Technology and Engineering is a unique partnership among business and industry, the University of Nebraska at Omaha (UNO) and the University of Nebraska-Lincoln (UNL) to provide high quality, up-to-the minute undergraduate and graduate education in information science, engineering and engineering technology. The Peter Kiewit Institute facilities are in Omaha, Nebraska, and consist of state-of-the art classrooms, research laboratories, and meeting rooms located on a redeveloped former racetrack. Academic programming at the Peter Kiewit Institute is provided by faculty in UNL's College of Engineering and UNO's College of Information Sciences and Technology. Institute faculty are heavily involved in research in the disciplines of computer science, bioinformatics, management information systems, computer electronics and engineering, construction science, architectural engineering, and civil engineering. Undergraduate and graduate degrees are offered in the same disciplines. The unique collaboration between business and industry and the University of Nebraska ensures that by all measures, the Peter Kiewit Institute exemplifies excellence in academic programming, research developments and constituent outreach.

The Institute, often referred to as PKI, was chartered by the University of Nebraska Board of Regents in 1996. PKI incorporated existing Omaha campus engineering and engineering technology academic programs administered by the University of Nebraska-Lincoln's College of Engineering and Technology with existing computer science and management information systems academic programs administered by the University of Nebraska at Omaha. The UNO academic programs were reorganized into a new College of Information Science and Technology.

PKI was organized with policy oversight provided by a Board of Policy Advisors (corporate chief executive officers selected from prominent Omaha and Nebraska companies) and a $70 million fund provided in part by the state ($23 million) and the remaining ($47 million) dollars provided by companies and individuals. The building and its equipment costs were slated to be $37 million with the remaining $33 million to provide endowment dollars as follows: $15 million for faculty support, $15 million for scholarships and $3 million for program enhancements. These donor funds were provided to the University of Nebraska Foundation with the Board of Policy Advisors having sole authority for their use. The Board of Policy Advisors reports to the President of the University of Nebraska System and works cooperatively with the campus administrations of both UNL and UNO. To date, the funds have supported scholarships for high-ability undergraduate students in both colleges, provided bridge-funding for new faculty hiring and technology and other upgrades as deemed appropriate by the board.

A non-profit PKI Technology Development Corporation facilitates business partnerships and technology development opportunities for the institute. The NU Board of Regents chartered the Charles W. Durham School of Architectural Engineering and Construction within the UNL College of Engineering in August 2005. The Durham School is housed within the Peter Kiewit Institute.

The UNO College of Information Science and Technology (CoIS&T) offers academic degree programs in computer science, computer engineering, and bioinformatics; it has 46 faculty and administrators. Fall 2005 enrollments were 678 undergraduate students and 228 graduate students. The UNL College of Engineering (CoE) has Omaha-based degree programs in architectural engineering, civil engineering, computer engineering, construction engineering, construction management, and electronics engineering and 49 Omaha-based faculty and administrators. Fall 2005 enrollments were 881 undergraduates and 32 graduate students. The CoIS&T awarded 129 undergraduate degrees in 2005-06 and the CoE awarded 115 undergraduate degrees. In 2006, the CoIS&T reported $2,770,277 in research expenditures, the CoE reported $1,998,454, and the PKI Technology Development Corporation reported $1,083,294.

The Peter Kiewit Institute shares a new campus (formerly the site of the Ak-Sar-Ben Race Track and Convention Center) at the University of Nebraska at Omaha with the Scott Resident Hall, Scott Village, Scott Conference Center, and the Scott Technology Transfer and Incubator Center. These additional facilities were made possible by contributions from the Suzanne and Walter Scott, Jr. Foundation, a public, not-for-profit foundation.

A recent survey undertaken by MSR Group showed general satisfaction with the PKI educational experience. The survey, reported in January 2007, shows that 51 percent of students report being "very satisfied" with their academic experiences, 39 percent say they are "somewhat satisfied and just 10 percent report being "somewhat disappointed" or "very disappointed." Moreover, 93 percent say they would recommend a PKI education for others. Some 62 percent rate the overall quality of their instructors as "far above average" or "above average." Students say the interdisciplinary collaboration displayed at PKI is a valuable and enriching factor. And 91 percent see a five-year program that would culminate in a master's degree as being beneficial with 85 percent say they definitely or probably would stay at PKI to earn this degree.

Peter Kiewit Mission Statement

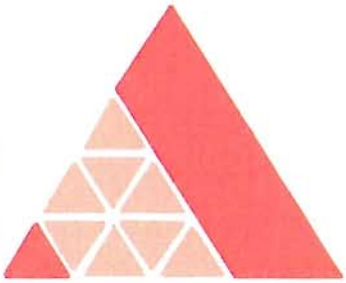
The Mission Statement of the Peter Kiewit Institute, a joint venture partnership between the University of Nebraska Omaha's College of Information Science and Technology and the University of Nebraska Lincoln's College of Engineering and Technology, is

- to create a center of excellence in information science, technology, and engineering by development of excellence in the programs of each College and through the cooperative utilization of resources from each College, from other Colleges or Departments within the University of Nebraska, and from the private sector;
- to provide the Omaha metropolitan area and the State of Nebraska with a unique resource for the education of their current and future employees, for the support of existing technologies, and for the creation of partnerships to develop new business opportunities through advancing technology;
- to exploit the advantages of cooperative programming between Colleges and Departments of the University of Nebraska, and the potential for mutually beneficial interactions with the private sector; and
- to create, through cooperative efforts, the achievement of common goals and a common environment for the success of the Institute.

Peter Kiewit Institute Statistical Profile[1]

- Total undergraduate enrollment in the College of Engineering and the College of Information Science and Technology has increased from 1,492 students in Fall 1998 to 1,559 students in 2005.
- Total graduate enrollment has increased from 183 in Fall 1998 to 260 in Fall 2005.
- Total PKI enrollment in both colleges has increased from 1,675 to 1,819 students from Fall 1998 to Fall 2005.
- Average ACT score of undergraduate students admitted to the PKI colleges in Fall 2005 was 26.2.
- Average GRE score (verbal and quantitative) for graduate students admitted to the PKI colleges in Fall 2004 was 1180.
- PKI colleges generated 16,274 student credit hours in 2005-06 compared with 12,788 SCH ten years ago.
- PKI colleges awarded 244 undergraduate degrees in 2005-06 compared with 156 ten years ago.
- Undergraduate and Graduate student/faculty ratios have ranged from 20.1 to 23.3 for the ten years under consideration.
- Sponsored research expenditure for the two PKI colleges and PKITDC combined increased from less than a million dollars in 1997 to nearly $6 million in 2006.

[1] 2006 numbers were not available at the time of writing this report.



University of Nebraska's

The PETER KIEWIT INSTITUTE

Self-Study Executive Summary

Self-Study Executive Summary

The Peter Kiewit Institute is a unique collaboration of the University of Nebraska and local business partners with the purpose of: offering educational programs in engineering, technology and information sciences; encouraging innovative research; and encouraging economic development. This self-study presents a review of the Peter Kiewit Institute's history, accomplishments, student environment, and faculty environment since its inception in 1996. The study concludes with recommendations for PKI's future development.

History of the Peter Kiewit Institute and its Cooperating Units

The Peter Kiewit Institute was founded in 1996 to meet perceived business and educational needs in Nebraska. After Omaha was not selected for several major plant locations in the mid-1990s, business leaders questioned why. Companies reported that Omaha lacked both sufficient numbers of highly trained, tech-savvy potential employees and the educational opportunities to train these employees. This latter concern also contributed to the perception that our most talented students were leaving Omaha and Nebraska to seek opportunities in higher education elsewhere. Some leaders also were concerned that engineering and computer science offerings at the University of Nebraska at Omaha (UNO) were moving to Lincoln.

In 1995, a blue-ribbon committee, established to address these concerns, recommended that an innovative program in engineering, construction, information technology and telecommunications be launched in Omaha. The University of Nebraska at Omaha (UNO), the University of Nebraska-Lincoln (UNL) and a number of Omaha-area businesses joined together to develop this program. The University of Nebraska Board of Regents approved the completed program in 1996.

The new venture was created through establishing a new college at UNO (the College of Information Science and Technology) and collaborating with the UNL College of Engineering, which had existing programs offered on the UNO campus. A Board of Policy Advisors composed of 11 CEOs was created to work with university leaders to develop curriculum and business plans. Approximately $70 million was dedicated to the new venture ($23 million in state funding and $47 million in private capital). Of this, $37 million was dedicated to construction, $15 million to endow faculty stipends, $15 million for scholarships and $3 million to spur innovation. Classes were first offered in fall 1997, concurrent with groundbreaking for the prime facility. At that ceremony, it was announced that this facility would be named The Peter Kiewit Institute of Information Science, Technology and Engineering. The unique, exposed-infrastructure building was completed in 1999. Since then, 15 associated facilities have been constructed near the PKI building.

Peter Kiewit Institute Accomplishments

In the 10 years since classes began, enrollment has steadily increased reaching, in 2005, a total of over 1,800 graduate and undergraduate students from the combined UNO and UNL colleges. PKI programs attract both exceptionally talented students who are academically accomplished and well-rounded leaders, active in their communities. An astonishing 99 percent of

undergraduates have jobs in hand or have been accepted to graduate school by the time they earn their bachelor's degrees. Students serve internships in industry where they can work on real-world problems and applications as part of their PKI curriculum. Both colleges have undertaken aggressive hiring plans and have developed new faculty and program strengths designed to be responsive to current industry needs and to anticipate future industry needs. Faculty have successfully competed for federal funding, and research expenditures have now topped $6 million.

A number of high-profile projects have brought attention to the Peter Kiewit Institute. These include a partnership with the National Security Agency Center of Excellence in Information Assurance; the establishment of the Charles W. Durham School of Architectural Engineering and Construction; an alliance with U.S. Strategic Command, the new International Academy for Advanced Decision Support; and a center for research in bioinformatics.

The Peter Kiewit Institute is a successful new model for educational services in Nebraska – a true partnership between industry and a state university. It relies on collaborations between two colleges 50 miles apart (albeit sister institutions) and on the support and advice of the business community that has invested heavily in the Institute's future. Memoranda of agreement exist with more than 200 companies, and another 800 are part of PKI's career services programs. The importance of the financial, moral and advisory support from business leaders cannot be undervalued. This support gives the Institute high visibility and credibility, and encourages all participants to be respond quickly and proactively anticipate market and research demands. The membership of the policy advisory board has remained quite stable, allowing for long-term insight, and new members on the board have contributed new ideas and enthusiasm.

The Unique Peter Kiewit Institute Student Environment

The students recruited for PKI are talented students who are being heavily recruited by top colleges and universities in America. Thus, PKI has created an extremely competitive recruitment package, with a number of valuable scholarships and other opportunities to attract top students. While the financial aid is impressive, so too is the chance to study in an architecturally significant building; live in modern, attractive, on-campus residence halls; work on projects of deep significance, such as tools to predict pandemic flu or contribute to Homeland Security; use the latest in technology, software and other equipment; and work with some of the best faculty, scientists and engineers in the field.

PKI's students find professionally-focused activities, residential opportunities, and extracurricular offerings to be among the many benefits offered at the Institute. Students also benefit from PKI's business partnerships, which involve nearly 800 companies that recruit for interns and permanent employees on campus each year. Finally, PKI offers high quality, personalized career assistance, as well as mentoring, tutoring and other academic advantages. Students excel at the Peter Kiewit Institute, for example:

- PKI civil engineering students have placed in the top five in the nation in a construction engineering competition for five consecutive years;
- PKI computer science students dominate Nebraska Section IEEE competitions each year;

- PKI students designed the national website for the Lewis and Clark Bicentennial;
- PKI students have patent applications in process and have collaborated with U.S. Strategic Command; and
- a PKI student was the international winner of the Microsoft Imagine Cup competition and another PKI student was the U.S.A. runner-up.

PKI graduates are highly sought after and have been placed in every Fortune 500 company in Omaha, as well as firms like Boeing, Lockheed Martin, Northrop Grumman, SAIC, Booz Allen Hamilton and John Deere. Others have joined federal agencies, such as the National Security Agency.

A recent survey undertaken by MSR Group showed general student satisfaction with the PKI educational experience. The survey, reported in January 2007, shows that 51 percent of students report being "very satisfied" with their academic experiences, 39 percent say they are "somewhat satisfied and just 10 percent report being "somewhat disappointed" or "very disappointed." Moreover, 93 percent say they would recommend a PKI education for others. Some 62 percent rate the overall quality of their instructors as "far above average" or "above average." Students say the interdisciplinary collaboration displayed at PKI is a valuable and enriching factor. And 91 percent see a five-year program that would culminate in a master's degree as being beneficial with 85 percent say they definitely or probably would stay at PKI to earn this degree.

The Unique Peter Kiewit Institute Faculty Environment

PKI breaks through the traditional boundaries that separate institutions and disciplines. At PKI, faculty from UNO and UNL work together in a well-equipped facility, sharing students, course development and research projects. Disciplines represented include: computer science, bioinformatics, management information systems, computer electronics and engineering, construction science, architectural engineering, and civil engineering.

Both the College of Engineering and the College of Information Science and Technology have made faculty hires since 2000 that complement and augment existing strengths. Plans call for a focus on specific disciplines for further development. The goal is to improve the individual colleges and at the same time develop new specializations by combining strengths.

PKI's high-caliber facilities are attractive to highly talented and productive faculty. The 192,000 square foot building features a number of state-of-the-art laboratories. The Institute's policy of frequent equipment upgrade and renewal assures that faculty and students are working with current equipment. Nearly all labs have been funded by either federal or state funding agencies. The majority of PKI graduate students and a large number of undergraduate students are actively engaged in long-term research projects with faculty mentors. PKI's close ties to industry provide opportunities for faculty and students to learn about the challenges and needs of high-tech industry and to develop productive partnerships, which, in turn, inform a cutting-edge curriculum.

Two sets of seed grants programs have been initiated over the years to foster collaboration among PKI faculty. The first is a Board of Policy Advisors grants program designed to encourage faculty collaboration and the second, initiated in 2005, is a three-year experimental seed grant program launched to foster collaborations in priority areas of engineering, computer science, information systems and information technology.

Since its inception in 2002, the PKI Technology Development Corporation has generated unique learning opportunities and experiences for students and faculty. With more than 70 contracts and flow-through dollars of more than $3.5 million, the PKITDC serves to keep professors and students abreast of where industry is going, not where it's been.

Plans for Future Development

The Peter Kiewit Institute has great potential to be a national center of innovation and entrepreneurship in information technology and engineering. Among PKI's key assets are the opportunities to spark new research through integrating engineering fields and to partner with industries to explore new products and applications. Accomplishments during the first years of PKI's operation have demonstrated this potential; however, it is clear that PKI can achieve more.

To be nationally prominent as an academic/industry collaborator in engineering and technology, PKI must fulfill these overarching objectives:

1. Grow academic programs that fully exploit the academic-industry collaboration and prepare top-flight students to work for Nebraska industries;

2. Construct magnet innovation centers through cluster-hiring of nationally prominent faculty who will lead basic research and its application with industry partners; and

3. Become a driver of economic development in Nebraska through engaging industry partners in promoting and funding innovation.

PKI can meet these objectives by adopting the following strategies:

1. **Grow academic programs that fully exploit the academic-industry collaboration and prepare top-flight students to work for Nebraska industries.**

   - **Expand collaborative and joint academic programs.** New program areas to explore include Wireless Communications, Building Information Management, Project Management, Construction Engineering and Management, and Integrated Circuits Design.
   - **Create cross-college academic appointments.** Joint appointments encourage connections between existing programs and facilitate interdisciplinary activity.
   - **Involve students and industry partners in creating alternative programs.** Students and industry partners should be more fully engaged with faculty members in designing internships, practical training opportunities, and distance-learning development.
   - **Develop executive education.** PKI units should evaluate their potential to develop

highly visible executive education programs, should offer graduate certificates and executive degrees in IT Management and Project Management; and develop cohort classes of young professionals who can benefit from this training, committing sustained corporate sponsorship of life-long learning for their employees.

- **Enhance student recruitment and program marketing**. PKI must develop new recruitment and marketing strategies to: publicize PKI programs, emphasizing their grounding at the University of Nebraska; identify niche target markets for student recruit; and emphasize national advertising.
- **Achieve calculated growth**. For the next five years, an increase of 25 percent in the undergraduate enrollment, 100 percent in the graduate enrollment and 15 percent in faculty and staff should support the program goals listed above.

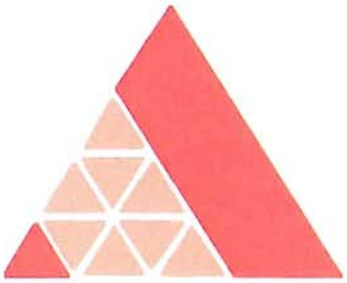
2. **Construct magnet innovation centers through cluster-hiring of nationally prominent faculty who will lead basic research and its application with industry partners.**

- **Hire clusters of faculty experts in key areas**. Several PKI academic areas have potential to be recognized as centers of academic excellence through strategic hiring. Through cluster hiring, we have already achieved excellence in architectural engineering and management information systems. PKI academic units must take a strategic approach to building excellence in other areas with the goal of achieving top-25 ranking among peer departments nation-wide through cluster hiring.
- **Design centers for innovation in new areas**. PKI has the potential to play a leading role in creating institutes, centers, and consortiums in the areas of Simulation and Modeling, Visualization, and Project Management.
- **Grow external funding.** External grants and contracts are essential to PKI's future. We have set a five-year goal of attracting $15 million in annual grants and contacts. This growth will stimulate research (both basic and applied) and curricular innovations, support goals for attracting top faculty and expansion of graduate programs, and will foster development of new inventions that will fuel economic development.
- **Streamline approval processes for new programs.** Simplifying and coordinating new program approval processes would aid in developing new and innovative programs sensitive to the demands of the market place and respective professions.
- **Build state-of-the-art research laboratories**. New laboratories that would support advanced research and educational programs would complement PKI's existing infrastructure.
- **Plan spaces for future development**. PKI's early success has caused it to outgrow its facilities. New programs in Bioinformatics, information technology, and architectural engineering have been added, however insufficient office and research space severely limits program growth. A space feasibility study should be developed in the near future.

3. **Become a driver of economic development in Nebraska through engaging industry partners in promoting and funding innovation.**

- **Stimulate entrepreneurship through support infrastructure.** Faculty and staff need help to address issues associated with product development, intellectual property management, marketing, and identification of venture capital. Enhanced interaction with partners in the Scott Technology Center and the Technology Development Corporation can bridge this gap.
- **Connect industry partners to academic units.** The involvement of practitioners and domain experts is a key component to the success of PKI. Industry partners with academic appointments as adjuncts or professors of practice will help connect academic programs directly to innovation in workplace contexts.
- **Publicize and recognize PKI as a state and national asset for economic development.** Efforts must be made to connect PKI faculty and administrators to statewide and national economic development programs to build on success of networks in Omaha and Lincoln.

The Peter Kiewit Institute has established a model partnership of university and industry that enhances Nebraska's potential to educate a workforce and develop new business opportunities in the fields of engineering, technology, and the information sciences.



University of Nebraska's

The Peter Kiewit Institute

History of the Peter Kiewit Institute and its Cooperating Units

History of the Peter Kiewit Institute and its Cooperating Units

Overview of the Institute

Background

Between 1993-95, the Omaha business community was confronted with signals creating serious concern for the economic well-being of the city of Omaha, the state of Nebraska and the entire region. The first came as Omaha watched MICRON, BMW and Mercedes-Benz announce Omaha as a finalist for new plant locations for each of these entities. However, just as the excitement soared, so did the disappointment, as each company selected alternative sites.

Debriefings revealed common threads. Omaha did not have the world-class higher education opportunities in engineering and information technology needed to support such firms. Coupled with this educational void was the lack of a highly trained technical work force ready to help populate these corporate entities. The experience was a "wake up" call for Omaha and the state.

Another growing concern was the realization that the state's "best and brightest" were leaving Nebraska in large numbers to pursue higher education opportunities, especially in the more technical fields of study. During this same period, the design, engineering and construction industry in Omaha realized that many of the local engineering programs were being moved from Omaha to Lincoln, a trend local business leaders resolved to reverse. Local companies like Inacom, Union Pacific Railroad, Kiewit, Hawkins, DLR, HDR, Leo A. Daly, Mutual of Omaha, First Data Resources and others needed a local, qualified workforce and a graduate school to fine-tune employee skills to take these businesses to new levels and to help their employees advance their careers.

The Solution

A study was commissioned to determine what business and industry needs and educational offerings would position Omaha and the region to grow economically and to attract new growth opportunities to the city. The study recommended launching a new world-class educational initiative in engineering, construction, information technology and telecommunications. If done correctly, the professional workforce should grow. Those beginning a post-secondary program would have local options, thus helping keep the "best and brightest" at home, while providing those already in the workforce with additional education to grow their skills as technology and engineering fields demanded it.

The result was a joint initiative led by Omaha businesses to work with the University of Nebraska to quickly develop a new world-class institute aimed at reversing the aforementioned trends. This new institute began as a concept or "white paper," now referred to as the Charter document, signed December 1, 1995, and was approved by the University of Nebraska Board of Regents in December, 1996. (See appendix.)

Formation

The institute Charter called for a joint venture partnership between the University of Nebraska at Omaha (UNO) and the University of Nebraska-Lincoln (UNL). UNO would create a new College of Information Science and Technology (IS&T) by merging Management Information Systems from the College of Business Administration and Computer Science from the College of Arts and Sciences. UNL would enhance the engineering and technology offerings already on the Omaha Campus through the College of Engineering with the intent of providing programs that the local economy needed and that would be best positioned to partner with the College of IS&T. The mission of the new Institute would be:

- to create a center of excellence in information science, technology and engineering by development of excellence in the programs of each College and through the cooperative utilization of resources from each College, from other Colleges or Departments within the University of Nebraska and from the private sector;

- to provide the Omaha metropolitan area and the State of Nebraska with a unique resource for the education of their current and future employees, for the support of existing technologies, and for the creation of partnerships to develop new business opportunities through advancing technology;

- to exploit the advantages of cooperative programming between Colleges and Departments of the University of Nebraska, and the potential for mutually beneficial interactions with the private sector; and

- to create, through cooperative efforts, the achievement of common goals and a common environment for the success of the Institute.

A key component of the new institute would be a Board of Policy Advisors composed of eleven CEOs who would work with the University president, the deans of the two colleges, and the top academic leaders from the two campuses to develop meaningful academic curriculum and responsible business plans to ensure the Institute had what it needed to achieve its potential (see Figure 1). The Board appointed an Executive Director to serve as liaison to the Board and to work on a daily basis with the Colleges to remove obstacles, recruit talented students and solicit additional business partnerships.

The original initiative called for the state to allocate $23 million to the effort with the business community and/or individuals contributing another $47 million. The $70 million total would cover construction of a new state-of-the-art facility ($37 million), endow faculty stipends ($15 million), fund scholarships ($15 million) to attract the best students, and provide monies to enhance and generate innovation ($3 million). First Data Resources donated the land adjacent to its facility on the former Ak-Sar-Ben property (a defunct horse-racing facility in the center of Omaha). Ground was broken on the new 192,000 square-foot facility on September 10, 1997. Local Omaha company DLR designed the facility, which was constructed by another local firm, Kiewit Construction Company.

The groundbreaking was a widely attended event with a virtual component allowing leaders across the state to participate through satellite capabilities provided by NET, Nebraska's public broadcasting service. At groundbreaking, the name was announced — *The Peter Kiewit Institute of Information Science, Technology and Engineering* (PKI). Peter Kiewit Jr. attended the event, noting the lead gift of $15 million had been provided for the facility by the Peter Kiewit Foundation, his late father's personal foundation.

The World-Class Education Beginning

Classes started under the new Institute umbrella in the fall of 1997. The courses under Information Science and Technology (UNO) were delivered in the Durham Science Building on UNO's North campus; classes under Engineering and Technology (UNL) were taught in the Engineering facility also on the North campus.

Walter Scott, Jr., the Board of Policy Advisors' first chair (a role he still holds), established with his wife Suzanne Scott, the Walter Scott, Jr. Scholarship program. This scholarship initiative was intended to recruit the very best students to the Institute and to set a precedent for excellence. The first 28 scholarship recipients began their course of study in the fall of 1997.

The hoped-for profile for this group was established as follows: an ACT score of 30 or above, class rank in the top 10 percent of their graduating class, a GPA of 3.5 or higher, and a proven record of school and/or civic participation. The first class came close to meeting the overall profile with an average ACT of 29.5 and a mode of 28, slightly below the desired student profile, but surprisingly high considering recruitment began late in the previous spring. In that first year, two of the PKI students turned down MIT to help build a legacy for what all thought would become one of the leading programs of its kind in the nation.

The PKI building opened in August of 1999. The celebration was an innovative, "community-centric" event involving the entire state and the then-U.S. Secretary of Education, Richard Riley. Instead of a ribbon-cutting, a robot bowed to the crowd and cut fiber to symbolize PKI's unique mission and focus.

Nine Years Later

Leadership within the Colleges has changed over the years. The College of IS&T has had four deans and one interim dean due to the untimely death of founding Dean Michael Mulder. The College of Engineering has had two deans during this same period with two associate deans to specifically address the Omaha programs. The Board has similarly evolved; each new member brings new ideas and excitement.

Programs have now attained accreditation through ABET, the recognized U.S. accreditor of college and university programs in applied science, computing, engineering, and technology. New bachelors, masters and doctoral degree offerings have evolved and new areas of emphasis have gained momentum. These include Information Assurance, Bioinformatics and Architectural Engineering; the latter two have become degree offerings and the first is moving in that direction.

Since 1997, when the Scott Scholarship program began with 28 scholars with an ACT average score of 29.5, each year has attracted more high-ability students. In 2004, the average ACT score was 34; in 2005, the average score was 32 and in fall 2006, the average was 33.4. More than 400 of these extremely highly ability students attend the Institute; Scott Scholars account for approximately half of them

Industry and news media publications have described the Institute as innovative and responsive to industry. Recently the Institute was featured at the national FIATECH Conference, whose mission is to help the design and construction industry attain interoperability with software applications that could help revolutionize the overall design and construction industry, making it more efficient throughout its processes.

Some of the PKI initiatives drawing local and often national attention have included:

- The Charles W. Durham School of Architectural Engineering and Construction
- The National Security Agency Center of Excellence in Information Assurance
- Multi-Media and Graphic Design
- A Center for Building Integration
- An Intelligent Transportation Lab
- Satellite Communications for Learning
- Sensor Technology and Embedded Systems
- Access Grid
- PKI Technology Development Corporation
- Lewis and Clark Bicentennial Project
- U.S. Strategic Command Alliance
- The International Academy for Advanced Decision Support
- Bioinformatics

Since PKI opened, fifteen associated facilities have emerged. These facilities have been funded in large part by the Suzanne and Walter Scott (public not-for-profit) Foundation. They include:

2000	Scott Residence Hall/Conference Center
2001	Scott Technology Center, Phase I
2003	Scott Village (10 housing units)
2005	Scott Technology Center, Phase II
2005	Scott Technology Center, Phase III A
2006	Scott Technology Center, Phase III B
2007	(Additional Facilities Anticipated)

Involving Business

The Institute has added partnerships steadily since its inception. More than 200 businesses have signed Memoranda of Understanding and more than 750 local, national and global businesses are involved with PKI's Career Resource Center. Many offer student internship opportunities.

Statewide outreach has increased to a half-dozen communities to show students their degrees can be applied in rural as well as urban communities. The first project occurred five years ago in Cambridge, Nebraska, with Pinpoint Communications.

The Institute began developing its Computer Science curriculum with an expert in residence from Boeing and this trend of utilizing "experts in residence" continues with the involvement and commitment of such organizations as Raytheon, IBM, Foundry, the U.S. Army Corps of Engineers, and KUKA Robotics, among others.

Technology trade-outs allow the Institute to be and remain state-of-the-art. The Institute is often in the national spotlight through case studies done as new equipment is deployed and tested by students and faculty. From broadband connectivity to Internet2 to super computing, the Institute has been positioned to react to partners and to work with them to advance the industry. Proof of this can be seen in the Scott Technology Center, both in participation by faculty and students and with an array of companies from incubator startups to corporate giants like SAIC, Raytheon, Union Pacific, and the University of Nebraska Medical Center. Of special interest and growth lately is the Global Innovations and Strategy Center (GISC), a partnership between PKI and U.S. Strategic Command. The first project commissioned by the GISC was an early-detection of pandemic flu tool that involved a number of professors at PKI, a student team, a staff technical lead and a doctor from UNMC. By partnering with an array of business, school entities, the Medical Center and governmental agencies, the Institute gained national acclaim and its efforts were received well by the United States Centers for Disease Control.

Another example of industry involvement is the deployment of an FBI Cyber Forensics Lab in Scott Technology Center that enabled Guidance Software to partner with the Nebraska University Center of Information Assurance (NUCIA) to provide even stronger instructional opportunities to students and to help train an array of community associated groups. Other examples include KUKA Robotics helping write curriculum for Computer and Electronics Engineering programs, as well as for Construction Engineering classes to sensor deployment and testing for the Henry Doorly Zoo, that provide the Institute the ability to deliver relevant education to students and to help ensure professors are teaching skills in step with where industry is going, not where it has been.

The development of the PKI Technology Development Corporation (PKITDC) has encouraged more direct interaction with business and industry for testing, development and deployment. When utilized to the fullest, PKITDC is intended to bring more opportunities to the University of Nebraska, its students and faculty.

Conclusion

The Peter Kiewit Institute has experienced phenomenally exciting success in its first decade. Momentum is evident, and the Institute is poised to do more. Looking ahead five or ten years, possibilities exist for even closer collaborations between and among the Colleges in the Institute, the many partners and other colleges and departments both inside and outside of the University of Nebraska, and with industry partners. Looking back is valuable, as history helps set the direction for the future. Moving ahead takes vision, commitment and resolve. The Institute is a work that should always be considered a "work in progress" as there is always a future generation to inspire and a new technology to invent or perfect.

Figure 1

The Peter Kiewit Institute

Founding Board of Policy Advisors

Walter Scott Jr.
Chairman Emeritus - Peter Kiewit & Sons', Inc. and Chairman - Level 3 Communications
Robert Bates
Chairman, President & CEO – Guarantee Mutual Life Insurance Co.
John K. Boyer
Fraser, Stryker, Vaughn, Meusey, Olson, Boyer & Bloch, P.C.
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Winnie Callahan
Executive Director – The Peter Kiewit Institute

Current Board of Policy Advisors

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Chairman Emeritus - Peter Kiewit & Sons', Inc. and Chairman - Level 3 Communications
Richard Bell
Chairman – HDR, Inc.
John K. Boyer
Partner – Fraser, Stryker, Vaughn, Meusey, Olson, Boyer & Bloch, P.C.
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Anthony Raimondo Sr.
President and CEO – Behlen Manufacturing, Inc.
J. Richard Shoemaker
President, Pinpoint Communications, Inc.
Jim Strand
Market Area President – Alltel Communications
Lewis Trowbridge
Executive Vice President, CFO and Treasurer – BlueCross BlueShield of Nebraska
Gary Warren
Executive Vice President – Hamilton Telecommunications
Winnie Callahan
Executive Director – The Peter Kiewit Institute

UNO College of Information Science and Technology and PKI

UNO's College of Information Science and Technology (IS&T) was established in 1996 as one of two colleges within the University of Nebraska Peter Kiewit Institute (PKI). The other is UNL's College of Engineering. PKI is recognized as a path-breaking model for information technology education. Peter J. Denning, past president of the Association for Computing Machinery (ACM), gave early recognition to the college by listing it as one of five pioneers in the Information Technology schools movement. The five were: the School of Information Technology and Engineering at George Mason University (1986), the School of Computer Science at Carnegie Mellon University (1988), the College of Computing at the Georgia Institute of Technology (1991), the College of Information Science and Technology at the University of Nebraska at Omaha (1996), and the College of IT at the United Arab Emirates University (2000) (See *Communications of the ACM*, August 2001).

The College of IS&T offers three undergraduate degree programs and four graduate degree programs. These are: BS and MS/MA in Computer Science, BS in Bioinformatics, BS and MS/MA in Management Information Systems, MS and PhD in Bioinformatics (joint programs with UNMC), and a PhD in Information Technology. The college is organized into two major departments that manage the degree programs, the Department of Computer Science (CS) and the Department of Information Systems and Quantitative Analysis (ISQA). The college's over-arching philosophy is exemplified by the value statement, "No student will go unassisted or unchallenged."

The College of Information Science and Technology represents the joint efforts of the University of Nebraska, the State of Nebraska, and private industry to address the growing global needs for knowledgeable professionals in the area of information technology.

College of Information Science and Technology Mission:

- To provide comprehensive up-to-date education of the highest quality in the various areas of information science and technology to individuals at the Metropolitan Omaha, state, national and international level.
- To engage in basic and applied research activities to be carried out by students and faculty of the college with collaboration of other University of Nebraska units as well as profit and non-profit organizations.
- To equip college graduates with the knowledge and expertise to contribute significantly to the work force and to continue to grow professionally.
- To partner with other university units in the development and utilization of information technology in teaching and service activities.
- To partner with local, state, national and international entities in the resolutions of information technology problems and issues.

In order to accomplish the college's mission and vision, the faculty and staff will strive to achieve the following three strategic goals:

1) Keep students at the center of all college efforts;

2) Strive to achieve the highest academic excellence; and

3) Actively lead and collaborate with academic, business and community entities in various projects related to IS&T.

UNL College of Engineering (Omaha Campus) and PKI

Omaha University was founded in 1908 as a private non-sectarian college and in 1930 became the Municipal University of Omaha. A college of engineering was established early in the history of Omaha University, second only to the college of arts and sciences in seniority.

In the mid-1960s, a Technical Institute was established as part of Omaha University to house an extensive collection of engineering technology programs (industrial technology, construction engineering technology, drafting & design technology, electronics engineering technology, industrial engineering technology, and fire protection technology). Engineering programs offered by the Omaha University College of Engineering and Technology included civil engineering, general engineering, and industrial engineering.

The Omaha-campus portion of the UNL College of Engineering traces its existence to the creation of the University of Nebraska System in 1968. The System merged under one Board of Regents and President the separate University of Nebraska-Lincoln, Omaha University, and the University of Nebraska Medical Center. At that time, the Omaha campus name was changed to the University of Nebraska at Omaha (UNO).

Also in 1968, the UNL College of Engineering and Architecture and UNO College of Engineering and Technology were merged into a single UNL College of Engineering and Technology administratively based on the Lincoln campus. The Technical Institute became part of the UNL College of Engineering and Technology on the Omaha campus along with the other engineering programs.

In February 1972, the University of Nebraska Board of Regents established one College of Engineering and Technology in Nebraska. The Dean of the College was based in Lincoln, with an Associate Dean on the Omaha campus. A School of Engineering Technology was authorized in this action, but was not formally established until 1976. From 1972-76, the Director of Technical Institute reported to the Associate Dean on the Omaha campus, who in turn, was administratively responsible to the Dean of the UNL College of Engineering and Technology.

With the creation of the School of Engineering Technology in 1976, the Director of the School of Engineering Technology also held the dual title of Associate Dean of Engineering and Technology, and reported to the Dean of the UNL College of Engineering and Technology.

During the mid-1990s, the School of Engineering Technology was dissolved and the Director position eliminated. By this time, civil engineering was the only engineering undergraduate program offered on the Omaha campus (the others were phased out or consolidated on the Lincoln campus). Civil engineering was the only program that offered graduate degrees on the Omaha campus.

With the creation of the Peter Kiewit Institute of Information Science, Technology, and Engineering in 1995, the UNL College of Engineering and Technology committed to an

expansion of the engineering academic programs offered on the Omaha campus. In 2005, the University of Nebraska chartered the Charles W. Durham School of Architectural Engineering and Construction, with an announced start-up endowment of $30 million.

Since 1995, programs in Architectural Engineering, Computer Engineering, Electronics Engineering, and Construction Engineering have been developed and deployed. Construction Management, a Lincoln-based program, became an option for Omaha campus students at the beginning of the 2006-2007 academic year. All of the engineering technology programs, with the exception of Fire Protection Technology, have either been discontinued or are in the process of being phased out. Graduate degree programs at the masters and doctoral levels are available in all of the engineering disciplines offered on the Omaha campus.

In 2005, the College of Engineering and Technology changed it name to College of Engineering to better reflect its focus.

UNL College of Engineering Mission:

- to deliver relevant and challenging educational programs that attract an outstanding diverse student body, that prepare graduates for rewarding careers in their chosen professions, and that encourage graduates to extend their level of knowledge through lifelong learning;
- to conduct leading edge research that advances engineering science and technology, and to stimulate the intellectual development and creativity of both students and faculty; and
- to extend exemplary engineering and technology service and to transfer knowledge that contributes to the well-being and betterment of society.

University of Nebraska's

The PETER KIEWIT INSTITUTE

The Peter Kiewit Institute Accomplishments

The Peter Kiewit Institute Accomplishments

Overview

Since the opening of The Peter Kiewit Institute in the fall of 1997 and the move into the Institute facility in the fall of 1999, accomplishments have been many. Enrollment, reached 1,819 students in fall 2005; an unofficial count has it at 2,200 in 2007. Program offerings have increased through such additions as Architectural Engineering, Bioinformatics and concentrations such as Information Assurance, Robotics, and Imbedded Systems to mention just three.

Students have been encouraged to pursue dual degrees, and they have taken advantage of that option. ABET accreditations have been achieved by both colleges in their primary fields of study. Graduate degrees have been added in both colleges, which allows students to achieve bachelors, masters and doctoral opportunities through the colleges housed in the Institute. Applications from the region's "best and brightest" students have increased on an annual basis due to program offerings and scholarship recognition and availability.

Endowments are increasing; a major step occurred with the establishment of the Charles W. Durham School of Architectural Engineering and Construction, which carries a $30 million endowment, and sets a standard for similar programs across the country to pursue.

The former Ak-Sar-Ben property has taken on new life. First Data Resources was the first company to redevelop the site and the Institute facility closely followed in 1999. Since then, growth has been steady with an honors residence hall opening in 2000 along with a conference center used both by the Institute and its associated programs, but also for community events and national conferences. In 2001, an incubator and technology transfer facility was built just south of PKI, and a ten-unit facility opened in 2002 increasing "on campus" housing by approximately 500 beds.

Business partnerships also were growing. The Peter Kiewit Institute Technology Development Corporation was formed, a not for profit contracting arm allowing the Institute to work with business, industry and governmental agencies for testing, development and deployment of new initiatives "at the speed of business." This endeavor broadened the Institute's ability to work with partners as it gave faculty and students experiences impossible to achieve through a more traditional academic research venue. Academic research has increased dramatically with funds coming from earmarks and also through competitive opportunities through the National Science Foundation and other agencies.

The Scott Technology Center has added a second facility increasing floor space for multi-tenant leasing to just over 140,000 square feet. An additional secure facility with approximately 50,000 square feet was built for multiple tenants; it houses the world's first

Global Innovation and Strategy Center, a partnership between the Institute and U.S. Strategic Command.

Business partnerships have reached an all time high at more than 200; additionally, a record 800 global business entities work directly with the PKI Career Resource Center. This Center has seen remarkable growth; each year more students and businesses use its services to access internships and jobs. The Center has attracted recruiters from around the world who display their capabilities and employment needs in PKI's atrium.
Nearly 95 percent of all students receive job offers during the second semester of their junior year or the first semester of their senior year. Overall, 99 percent of PKI graduates are employed or have been accepted to the graduate school of their choice prior to graduation.

Employment opportunities are coming from small, middle and giant-sized corporations and governmental agencies worldwide. However, the majority of PKI's graduates remain in the region, or are hired by a local or regional firm that may deploy them to another geographic location.

Employers report PKI graduates show outstanding performance. This level of satisfaction has prompted those employers to continue to recruit PKI graduates, and has encouraged other firms looking for high-quality employees to recruit from PKI. The Institute also has benefited from the Omaha business community's connections and leadership and also through outreach from nearby Offutt Air Force Base and U. S. Strategic Command. The Peter Kiewit Institute's reputation has grown; the Institute clearly has national and international renown. News coverage has been global. Because of innovative efforts like the early detection model for pandemic flu and STATPack™, both of which have caught the attention of the Centers for Disease Control (CDC), and through organizations such as FIATECH and the National Security Agency, two to seven companies/agencies come through the Institute in any given week. While PKI's programs, students and governance model have garnered attention, the building's exposed infrastructure has become a magnet for other higher education institutions, organizations, businesses and government.

The Institute's architecture, programming and governance have been the focus of several national conferences, with PKI officials delivering keynote addresses related to the building's design and the PKI governance structure. The Institute has hosted several conferences that gather together the nation's largest IT groups. PKI also hosted the AIA Large Firm Roundtable, a national conference on Lighting Research Technology, the AEI Institute and is slated to host the 2008 International Conference on i-Warfare and Security.

Governmental organizations such as the FBI, the CIA, the Homeland Security and Intel Leadership Convocation among others have visited, toured and been briefed on the Institute as have the nine unified commands and the George C. Marshall Institute located in Germany. The architectural design of the Institute, the public/private partnership with higher education, and the ability of faculty and staff to react to business interests captivate most visitors.

Recently, PKI, Oxford and several national laboratories were asked to test IT intrusion detection equipment for Force 10. The published case study focused on PKI's findings and a similar case study was done for Foundry Networks denoting the advantages of their robust network solution featuring dual cores, a 20 GIG backbone and a GIG to the desktop throughout our facility. Other areas of attention include our long haul carriers, and our on-demand OC 192 capability.

PKI is proud to partner with U.S. Strategic Command in offering an Information Operations graduate initiative; it is the only accredited program offering outside of the Naval Post-Graduate School.

While the accomplishments are many, the potential is huge. To meet anticipated future needs, PKI will need more funding to keep abreast of opportunities, will need more space to meet growth and program expansion, and the technology center will continue to be pressed for additional tenant space.

Several years ago, a PKI Board member posed the question: "Are you ready for success?" This could be the most relevant question asked with regard to The Peter Kiewit Institute and what the planned expansion on the adjacent properties may have on opportunities for the Peter Kiewit Institute, the University of Nebraska and the city of Omaha.

UNO College of Information Science and Technology Accomplishments

The NU Board of Regents identified the College of IS&T's academic programs as priority programs in 2001. Since then, the college has undergone enormous change in terms of the diversity and breadth of programs and course offerings; student enrollment and demand for graduates; partnerships with industry, government, and other parts of the University; and external funding to support research and development programs of national prominence. The accomplishments listed below are organized around the broad purpose of the Peter Kiewit Institute established in its Charter dated December 1, 1995. (See appendix.)

Purpose #1: To create a center of excellence in information science, technology, and engineering by development of excellence in the programs of each College and through the cooperative utilization of resources from each College, from other Colleges or Departments within the University of Nebraska, and from the private sector.

- Received ABET (Accreditation Board for Engineering and Technology) Accreditation. The Computing Accreditation Commission (CAC) of the Accreditation Board for Engineering and Technology granted accreditation for the college's undergraduate programs in Computer Science and Management Information Systems. The programs joined an elite group of programs in the country with this honor. In September, 2003, the commission examined objectives and assessment tools, student quality and satisfaction, faculty quality and satisfaction, curriculums, technology infrastructure,

institutional support and financial resources, program delivery, and institutional facilities.

- Developed and implemented an overarching Program Quality Management Process to evaluate undergraduate programs.
- IS&T faculty and staff received sponsored research and development grants and earmarks valued at $3.5 million in FY 2006 compared with $.75 million in FY 2001. In addition, about $1 million per year in research and development projects now flow through The Peter Kiewit Institute Technology Development Corporation's work with business and industry.
- Received the UNO Chancellor's Strategic Planning Award for Academic Excellence (Information Systems & Quantitative Analysis department, 2004).
- IS&T Faculty is recognized internationally for their research and development work in a wide range of areas in computer science, management information systems, and bioinformatics.
- Received recognition as one of the first 20 Centers of Academic Excellence in Information Assurance by the National Security Agency (2001); received a second recognition for excellence by NSA and the Department of Homeland Security (2005); and received several million dollars for scholarships for information assurance students.
- Hosted three internationally recognized journals: *eService Journal, International Journal of Information Technology and Decision Making*, and *Information Technology for Development.*
- IS&T faculty members have been appointed to visible positions in national/international computing organizations and conference program committees.
- Received recognition for outstanding contributions in the classroom and/or research through distinguished professorships, including the Kaiser, Isaacson, Peter Kiewit, Mutual of Omaha, and Durham professorships.
- Established the Institute of Collaboration Science led by the College of IS&T and College of Business Administration (CBA) and initially funded by entrepreneur Steve Wild. This Institute has collaborators from each of the other colleges on the UNO campus (College of Public Affairs and Community Service; College of Arts & Sciences; College of Communication, Fine Arts and Media; and College of Education).
- The College of IS&T was host to the Americas Conference on Information Systems (AMCIS 2005) which attracted nearly 1,100 delegates from more than 40 countries and 400 institutions.

Purpose #2: To provide the Omaha metropolitan area and the State of Nebraska with a unique resource for the education of their current and future employees, for the support of existing technologies, and for the creation of partnerships to develop new business opportunities through advancing technology.

The College of IS&T has established new academic programs and specializations/areas of concentrations as follows:

- BS in Bioinformatics (in collaboration with UNO College of Arts & Science)
- PhD in Information Technology (established in collaboration with UNL's Computer Science & Computer Engineering departments)

- Internet Technologies concentration (college-wide, i.e., both in the BS MIS and BS CS degree programs)
- Revised and expanded the MS in MIS program with new specialization in the following areas:
  - Health Informatics (collaboration with UNMC);
  - Project Management;
  - IT audit and control (collaboration with the Department of Accounting in UNO's College of Business Administration);
- Established an Information Assurance (IA) area of concentration offered in both IS&T graduate and undergraduate programs
- Revised and extended the undergraduate BS in MIS program with new areas of concentrations in IT Audit and Control; i-Business Applications Development and Management, Decision Support and Knowledge Management; and Information Assurance (also offered in the undergraduate CS program as a concentration).
- Established an Information Technology (IT) specialization for the BGS degree and completely updated the MIS and CS specializations in the BGS degree.
- MS in Bioinformatics (in collaboration with UNMC's Pathology Department)
- Revised the MIS concentration for the College of Public Administration and Community Affairs (CPACS) MPA degree program
- Added an integrated undergraduate-graduate degree track to the MS in MIS program to allow students to complete both degrees in 5 years.
- Added three Graduate Certificates in Information Assurance, Systems Analysis and Design, and Project Management for potential students who want to upgrade their education without doing a full-fledged MS in MIS degree.
- Proposed undergraduate degree in information assurance (The proposal for a new undergraduate degree in Information Assurance has been approved by the college and is now being processed at the campus level and is expected to begin operation in fall 2007.).

Purpose #3: To exploit the advantages of cooperative programming between Colleges and Departments of the University of Nebraska, and the potential for mutually beneficial interactions with private sector.

- Engaged in numerous mutually beneficial cooperative research and development projects and educational initiatives with Colleges and Departments of the University of Nebraska including, but not limited to, UNO (CBA, CPACS, CA&S, COE, and CFAM), UNL (CS, CEEN, and CBA), UNMC and Metropolitan Community College.
- Engaged in numerous mutually beneficial collaborative research and development projects with the private sector including, but not limited to, Union Pacific; Mutual of Omaha; infoUSA; Sandia National Laboratories; Claas Omaha Inc.; 21st Century Systems, Inc.; Lockheed Martin; Gallup Inc.; Logical Software Solutions; and National Council of the Lewis and Clark Bicentennial. All these collaborations had specific deliverables and involved funding to support IS&T students, faculty and staff.

- Worked jointly with the College of Arts & Sciences (A&S) in the federally funded STEP program designed to encourage students to major in the sciences, technology, engineering or mathematics.
- Completed articulation agreements with all of the area community colleges.

Purpose #4: To create, though creative cooperative efforts, the achievement of common goals and a common environment for the success of the Institute.

- Developed 10 new academic research labs, including a center for Bioinformatics, Center for Management of IT (CMIT), Data Mining Research Laboratory, International Academy for Advanced Decision Support (IAADS), two information assurance labs through the Nebraska University Consortium for Information Assurance (NUCIA), and the Center for Telecommunications Management.
- Received recognition for community outreach, examples including work on the Lewis and Clark Bicentennial project, the tobacco cessation PDA application (with UNMC), the Mayor's Hotline, the Nebraska Department of Corrections Reentry Case Management System, the Omaha Convention and Visitors Bureau website, and most recently, the Sunpu Gate Project for Omaha Sister Cities.
- Fostered a number of interdisciplinary research and development initiatives — examples include BRIN/INBRE (with Biology and UNMC); NDCS (with CPACS); STATPack™ (with UNMC and rural clinics); Health Informatics (with UNMC's College of Nursing and the Health Informatics Program).
- The College of IS&T faculty/staff undertook an estimated $.65 million in applied information technology projects under the auspices of the Peter Kiewit Institute Technology Development Corporation (PKITDC) in the FY 2005-06.

UNL College of Engineering Accomplishments

The accomplishments listed below are organized around the broad purpose of the Peter Kiewit Institute established in its Charter dated December 1, 1995. (See appendix.)

Purpose #1: To create a center of excellence in information science, technology and engineering by development of excellence in the programs of each College and through the cooperative utilization of resources from each College, from other Colleges or Departments within the University of Nebraska, and from the private sector.

- During the past four years, the College of Engineering has been in transition to fulfill new educational goals that place emphasis on graduate education and sponsored research while maintaining the College's strong reputation associated with undergraduate instruction and preparation of students for entry into professional engineering practice.
- The Charles W. Durham School of Architectural Engineering and Construction with an announced start-up endowment of $30 million has been chartered by the University of Nebraska.

- A five-year ABET/EAC BS/MAE program in Architectural Engineering has been developed and deployed.
- Ten new tenure track faculty members with architectural engineering specializations have been hired.
- A four-year BS program in Construction Engineering has been developed and deployed. This new program will be reviewed by the ABET/EAC for initial accreditation the fall semester following the awarding of the first baccalaureate degrees.
- Three new tenure track faculty members with construction management and construction engineering specializations have been hired.
- A four-year ABET/TAC accredited BS program in Electronics Engineering Technology has been phased out and been replaced by a four-year ABET/EAC accredited BS program in Electronics Engineering.
- A four-year ABET/EAC BS program in Computer Engineering has been developed and deployed.
- Seven new tenure track faculty members with computer and electronics engineering specializations have been hired with an emphasis on wireless telecommunication technologies.
- Computer and Electronics Engineering faculty have developed an integrated innovative curriculum learning module based on the design of robots.
- MS and PhD degree programs in architectural engineering, computer engineering, construction engineering, and telecommunications engineering have been developed and deployed.
- MS and PhD degree programs in civil engineering have been strengthened by two additional faculty hires.
- Innovative bridge girder research has resulted in a series of long-span pre-stressed designs that have been adopted by state transportation agencies in the United States and by several foreign countries.
- Two new College of Engineering business and finance specialists have been hired to support the academic programs and departments have been hired.
- New College of Engineering administered International Study Abroad Programs (France, Italy, China and Brazil) are available to Omaha campus students.
- Undergraduate enrollment in the Omaha-based based engineering programs has grown to 881 registered students.
- Graduate enrollment in the Omaha-based engineering programs has grown to 103 registered students.
- A four-year ABET/TAC accredited BS programs in Manufacturing Engineering Technology, a two-year ABET/TAC accredited Associate Degree program in Manufacturing Engineering Technology, and a four-year non-accredited BS in Industrial Engineering Technology have been phased out.

Purpose #2: To provide the Omaha metropolitan area and the State of Nebraska with a unique resource for the education of their current and future employees, for the support of existing technologies, for the creation of partnerships to develop new business opportunities through advancing technology.

- The package of undergraduate and graduate academic programs offered by the College of Engineering on the Omaha campus coincides with the educational priorities within the Omaha metropolitan area:
    - architectural engineering
    - civil engineering
    - computer engineering
    - construction engineering
    - construction management
    - electronics engineering
    - telecommunications engineering

Purpose # 3: To exploit the advantages of cooperative programming between Colleges and Departments of the University of Nebraska, and the potential for mutually beneficial interactions with the private sector.

- Civil engineering undergraduate and graduate programs utilize faculty resources and shared courses on the Lincoln and Omaha campuses of the University of Nebraska.
- Construction management and engineering undergraduate and graduate programs employ faculty resources and shared courses on the Lincoln and Omaha campuses of the University of Nebraska.
- The Omaha-based electronics engineering graduate program shares faculty resources and shared courses with the Lincoln-based electrical engineering graduate program.
- The UNL College of Engineering and the UNO College of Information Science and Technology faculty are conducting joint "seed-grant" research projects sponsored by the UNL Vice Chancellor for Research.
- The UNL Department of Computer and Electronics Engineering is working with the UNO Department of Computer Science to implement joint degrees that employ courses and faculty in computer engineering and computer science.

Purpose #4: To create, through cooperative efforts, the achievement of common goals and a common environment for the success of the Institute.

- Financial planning is conducted by the PKI Coordinating Council which consists of the following academic and foundation officers:
    - UNL Senior Vice Chancellor for Academic Affairs
    - UNO Vice Chancellor of Academic and Student Affairs
    - UNL Vice Chancellor for Research and Dean of Graduate Studies
    - UNO Associate Vice Chancellor for Research and Dean of Graduate Studies
    - UNL Dean of Engineering

- UNO Dean of Information Science and Technology
- PKI Executive Director

University of Nebraska's

The PETER KIEWIT INSTITUTE

The Unique Peter Kiewit Institute Student Environment

The Unique Peter Kiewit Institute Student Environment

The Peter Kiewit Institute has created a unique recruiting environment for talented students in information technology and engineering. Central to the student experience at PKI are:

- competitive student recruiting with scholarship packages that attract top students to the PKI academic programs;
- professionally-focused student activities supported by residential opportunities and student orientation and extracurricular programs that support students' professional development;
- opportunities for career development; and
- outstanding student achievement.

Competitive Student Recruiting

Since the Institute began, the talent pool entering the colleges has been impressive. Over the first six years of the Institute's existence, the top high school scholars applying to the two colleges within the Institute have annually raised the bar. For example, the first year, the average ACT composite score of a PKI recruit was a little over 29 (of the potential 36). Students were in general within the top 10 percent to 15 percent of their graduating class and most carried a GPA ranging between 3.0 and 3.5 (on a 4 point scale). Each year, the size of the eligible pool has increased, and the profiles of individual students have improved.

Average ACT scores over the last two to three years have ranged from 32 to 34 with the accompanying GPA ranging from 3.5 to a high of 4.371 (incorporating advanced placement offerings and weighted scores). Incoming students during the last two or three years are now in the top 1 percent to 3 percent of their high school graduating classes with an impressive list of participation activities.

An important key to the success of PKI recruiting has been the generous scholarship program. With more than 300 scholarship opportunities through the Institute added to those specific to the Colleges, many students find support and encouragement to select The Peter Kiewit Institute for their higher education experience. The most prominent and generous scholarship offering since the Institute's inception is the Walter Scott Jr. Scholarship program. It provides a full-ride opportunity with honors residence hall complete with maid service, meals, and personal computer systems. It is awarded for a four-year period as long as the recipients maintain a 3.2 grade-point average or better. Other scholarship offerings, while of lesser value, give much-needed and generous support. These other opportunities are provided by individual and corporate donors, and they address academic ability, diversity and financial need. As student quality has increased, scholarship standards for students admitted to the academic programs in the Institute in general also have become more competitive.

Another important recruiting factor is that high-ability students appear to be bringing other talented students (peers) with them. These peers have helped increase enrollment across the entire University, as not all of them are entering PKI programs. These recruits appear to be telling us, "If the University of Nebraska (and PKI) is good enough for (my friend) with his or her opportunities, it is good enough for me (or my son or daughter)." This domino effect has greatly benefited PKI and the University. And the recent MSR Group survey revealed that 93 percent of students would recommend the PKI experience to others.

Professionally-Focused Student Activities

Residential Life

A range of programs helps students to develop professionally and to develop teamwork and camaraderie. Residential life makes a significant contribution to this environment.

When the Peter Kiewit Institute was first established at its Omaha site, there were no residence halls at the University of Nebraska at Omaha. Within the first year, 1997-98, the Board of Regents approved the first on-campus housing to the formerly commuter-only UNO.

Prior to residence hall construction, the recruited Scott Scholars who did not live in Omaha were housed at Spring Acres Apartments near 72nd and Spring streets. Working with the NP Dodge Company, the scholars were extended aggressive pricing and multiple units were occupied by two to three scholars per unit.

Ground was broken in the fall of 1999 at the northeast corner of 67th and Pine streets for the first honors residence hall and conference center to support growth at The Peter Kiewit Institute. The 164-bed facility contains four-bedroom suites, each with a shared living room and a mini kitchen with refrigerator and microwave. Each of the three floors of the residence hall also has a large lounge area with full kitchen, a bathroom and large television and couches so students could gather to meet, plan, view movies, etc. Each floor also has a two-bedroom apartment much like the "Stanford model" so faculty members with their families could live up to two years in the residence to interact with students. Attached to the Scott Residence is a state-of-the-art conference center and a dining area to serve the residence hall. In addition, this center has a large student game room, an exercise room and a good-sized study area.

The first student moved into the facility in the fall of 2000 and residential life took on new meaning and new opportunities. Beginning with the Orientation Week and running throughout the school and calendar year, students found many activities and social events available to them. Dining room amenities, from menus to special events, invited student input. Many students find the food, the availability of broad-band connections and weekly maid service at Scott Hall to be an advantage.

The Scott Scholars formed the Scott Scholar Focus Group, elected officers and worked to make their group interesting, responsive to community needs and inviting to other students who might wish to attend PKI.

The Scott Scholars are campus leaders who have enjoyed weekend all-night LAN parties supported by the College Park staff who made sure the cafeteria was ready for their numerous computers and supplied endless food. As cohesiveness built, the Scholars hit intramurals with a vengeance. They have made their mark, contributing to the UNO football, basketball, softball and baseball teams. They also have taken part in such groups as Campus Crusade, designed floats for River City Roundup and volunteered their efforts to Durham Western Heritage, Joslyn Art Museum and other Omaha non-profit groups.

Business Seminar Series

A unique Business Seminar Series has been implemented for PKI students to provide some of the following skills sets and entry-level knowledge:

Table manners
Etiquette
Dressing for success
Business law
Banking, finance and investments
Fringe benefit packages
Interview techniques and skills
Networking strategies
Entrepreneurship
Seed and Venture funding
Intellectual property, copyrights, trademarks, etc.

In pursuing these seminars, students meet community leaders, visit and tour facilities from Union Pacific to the Omaha World-Herald (to mention only two), learn to speak in front of large groups and to convey concepts. The seminars help students develop a new vocabulary for professional work, gain confidence and build self-esteem as they wrestle with real challenges faced by business and then hear executives tell how they faced similar challenges. Many students find mentors through these sessions.

The Business Seminar Series is expanding in 2007 New Year, moving from ad hoc sessions to a new immersion program that may result in college credit for some and will provide, with successful completion of the 5-week session, a letter of completion issued through The Peter Kiewit Institute Board of Policy Advisors for inclusion in their portfolios/resumes.

Experts in Residence and Academy of Excellence

Experts in Residence are also a part of the fabric of campus life at PKI. Whether from IBM, Prophet Systems, Net Appliance, DELL, Boeing or others, having an executive "live" with students for a period of time and influence the PKI curriculum and emphasis of study provides a unique glimpse into some of the nation's most prestigious companies.

Another PKI recruitment effort is the summer Academy of Excellence. This unique activity involves bringing high school sophomores to campus the last week of June. Along with the individual high school's top scholar, a favorite math and/or science teacher is required to attend. The week is packed with activities so students and teachers understand the disciplines taught at PKI and the types of classes and activities they would participate in as PKI students. Current Scott Scholars assist in this endeavor; they also work with professors in the weekend activities designed for Women in IT and Women and/or Minorities in Engineering; they help teach Scouts; and they work with "tekbots".

Many PKI students assist with recruiting at their own high schools and also at schools in the region and across the nation. Co-ops and study abroad are all a part of PKI student options.

PKI students have tutoring available to them and they serve as tutors. They have the opportunity to mentor and mentors are provided to them. Some students have received up to $10,000 in grants to build out a product or business that they feel has potential and that judges from our Board and the business community in general see as having business potential or at a minimum, a wonderful learning experience.

The idea at PKI and in the residence community is "if you have a great idea … let us help you support it."

Opportunities for Career Development

The PKI Career Resource Center, directed by Douglas Bahle, provides many career development opportunities for PKI students. Bahle has developed unique approaches to creating student internships, business partnerships and student employment opportunities. The Center at PKI is not affiliated directly with the University of Nebraska career centers, which focus on employment after graduation, but rather is designed to get students involved with businesses as part of their academic experience.

Help is available for resume development; students are encouraged to prepare resumes upon entry to the program, so they are ready when an opportunity comes along. Every internship request is followed up on and every listing is dispersed to those students who have signed up. Bahle visits classes, invites speakers and corporations to host meetings with students and has established an activity called BIOS (Business and Industry Opportunities for Students). This activity results in companies setting up displays in the PKI lobby and meeting with interested young people about their firm's career opportunities. These same companies participate in

"mock interviews," which provide students with excellent feedback on things they did very well, things they need to work on and how to avoid the "pitfall" questions.

The Career Resource Center has grown from 54 business/internship placements the first year to over 700 during 2006. The number of companies registered with the Career Resource Center nears 800 and they are global in scope.

The operation of the Center, the approach, the outreach and the follow-up are unique to PKI and seem to be supported by students and companies alike. This has contributed to successful employment after graduation; current measures indicate that 99 percent of PKI graduates are hired (or accepted to graduate school) prior to graduation. The MSR Group survey found that 51 percent of the surveyed students said they were "very satisfied" and 30 percent are "somewhat satisfied" with the counseling, guidance and help they receive. (See Appendix Q)

Outstanding Student Achievement

As noted earlier, the Peter Kiewit Institute has attracted an outstanding array of students who come with a history of high achievement in school. Once enrolled, they continue to push professors for more opportunities to excel. PKI students have enrolled in independent studies when an established class might not currently exist to meet their needs; they have been matched with mentors from industry, allowing them push the envelope even further. The results have been and are gratifying.

Student recognitions are many. PKI Civil Engineering students have been on the top five teams in the nation during the last five years with the Big Beam Competition in structural engineering. This past year, they were named National Champs. PKI Computer and Electronics Engineering students have dominated awards at the E-Week Design Competition sponsored by the Nebraska Section of IEEE on an annual basis, finishing first and second and first and third the last two years.

PKI students developed the national website for the Lewis and Clark Bicentennial and have designed the website for such development companies as Noddle and Paxton-Verling Steel. Two to four patent applications are in process and one of our graduates is controlling and maintaining the systems in the Global Innovations and Strategy Center (GISC) in collaboration with U.S. Strategic Command on the PKI campus. IS&T students have been recognized for teaching computer skills to inmates in the penal complex in the Nebraska Department of Corrections. Three students and a graduate of IS&T designed the early pandemic disease detection model for Gen. Cartwright (U.S. Strategic Command) as the first official project through the GISC, and the project was accepted by the Centers for Disease Control and Prevention. A similar project called STATPack™ has made international news as well. PKI has an international winner of the Microsoft Imagine Cup competition and a student who was the national runner-up in the same competition.

The student internship program continues to be very strong. Students either directly or indirectly have helped grow Nebraska companies as interns or as entrepreneurs at the Scott Technology Center with companies like Spiral Solutions, 21st Century Systems, Proxibid, and Tournament Gold. This phenomenon bodes well with the desire of the Board of Policy Advisors and the State to enhance economic development for Nebraska.

True to the intent of the Institute Charter to encourage multi-disciplinary student, nearly twenty graduates have degrees from both colleges of PKI. Several have Computer Science degrees from the College of IS&T and Computer Engineering degrees from the College of Engineering. Other students, especially those majoring in Architectural Engineering or Computer and Electronics Engineering, leave with multiple majors; most frequently their second major is mathematics. One student graduated with two degrees and four majors (Computer Science, Computer Engineering, Mathematics and Electronics Engineering). This student is also representative of a number of graduates who have worked as interns in one or more national laboratories while attending PKI.

Two PKI students, both with majors in Computer Science, subsequently earned Masters Degrees from Carnegie Mellon. They returned to Omaha to start up a software development firm. Two PKI graduates are studying in Sweden, one supported with a Hunt Fellowship and the other with a Fulbright Scholarship. These young people are pursuing Architectural Engineering (AE) specializations. Two more AE graduates have been named NSF Fellows, while two graduates of the College of Information Science and Technology (IS&T) are now graduating with advanced graduate degrees at the University of California-Davis, one at the University of Texas at Austin, all with PhDs in information assurance concentrations; another graduate has received his Masters from the University of Sussex in England.

PKI has placed graduates in all of the Fortune 500 companies headquartered in Omaha and has graduates hired at four National Laboratories. One graduate is a leading engineer with Boeing, several are employed by NSA, others are employees of Lockheed Martin, Northrop Grumman, SAIC, Booz Allen Hamilton, and U.S, Strategic Command. Numerous graduates have been placed with Claas, Valmont, the Omaha World-Herald, John Deere, Olsson Engineering, Kiewit, DLR, HDR, Leo A. Daly, Hawkins, and other prominent Omaha-area companies. Graduates have advanced through promotions to supervisory positions in many cases and several are involved in entrepreneurship endeavors and doing well. One young man is the president of his company and one young woman is now three rungs up her career ladder with only two years under her belt in a company that hires 94,000 people world-wide.

PKI graduates have just begun to show what they can achieve. But given the national and international traffic through PKI, it is clear that the reputation built, in large part by its students, places the Institute among the most respected and most elite educational forces in the nation.

University of Nebraska's

The PETER KIEWIT INSTITUTE

The Unique Peter Kiewit Institute Faculty Environment

The Unique Peter Kiewit Institute Faculty Environment

PKI breaks through the traditional boundaries that separate institutions and disciplines. At PKI, faculty from UNL and UNO work together in a state-of-the-science facility, sharing students, course development and research projects. Disciplines represented include: computer science, bioinformatics, management information systems, computer electronics and engineering, construction science, architectural engineering, and civil engineering. Students, who can be harsh critics, report a high level of satisfaction with the quality of the faculty; the recent MSR Group survey found that 62 percent of students rate their instructors as "far above average or "above average." Students say the strongest faculty attributes are subject matter knowledge and currency of information.

Faculty Strengths

Over the past five years the UNL College of Engineering has successfully hired 11 new faculty in the Peter Kiewit Institute, despite the fact that state funding for the college has been relatively flat. These new hires by department include: Architectural Engineering (3 new faculty), Computer & Electronics Engineering (4), Civil Engineering (2), and Construction Engineering (2). Two searches are currently under way, including for the position of Director of the School of Architectural Engineering & Construction. These recent hires are significantly increasing external research funding within the institute, as more faculty with interests in research are hired and pursue extramural grant funding.

Since 2000, the UNO College of Information Science and Technology has successfully hired 15 new faculty members. These new hires by department include: Management Information Systems (8) and Computer Science (7). The college also established the NU Consortium of Information Assurance (NUCIA) and hired 4 research fellows associated with the center, which has been designated as an National Security Agency (NSA) Center of Excellence.

Faculty hiring has been assisted significantly by contributions from the NU system Programs of Excellence and the PKI Foundation.

The current faculty strengths of each college as well as developing strengths are reflected in plans for focusing on specific disciplines for further development. These are as follows:

College of Engineering

Current Strengths

- Architectural Engineering

Developing Strengths

- Wireless Technologies
- Construction Engineering & Management

College of Information Science and Technology

Current Strengths

- Management Information Systems

Developing Strengths

- Wireless Networks
- Bioinformatics
- Information Assurance
- Collaboration Science

In addition, there are efforts under way conjointly by the two colleges to develop new specializations that combine our strengths. These are:

- Wireless Communications
- High Speed Computing in Construction
- Building Information Management
- Project Management
- Integrated Circuits Design

Premier Facilities

One of PKI's greatest strengths is the state-of-the-science facilities and equipment it offers students and faculty for research and education. The Peter Kiewit Institute facility has an exposed infrastructure that literally serves as a lab for students attending the colleges in the Institute. Whether majoring in a field of Engineering or one of the disciplines provided through Information Technology or Telecommunications, there are systems to be observed and/or touched within the facility that expand knowledge, invite curiosity and challenge the mind to understand why and how electrical, mechanical, HVAC and/or network infrastructure is configured.

Within the 192,000 square-foot facility there are several labs that beg for exploration. An example is a structures lab with a reaction wall that will sustain up to 1,000,000 pounds of force, a 25-ton overhead movable crane, and a floor configuration designed to sustain significant weight, but with access below to allow researchers and students to see and learn. A BIM Pit enables exploration of the latest in building information modeling, a lab for robot instruction and testing, rapid prototyping and a host of other construction extensions and enhancements.

Large classrooms exploit the latest in multiple-screen technologies, while access grid and distance-learning capabilities are available and ready to serve more than 120 students simultaneously. There is a lighting lab, a systems lab for HVAC, fire technology, plumbing

and the ability to change settings on the building systems themselves and observe the adjustments prior to default returning the building to the prescribed configurations.

In addition to multiple state-of-the-art computer classrooms, there is an instructional lab supporting the National Security Agency Center of Excellence curriculum and a testing lab where computer viruses, worms and other destructive techniques can be explored and curtailed with minimum damage to a business or its client base.

Not only are the building systems viewable, so is the network infrastructure. From the latest Foundry network dual core multi-level routers and switches to the fastest research switches made by Force 10 networks, the building infrastructure boasts of a gig to the desktop with a 20 gig backbone and the capability to take the switching gear to 100 gig when the equipment catches up with the technology. Additionally, installed in the head end room to the facility, is a 10 gig intrusion detection device made by Force 10 that allows detection of penetration over 10 gig Ethernet in real time. The facility has multiple broad-band and local carriers with the ability to utilize a Level 3 OC192 on demand. From UPS units provided by Eaton Industries, to SUN equipment supporting Air Force and Global Weather, to a bioinformatics cluster working in conjunction with the Medical Center, the Institute is one of the most robust higher education entities in the nation. In addition, the building includes over 2,000 square feet of computing lab space divided into a general-purpose lab, instruction labs and research labs. The general-purpose lab consists of more than 100 PC stations and each of the instruction labs has between 35 and 50 stations. Also, the building includes more than 20 advanced instruction and/or research labs. Nearly all labs have been funded by either federal or state funding agencies. The majority of the PKI graduate students and a large number of undergraduate students are actively engaged in long-term research projects with faculty mentors. A more complete description of these premier PKI laboratories follows.

The Telecommunications Engineering Laboratory

The Telecommunications Engineering Laboratory (TEL) is equipped with its own state-of-the-art wired and wireless network infrastructure and tools to support advanced studies in Telecommunications Engineering. TEL houses 34 high-end workstations for a number of research projects and provides gigabit connectivity to all computing elements in the lab, and multi-gigabit connections to the Abilene high-performance Internet2 backbone network. TEL also has direct access to both the Cluster Computing System at PKI as well as an IBM 670 and IBM 690 supercomputers.

The lab is also equipped with multiple wireless networking research platforms, consisting of Strix Systems OWS 2400 access points as well as Cisco Airespace access points. In order to support our research in wired and wireless networking technologies, the TEL lab features a number of advanced hardware and software tools that are critical to our ongoing research activities. Some of these include:

- Wildpackets AiroPeek high-end wireless packet capture and expert protocol analysis packages to support variety of wireless standards such as 802.11 a/b/g

- Ethereal/Wireshark Protocol Analyzers for both wired and wireless protocol analysis needs
- High-performance FPGA development platform for generic computing implementations featuring three parallel Xilinx Virtex4 processors
- Tektronix 68 channel TLA5201B logic analyzers
- PSA series Spectrum Analyzers from Agilent Technologies
- Other oscilloscopes, meters, and test tools

Additionally, TEL lab is operating its own outdoor wireless infrastructure testbed for railroad environments located in Crete, Nebraska, about 30 minutes west of Lincoln. This testbed is situated on BNSF-operated railroad track, measures about 3.5 miles and is equipped with 9 Strix Systems OWS 2400 access points. We frequently use this testbed to obtain measurements of our on-going research project for wireless network performance in railroad environment.

The Lighting and Electrical Systems Laboratory

The Lighting and Electrical Systems Laboratory has 1,600 square feet of space designed for teaching and research. It has seating for 40 students, and includes state-of-the-art computer projection and audio-visual equipment. Ten overhead lighting systems illuminate the central teaching area, which can be enclosed with motorized shades. Examples of fluorescent, incandescent, and high intensity discharge systems are included, which are controlled by a Lutron Grafik Eye 5000 dimming system. The layouts are designed to study the spatial and spectral distribution of light in building interiors. Two dedicated dimming panels control the electrical supply. Electrical performance can be quantified using a current transformer connected to each panel's feeder. Receptacles in the ceiling provide 24 separate circuits for the lighting in the mock-up area, all of which are fully dimmable.

The laboratory is equipped with several Minolta T-1M illuminance meters, a Minolta CS-100 Chroma meter, Minolta LS-100 and LS-110 luminance meters, a LightSpex handheld spectroradiometer, two EPP200C spectroradiometers from Stellarnet, a ProMetric 1600 digital image photometer system from Radiant Imaging, a CM-2600d spectrophotometer from Minolta, and a custom-designed trichromatic colorimeter. The laboratory is also equipped with a spectral lamp measurement system, consisting of a six-foot integrating sphere from Labsphere, a diode array spectrometer, AC and DC power supplies, a 3-element power meter, and two reference ballasts. The system is used to measure the electrical and spectral characteristics of lamps, including spectral power distribution, lumen output, color rendering, and color temperature.

The laboratory also includes powered and non-powered electrical equipment to help students transfer from electrical theory to applied electrical engineering. The unpowered building electrical distribution equipment includes a main distribution panel, motor control center, 480Y/277V panelboard, step-down transformer, 208Y/120V panelboard, transient voltage surge suppressors, conductors and conduit. Although these components are not powered,

they are connected and grounded identically to an actual distribution system. Students can work with the internal components of the system to understand how lecture concepts like distribution, voltage transformation, over-current protection, and grounding are actually implemented.

The powered part of the laboratory includes a motor and starter to study motor starting currents and protection, capacitors to study power factor correction, an automatic transfer switch, enabling the study of power quality and harmonic distortion. The electrical system is monitored by a Square-D Powerlogic circuit monitor that allows detailed measurement and waveform capture of the laboratory electrical system. This monitor and software interfaces with the computer projection system, providing a dramatic depiction of power quality, harmonic distortion, motor starting and power factor correction.

The BASmobile Laboratory

The BASmobile Laboratory is a mobile building automation systems laboratory used to illustrate the heating, ventilating, and air-conditioning of commercial buildings. This unique laboratory was designed to show the various components and subsystems of a commercial building energy system and demonstrate how they operate on a miniaturized scale and to lay particular emphasis on the control systems and control applications, which are a critical part of any HVAC system. Students use the laboratory to conduct experiments in a miniature zone (MZ) or a full-size zone (FZ) or to design control strategies for HVAC systems with the help of custom learning modules. The BASmobile also provides modern web-based control functionality for remote control access and energy information. The BASmobile is small enough to be moved between classrooms and laboratories and can be used as a teaching and research tool to investigate improved operational and control strategies and to develop new strategies for facility engineering systems.

The Building Systems Laboratory

The Building Systems Laboratory is a 2,600 square foot heating, ventilating, and air conditioning (HVAC) teaching and research room. It contains a completely operational commercial HVAC system designed to demonstrate and incorporate HVAC research needs for the Construction Science program and the new Architectural Engineering HVAC option program. The system consists of a York 3000 CFM, 3-inch TSP air handler with 2 sets of chilled water and hot water coils one set for conditioning and one set for pre-conditioning; space for humidifiers; filters for 30 percent to 99 percent capacity; and mixing zone for 100 percent return air to 100 percent fresh air, along with a 3000 CFM exhaust fan to the exterior. The system includes a dual compressor, 17.5 ton water cooled Multistack chiller, 25 ton Marley cross flow water tower and a 600,000 BTUH 15 psig horizontal steam boiler by LES. The system is fully controllable with a new Honeywell DDC controller unit. There are four zone VAV duct configurations with by-pass capacity for research use. Other testing systems are a fully exposed commercial plumbing facility, and for future installation a new friction loss piping network, standing fire sprinkler system, and fan comparison experiment setup.

The Structures Research Laboratory

The Structures Research Laboratory supports infrastructure and construction engineering research and provides capabilities for static, dynamic, and fatigue testing. The testing area of the structural floor is approximately 30 feet by 90 feet. The floor system is designed to withstand 500,000 pounds per tie-down location and approximately 28,000 pounds per square foot of testing area. A 30-ft high reaction wall is designed to take maximum allowable horizontal forces of 600,000 pounds. Two hydraulic pumps are available to provide hydraulic power to drive actuators. In addition to the heavy usage by research faculty at PKI, the Laboratory also offers structural and material testing services to regional engineering firms for their design validations. The capabilities of the Structures Research Laboratory include:

- Max loading capacity of floor system = 750,000 pounds per 3-foot anchor spacing
- Max load capacity of steel transfer beam = 500,000 pounds.
- 60 feet by 90 feet testing area
- 25-ton crane (or 50,000 pounds) for lifting test objects.
- A 30-foot tall reaction wall for prototype structural testing, including seismic loads
- Max horizontal load = 240,000 pounds
- Underground chambers with 6-1/2 feet head room for testing setup
- Removable floor panels designed for semi-truck wheel loads, such that a flat bed can deliver big test articles directly to position
- 70-foot long pre-stressing bed for casting pre-stressed concrete structures

Bioinformatics Research Laboratory (BRL)

Bioinformatics is an emerging, rapidly expanding science that addresses problems related to the storage, retrieval and analysis of data describing the structure and function of biological systems. Bioinformatics refers to both the development and the use of mathematical and computational methods to assist in understanding and applying structural, as well as functional information to the study of biologically important molecules. The need for bioinformatics reflects the radical changes that the biological sciences have undergone over the last decade, particularly the availability of massive biological databases. The focus of the Bioinformatics Research laboratory (BRL) is to develop advanced computational tools to address current bioscience problems, including the identification and classification of biological organisms, with the goal of complementing the current experimental approaches to predicting a wide range of biological events that range from potential virus outbreaks to bio-terrorism. The lab has a library of books and software programs to support the academic programs in Bioinformatics, both at the undergraduate and graduate levels.

Secure Telecommunications Application Terminal (STATPack™) Research Lab

The STATPack ™ (Secure Telecommunications Application Terminal) system is an Emergency Response system for the Public Health Microbiology Laboratories. This research project is part of a nation-wide effort to increase biosecurity preparedness and awareness. In addition, this project includes research studies on agile system development methods using eXtreme programming principles, human computer interaction usability evaluations,

collaboration engineering process studies and software engineering technology research to develop leading edge software that interfaces with video cameras and microscopes. Students, faculty and staff for this project work in collaboration with the Nebraska Public Health Laboratories at the University of Nebraska Medical Center.

Data Mining Research Laboratory (DMRL)

The Data Mining Research Laboratory is set up with the help of grant from the University of Nebraska Foundation to support research and teaching on data warehousing and data mining, and to allow students, faculty, and industry fellows to conduct analytic customer relationship management (CRM), bioinformatics research and other research for real-world applications. During the past several years, the lab has facilitated the development of a series of multiple criteria-based mathematical models that have been applied successfully to various data mining applications. UNO students are using lab facilities for Data Warehousing and Data Mining courses. In addition, DMRL has participated in several research and industry projects, such as network intrusion detection, credit card risk analysis, and health fraud detection. The laboratory also significantly enhances the collaboration in the departments of the College of Information Science and Technology and between the College and other university units, and numerous businesses and industries for joint research and teaching activities in data mining. The laboratory has sponsored several prestigious data mining related international conferences.

Multi-Agent Networked Technologies for Intelligent Swarms (MANTIS)

The research performed by the MANTIS group combines principles from artificial intelligence, computational economics and evolutionary biology to design autonomous software tools and applications capable of assisting humans with enhanced capabilities for control and interaction in a variety of domains ranging from military and civilian security to paramedic operations and social networking. Specific applications of the PKI MANTIS project include identifying, tracking and destroying hostile targets using mobile robots for homeland security applications; tracing hazardous substances such as chemical plumes using autonomous vehicles for civilian applications; performing search and rescue operations using autonomous robots for paramedic applications; and exploring various commercial applications such as peer-to-peer information sharing for massively distributed social networking using software agents. The research is currently funded by grants from DoD-NavAir and NASA Nebraska Space Grant Consortium.

Security Technology Education and Analysis Laboratories (STEAL)

The STEAL complex is a primary component of the university's computer security – information assurance program. The STEAL is intended to serve as an isolated facility in which students, faculty and our partners have the opportunity to experiment with various forms of malicious code and other dangerous programs such as computer viruses, without risk. The work in the STEAL is directed toward understanding malicious code and devising protective technologies based on sound computer science. The STEAL is also used to supplement various information assurance classes taught at the university, providing students

with a place to gain practical experience and to apply what they learn in class. All students who use the lab must sign an ethics statement and agree to use the knowledge gained from working in the lab for academic pursuits. All access to the STEAL is controlled and audited. Additionally, the STEAL conducts cutting-edge research on various computer security topics and is frequently used to demonstrate security concerns to various industry and governmental groups.

Wireless Infrastructure Networks and Distributed Sensors (WINDS) Lab

One of the defining trends of the 1990s has been the explosive growth of mobile devices and wireless technology. In the next decade, ubiquitous network access is expected to be the primary communication media. However, it has been widely believed that the mobility severely limits robustness and security in wireless communications. As a result, a high degree of reliability, security and performance has been become difficult to achieve. The main goal of WINDS Lab is to support multiple research and instruction projects related to the developed a high performance wireless infrastructure. The lab activities also focus on researching a number of problems that have prevented wireless technology from being employed in many applications.

In collaboration with medical researchers, the WINDS lab has developed a hybrid network infrastructure that integrates wired and wireless technologies for hospital environments, that is secure, reliable and supports the use of different types of mobiles devices. The developed infrastructure is currently being used to develop a patient-tracking system for hospitals. In the proposed system, important assets, patients and staff will be marked by small, electronic sensor tags for positioning and security purposes. By tagging all equipment both the current position and the history of its movement will be logged. The proposed patient-tracking system will be integrated into a hospital's information infrastructure to track patients in real time, and their locations are graphically displayed on a Web interface, which is updated periodically. In fact, the identification management systems track not just patients but personnel and equipment as well.

Group Decision Support (GDS) Laboratory

The Group Decision Support Laboratory was designed to support and enhance the functioning of group work and group decision-making activities through the use of information and communications technologies. In addition, this laboratory can be used for research into the various modes of group support. The laboratory provides a variety of facilities to enhance group work. The furniture in the room is fully modular and can quickly and easily be reconfigured to fit the needs of large or small groups. A number of whiteboards – both affixed to the walls and moveable units – are available.

A central console at the front of the room contains three personal computers, an Elmo projector, a VCR, a V-Tel video-conferencing unit, and a hookup for a laptop computer. This console can be used to control three large displays in the room – each of which can be

manipulated independently – and to direct to these displays the images from either the Personal Computers or any of the other devices. An electronic whiteboard at the front of the room is connected to one of the Personal Computers to allow for both the display and capture of whiteboard drawings, as well as for the whiteboard-based usage of the computer. Twenty five laptop computers are available for the Group Decision Support Laboratory. These laptops contain wireless Ethernet cards for network connectivity, which allows these laptops to be easily moved around the room, based on group needs. These laptops can be used for group conferencing using the Facilitate.Com package, which contains computer-based brainstorming, discussion, voting and ranking, and document exchange features.

The Group Decision Support Laboratory has been used intensively and for a variety of teaching, research and outreach purposes. The lab has been critical to the development and the delivery of a number of undergraduate and graduate classes in the MIS programs. IS&T faculty have used the laboratory for conducting courses and seminars on the topic of group support, which have included extensive hands-on experiences for the students. Researchers have used the room to use, assess and enhance different group decision support tools and modes of usage. PKI industry partners have used the laboratory for meeting, teleconferencing, and training sessions.

In addition the GDS lab is the main lab for the newly formed Institute for Collaboration Science (ICS). ICS researchers investigate the theoretical foundations of collaboration and apply their findings to the creation of new collaboration techniques and technologies. Their work spans a wide variety of goals, ranging from reducing the drop-out rate among inner-city school children to cutting military decision cycles in times of crisis to creating collaborative work practices for multi-national corporations for tasks like risk and control self-assessment, strategic planning, or product development. Collaboration Science is a complex discipline that can only be encompassed by a multi-disciplinary approach, so its senior Fellows hail from all six colleges on the UNO campus. In addition to its research mission, the institute offers collaboration education and training to UNO students and to organizations in Omaha and beyond. The Institute also offers services to the campus and the community for facilitation, collaborative work practice development, and the design of cutting-edge collaborative decision spaces. Several such spaces are available or under development at the UNO campus, and the Institute welcomes the opportunity to demonstrate them and to present the practical and research contributions of the Institute's projects.

Collaborative Research Environment

PKI provides a unique environment supportive of research collaboration. The facility itself was built to encourage collaboration and is a "living laboratory" providing students the opportunity to learn about the intricacies of the facility's structures and systems. Faculty from different disciplines are housed together, sharing students, laboratories and equipment and developing the collaborative relationships that are critical to finding solutions to 21st century challenges. PKI's close ties to industry provide the opportunity for faculty and students to learn about the challenges and needs of high-tech industry and to develop productive

partnerships. These partnerships feed back into the classroom, informing courses that are at the cutting-edge in their discipline and providing students with internships and other opportunities with industry. Students report a high level of satisfaction with the collaborative environment at PKI.

Encouraging Research Collaborations

Two sets of seed grants programs have been initiated over the years to foster collaboration among PKI faculty.

Original Collaborative Grants and Student Entrepreneurial Awards

Beginning in the fall of 1999 with the opening of the new facility, the Board of Policy Advisors began awards programs aimed at both faculty and students. The effort was to encourage the two colleges that comprise the Peter Kiewit Institute to reach out to each other to explore ways that they could provide a stronger program to students and to the professions by leveraging the strengths and disciplines of both. ("Joint" initiatives were recommended and encouraged in the PKI Charter dated December 1995, see appendix.)

The Board appointed a committee of business leaders to review applications and select proposals with the most potential of advancing business innovation, joint curriculum development and research. The Omaha World-Herald Foundation pledged a total of $75,000 per year over a three-year period to support this endeavor.

The first year, 1999-2000, three $25,000 awards were given. In 2001, four awards were given totaling $70,000, exceeding what the Omaha World-Herald Foundation has initially promised. In the final year of the original initiative, another $75,000 was awarded. A total of 31 faculty members were impacted directly in the awards process over the three-year period. Two of the grants resulted in additional NSF funding; three conferences held as a result of the joint planning had a net impact on more than 500 people regionally, including academics, students and professional business partners.

The student awards were provided to students proposing an idea for a business or a research initiative that could result in a potentially viable product and/or entrepreneurial start-up opportunity. These "seed" grants of no more than $10,000 each were provided by the Suzanne and Walter Scott Foundation, with no ceiling number – any and all viable and worthwhile projects were to be funded. A committee of business leaders juried the entries. In year one, 1999-2000, five awards were given to teams, impacting 14 students. One team formed a company that is still operating. Another team is a viable software company. In year two, three grants were given, totaling $25,000. Of this group, an e-travel business took off and lasted for about 18 months. In the third year, the program was revamped as it became apparent that the process had to be spread over a two-year period. The four awards involving 20 students that were presented the fourth year were given a two-year process. This resulted in a conference, a business plan for a company start-up, a hand-held device for life support

and a product to track vital signs on line. It is hoped that several new initiatives be established during the second decade of the Peter Kiewit Institute. Building on success, land with a better understanding of the time requirements needed to generate meaningful proposals, students and faculty will be encouraged to think creatively and to tap others for resources both human and fiscal.

Current UNL-UNO and PKI Research Collaborations Grants program

The current UNL-UNO and PKI Research Collaborations Grants program grew out of the January, 2005 retreat sponsored by the PKI Coordinating Council. Thirty-five UNL and UNO faculty and administrators attended the retreat, and many gave presentations on their areas of expertise and research interests. Dr. Mel Ciment and Dr. Robert Borchers, consultants with extensive expertise in information technology retained by the UNL Office of Research, gave presentations on funding opportunities.

A major outcome of the retreat was the launching of the three-year experimental seed grant program to foster collaborations in priority areas of engineering, computer science, information systems and information technology. Seed grants require collaborative teams involving at least one faculty member from each institution. Funded projects must submit a proposal to a federal agency. Ciment and Borchers serve as external reviewers, critiquing the proposals for scientific merit and potential for obtaining external funding. The final funding decisions are made by the PKI Coordinating Council. A total of $50,000 in seed funding is supplied by the UNL Office of Research for each round of funding; awards of up to $25,000 are made. Request for proposals were issued in 2005 and 2006. In December, 2005, a Research Collaboration Meeting held at PKI included presentations by the teams funded in the 2005 competition and discussion among the attending faculty and administrators about leveraging of seed funding, potential future collaborations, and the 2006 request for proposals. Seed grants made to date are:

PKI seed grants funded in 2005 are shown below:

1. Collaborative Test Plan Creation to Accommodate Stakeholders' Value Propositions in Value-Based Software Engineering; Gert-Jan de Vreede, Ann Fruhling, Scott Henninger
$25,000

2. Project Management Informatics for Engineering; Donna Dufner, George Morcous, Avery Schwer
$5,000

3. Interdisciplinary Research on Ubiquitous Ultra-wideband Sensor Networks for Emergency Response; Won Mee Jang, Lim Nguyen, Jong-Hoon Youn
$10,000

4. Applying Patterns of Technology-Enabled Distributed Collaboration: Improving Multi-Actor Decision-Making in Traffic Systems; Gert-Jan de Vreede, Elizabeth Jones, Deepak Khazanchi, Lawrence Rilett, Ilze Zigurs
$10,000

PKI seed grants funded in 2006 are shown below:

1. Development of an FPPD CAD Platform; Haorong Li, Haifeng Guo
$25,000

2. Mobile Ad-hoc Wireless Position Tracking System for Construction Sites; Yong Cho, Jong-hoon Youn
$10,000

3. Remote Assessment of New Bridge Systems Using Smart Wireless Sensors; George Morcous, Yong Cho, Jong-hoon Youn
$25,000

From these seed grants funded in 2005 and 2006, one external proposal has already been submitted in 2006 to NSF NeTS Program, titled, " NOSS-Testbeds and Applications: Development of Ultra Wideband (UWB) Wireless Sensor Networks for Real-time Indoor Position Tracking and Smart Space Systems" by Jong-Hoon Youn, Department of Computer Science, UNO; Lim Nguyen, Department of Computer and Electronics Engineering, UNL; Wonmi Jang, Department of Computer and Electronics Engineering, UNL; and Yong Cho, Construction Engineering and Management Program, UNL.

Access to Business and Industry Leaders

Through more than 200 Memoranda of Understanding with business partners and more than 600 businesses working with our Career Resource Center on internships, mock interviews and other programs, the Institute clearly is providing students with unparalleled opportunities and access to business and industry.

A business seminar series supports corporate understanding beyond the disciplines in PKI. "Experts in Residence" add a unique perspective to courses, teaching alongside highly qualified professors in accredited programs that support undergraduate and graduate degree offerings.

The PKI campus has state-of-the-art residence halls, a conference center and a technology transfer and incubator complex. Through a partnership with U.S. Strategic Command, the only Global Innovations and Strategy Center in the world sits as a part of the Scott Technology Center Complex.

The technology within the facility is constantly changing and being upgraded in an effort to ensure that the Institute not only opened as a "world-class" facility, but remains such. Whether studying multi-media post production or designing bridges, it's hard to imagine a higher education facility with more capacity to ignite the imagination of the brightest minds from around the state and the nation.

PKI Technology Development Corporation

A Technology Development Corporation has been formed with the express purpose of providing a contracting arm to support rapid testing, development and deployment. This entity is used to be responsive to businesses while also showing a company the capabilities of the faculty and students. Often a small project through the PKITDC results in a large academic research project that acquires funding from such organizations as the Department of Defense or the National Science Foundation.

Since its inception in 2002, the PKITDC has generated learning opportunities and experiences for students and faculty that they may otherwise have missed. With more than 70 contracts and flow-through dollars of more than $3.5 million, PKITDC has done a great deal to keep professors and students abreast of where industry is going, not where it's been.

University of Nebraska's

The PETER KIEWIT INSTITUTE

The Peter Kiewit Institute Plans for Future Development

The Peter Kiewit Institute Plans for Future Development

The Peter Kiewit Institute is a unique collaboration of the University of Nebraska and business partners with great potential to be a national center of innovation and entrepreneurship in information technology and engineering. Among PKI's key assets are the opportunities to spark new research through integrating engineering fields and to partner with industries to explore new products and applications. Accomplishments during the first years of PKI's operation have demonstrated this potential; however, it is clear that PKI can achieve much more in years to come.

In order to reach national prominence as an academic/industry collaborative in engineering and technology, PKI must:

1. Grow academic programs that fully exploit the academic-industry collaboration and prepare top-flight students to work for Nebraska industries;

2. Construct magnet innovation centers through cluster-hiring of nationally prominent faculty who will lead basic research and its application with industry partners; and

3. Become a driver of economic development in Nebraska through engaging industry partners in promoting and funding innovation.

PKI has many of the ingredients needed to become a world leader in information technology and engineering. Through encouraging its creative model for collaboration, hiring and retaining high-caliber faculty and staff, recruiting excellent engineering and technology students, and engaging a supportive advisory board, PKI can become a nationally recognized institution and bring economic development in high-tech fields to Nebraska.

1. Grow academic programs that fully exploit the academic-industry collaboration and prepare top-flight students to work for Nebraska industries.

To fully exploit the novel model for collaboration that is PKI, collaborative projects must be at the center of plans for future development:

Expand collaborative and joint academic programs. The current academic programs offered separately by the UNO College of Information Science and Technology and the UNL College of Engineering are the core programs of PKI and should remain so. However, PKI can develop new, forward-looking programs that define how IT and engineering skills can be integrated to address new needs and demands. Among new programs that should be explored are: Wireless Communications, Building Information Management, Project Management, Construction Engineering and Management, and Integrated Circuits Design.

- Both the College of Engineering and College of IS&T have already established a strong relationship between faculty and students by developing and obtaining joint research grants in the area of wireless computing. This has led to the establishment of advanced research projects and new applications in the medical domain, with collaborations with UNMC and the two colleges now under way. PKI faculty and administrators in both colleges should now collaborate to offer joint specializations or concentrations and undergraduate/graduate certificates in wireless computing/communication.

- Project Management (PM) competency has become an important credential for IT managers and engineers, particularly in architectural engineering, civil engineering, and construction systems/management. The College of IS&T has established a strong area of excellence in PM research and education offerings. The college offers a PM specialization and a graduate certificate in PM in its graduate program, and elective PM courses are offered at the undergraduate level. PKI faculty and administrators see enormous potential to expand by offering a collaborative specialization, degree program and/or certificate that focuses on well-established PM concepts that cut across many engineering and IT disciplines.

- The integration of Building Information Management (BIM) technology into the UNL College of Engineering Construction Engineering and Construction Management undergraduate and graduate programs is an important priority. BIM technology is computer-based and allows the sequencing of construction operations through simulation of the entire construction process to ensure integration of structural, electrical, and mechanical systems within the as-built facility. This avoids costly redesign conflicts within building spaces that would delay project completion and created additional cost for the owner.

- One joint program between the two colleges is already underway: A proposal for an undergraduate dual-degree program offering computer science curriculum courses in the UNO College of Information Science and Technology and computer engineering curriculum courses in the UNL College of Engineering has been drafted and is under review by the College of Engineering. The computer science degree and the computer engineering degree are both accredited by the Engineering Accreditation commission of the Accreditation Board for Engineering and Technology (ABET). The proposed dual-degree program must meet the ABET/EAC requirements for both individual degrees to be accredited. We endorse the adoption of this program and pursuit of the other collaborative projects cited above.

Create cross-college academic appointments. Faculty members with appointments that relate to both UNO College of Information Science and Technology and UNL College of Engineering will be best positioned to lead efforts to develop integrated programs. Faculty with joint appointments also will encourage connections between current programs. In

general, cross-unit appointments are desirable both educationally and economically, particularly in highly interdisciplinary areas. Such appointments in a university system demonstrate support and encouragement for interdisciplinary activity. Joint appointments (with departments in the same college, with departments in different colleges, with department and interdisciplinary or research centers in the same or different colleges, or with units in different parts of a university system) can facilitate the cooperative management of teaching loads, availability of domain expert faculty supervision (and chairing of theses) for graduate students, and more opportunities for research and grant collaborations. As PKI faculty and administrators collaborate to create additional cooperative and joint programs, joint appointments will help assure their success.

- The establishment of joint degrees between the College of IS&T with UNMC in bioinformatics (graduate and Ph.D.) and an undergraduate degree in bioinformatics in collaboration with UNO's biology and UNMC programs have resulted in joint appointments between UNO colleges in its Department of Biology and courtesy appointments for UNMC faculty in the College of IS&T.

Involve students and industry partners in creating alternative programs. The PKI academic-industry collaborative inspires alternative models for course and program development. Students and industry partners should be more fully engaged with faculty members in designing internships, practical training opportunities, and distance-learning development. With its unique infrastructure, PKI can be the catalyst for a new paradigm in distance education, crossing academia and industry and exploring well-researched and new distance-learning approaches in this collaborative environment.

- For example, PKI has been actively developed a collaborative relationship with Johnson Controls, based in Milwaukee, Wisconsin. PKI offers to supply Johnson Controls with students who are qualified for employment there. In return, Johnson Controls supplies PKI with potential graduate students, adjunct professors, and advice on course content.

Develop executive education. PKI units should evaluate their potential to develop highly visible executive education programs. PKI should offer graduate certificates and executive degrees in IT Management and Project Management (IT/Eng). Furthermore, PKI partners should be encouraged to develop cohort classes of young professionals who can benefit from this training, committing sustained corporate sponsorship of life-long learning for their employees.

Enhance student recruitment and program marketing. As national trends show, enrollments in IT and Engineering programs are declining nationwide, yet now more than ever our state and nation need innovators in these fields. PKI must develop new recruitment and marketing strategies to: publicize PKI programs, emphasizing their grounding at the University of Nebraska; identify niche target markets for student recruit; and emphasize national advertising.

Achieve calculated growth. For the next five years, an increase of 25 percent in the undergraduate enrollment, 100 percent in the graduate enrollment and 15 percent in faculty and staff should support the program goals listed above.

2. Construct magnet innovation centers through cluster-hiring of nationally prominent faculty who will lead basic research and its application with industry partners.

A hallmark of innovation that defined U.S. dominance in engineering fields in the past were the research laboratories of industry giants like Bell and IBM. We have a new opportunity in PKI to re-create the partnership between research and industry that sparked such innovation; to do this, PKI needs the best academics in the global market to lead research, new centers for innovation, and advanced research laboratories:

Hire clusters of faculty experts in key areas. Several PKI academic areas have potential to be recognized nationally as centers of academic excellence through strategic hiring. Through cluster hiring we have already achieved excellence in architectural engineering and management information systems. PKI academic units must take a strategic approach to building excellence in several other areas (e.g. wireless communications, construction engineering and management, bioinformatics, information assurance, and project management) with the goal of achieving top-25 ranking among peer departments nation-wide through cluster hiring.

- A cluster hire will be made in the Durham School of Architectural Engineering and Construction within the next few months. The school will hire four new faculty members whose specialties will improve the Durham School's national status in construction-related disciplines. Out objective is to achieve national excellence in construction and architectural engineering, as well as construction management.

Design centers for innovation in new areas. PKI has the potential to play a leading role in creating institutes, centers, and consortiums in the areas of Simulation and Modeling, Visualization, and Project Management. PKI has generated several such centers, and these serve as prime examples for future success.

- The Intelligent Transportation Systems (ITS) simulation research laboratory at PKI collects, stores and analyses real-time traffic flow data obtained on Pacific Street (immediately adjacent to PKI) through a system of visual cameras and traffic movement sensors. The laboratory was designed and deployed by Dr. Elizabeth Jones, Civil Engineering, who also designed and uses a mobile traffic information data collection van that collects data.

- The Interior Lighting Research Laboratory in PKI, designed and deployed by Dr. Kevin Houser, Architectural Engineering, includes currently available commercial lighting fixtures and components. Dr. Houser's laboratory is used to test various combinations of lighting components in both living and work spaces. The aim is to determine and enhance the effectiveness of various environmental modifications in providing both illumination and a psychologically productive environment for human subjects.

- The Nebraska University Center for Information Assurance (NUCIA) within the College of IS&T has played an important role in bringing Information Assurance (IA) to the forefront of local businesses. Due to this center's efforts, UNO has been appointed by the National Security Agency as a Center of Academic Excellence in Information Assurance Education. This appointment has brought widespread attention to PKI programs and substantial funding in the form of earmarks and grants. The NSA cybercorp scholarship program has successfully attracted high ability students to PKI to study Information Assurance. The college is in the process of obtaining internal UNO approvals for a new undergraduate degree in IA.

Grow external funding. External grants and contracts are essential to PKI's future. We have set a goal of $15 million in annual grants and contacts to be achieved within five years. This growth will stimulate research (both basic and applied) and curricular innovations, support goals for attracting top faculty and expansion of graduate programs, and will foster development of new inventions that will fuel economic development. This $15 million goal is ambitious, especially considering the current funding level. However, recent successes, new initiatives and new investments in junior and senior faculty lend confidence that the proposed goals are achievable.

- Recent indications of that PKI can achieve our projected goal for external funding include: establishment of a National Center of Excellence in Information Assurance, involvement of faculty at PKI in the new $6 million regional transportation research center (Mid America Transportation Center) funded by the U.S. Department of Transportation, rising visibility of the Architectural Engineering Lighting program, participation of faculty located at PKI in the Nebraska's NSF-EPSCoR grant of $9 million in bioinformatics, and a $1 million NSF grant using robots in STEM education of high school students.

- External funding goals also can be reached through increased collaboration among PKI faculty and the University of Nebraska's campuses. Informational retreats and seed-funding for research development are among recent initiatives that have fostered collaboration among faculty within PKI and those at the University of Nebraska-Lincoln and UNMC. The retreats and seed-funding for collaborative projects offer opportunities to create a critical mass of research expertise that is important to attract federal funding.

- New junior and senior faculty hires have been made in targeted areas that align with federal funding priorities, especially those associated with R&D investments at the National Science Foundation that are expected to double in the next 10 years. Continuing this pattern will increase PKI's potential to reach external funding goals.

- Finally, a strong support structure exists at the college and university levels to help faculty in grantsmanship skills, team building and mentoring, another crucial factor in attaining our funding goal.

Streamline approval processes for new programs. Faculty and administrative teams at both UNO and UNL can play a significant role in developing new and innovative programs sensitive to the demands of the market place and respective professions by simplifying and coordinating new program approval processes. A collaborative PKI effort should be initiated to examine all steps in the process (undergraduate and graduate) for the purpose of targeted elimination and/or simultaneous rather than linear review, where possible. The use of a technology-based approval process should also be explored (e.g., digital documents and virtual meetings/approvals) and implemented if feasible.

- One area to be targeted for improvement is the graduate program approval process. The approval process is similar on both UNO and UNL campuses and currently requires a minimum of 14 internal steps prior program approval by the Nebraska Coordinating Commission for Postsecondary Education. This lengthy process does not allow us to respond in a timely way to opportunities and changing constituent demands.

Build state-of-the-art research laboratories. Advanced research labs enhance both basic research and educational programs. And they are essential for collaborative product development with industry; many IT/Engineering companies use university labs as test farms for new products and commercial applications. PKI has an excellent existing infrastructure with basic instructional labs and well-equipped research labs; the new laboratories would complement the current infrastructure and provide the environment to support advanced research and educational programs.

Plan spaces for future development. Space is a critical commodity for future development; the current facility was not designed to accommodate the current number of PKI students and faculty, let alone new programs. Since the inauguration of PKI, new programs have been developed in Bioinformatics, information technology, and architectural engineering. The current facilities do not have sufficient research space to add any new faculty members; there is a shortage of classroom space for the currently offered programs, with some classes held off site. We recommend that a space feasibility study should be developed in the near future.

3. Become a driver of economic development in Nebraska through engaging industry partners in promoting and funding innovation.

PKI's efforts to attract top faculty, to encourage faculty to work across colleges and to synergize their research both with the efforts of other faculty and our industry partners will guarantee increased intellectual property, improve the international reputation of PKI, and create the foundation for economic growth in Nebraska. PKI needs to tout this potential with its industry partners, garnering their support and funding for economic development:

Stimulate entrepreneurship through support infrastructure. New ideas with potential for commercialization have emerged from current PKI faculty/industry collaborations. Developing new engineering applications and bringing them from the lab to commercial markets remains a very challenging task. PKI needs a support infrastructure to encourage and foster entrepreneurship. Faculty and staff need help to address the challenging issues associated with product development, management of intellectual property, marketing, and identification of venture capital.

- Enhanced interaction with partners in the Scott Technology Center and the Technology Development Corporation can bridge this gap.

Connect industry partners to academic units. The involvement of practitioners and domain experts is a key component to the success of PKI. Industry partners with academic appointments as adjuncts or professors of practice will help connect academic programs directly to innovation in workplace contexts.

- Faculty and administrators now anticipate that the construction-related business community in Nebraska will develop a graduate-level internship program for mid-level managers to return to college for advanced training in the construction-related disciplines. Their hope is to produce a cooperative structure whereby these professionals will be funded by their respective employers to complete their graduate degrees with minimal absence from work and to pursue thesis topics designed to create synergies with their corporate interests.

Publicize and recognize PKI as a state and national asset for economic development. PKI has received positive recognition in Omaha, Lincoln, and state-wide for its contributions to research and economic development. Efforts must be made to connect PKI faculty and administrators to state-wide and national economic development programs.

Epilogue

The Self-Study Planning Team found the experience of conducting and writing the self-study to be a valuable exercise. The team hopes that the partners involved in the Peter Kiewit Institute find the resulting document useful in helping to chart the course of discussions that will ensure a bright and forward-looking future for the Institute.