

## **Innovation in eLearning and Educational Product Design: The Story of the IST Solutions Institute**

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### **Abstract**

As a pioneer in developing and deploying innovative curricula in Information Sciences and Technology (IST), the IST Solutions Institute is proud and committed to share the story of our Education and Training Team. In 1999, the School of Information Sciences and Technology at The Pennsylvania State University opened its doors dedicated to the creation of leaders for a global, digital society. As part of our mission, curricular sharing and technology innovation are core success factors. To this end, the IST Solutions Institute was created to meet the challenges associated with this innovative goal.

As the creative center of the School of IST, the Solutions Institute serves as the primary outreach arm through its innovative, media-rich eLearning products and services, information technology research, and student-centered solutions. The IST Solutions Institute's core areas of specialization include content and process management, Instructional Systems Design as applied to eLearning, and multimedia and visual design, authoring, and application development. Our organization is committed to solid pedagogy, quality products, creativity, and lifelong learning.

Our core initiative, Online IST, sets the Institute apart as the leading developer of integrated eLearning opportunities. Based on a custom instructional design and development methodology, the Online IST project has reached over 5000 students in the last two years. The entire online curriculum is supported by the Digital Design Document (D3), a custom, database-driven content management tool that facilitates content creation, collection, instructional design, team-based collaboration for designers and developers, and flexible course publishing.

The Online IST courses are created based on a custom, four-tier instructional design model. A seven-person team within the IST Solutions Institute manages all facets of Online IST design, development, delivery, and support. The design process is a highly collaborative one that integrates all team members and faculty/corporate subject matter experts. The Institute team has reduced design and development time to six months per course because of this innovative approach. In addition to the online course materials, the team is responsible for several complimentary components that serve to extend and support the reach of Online IST. These include the IST Solutions Exchange -- a centralized web-based resource for students and faculty, Edison's Services -- a suite of set-up and management tools for students and faculty, the Pennsylvania Governor's School for Information Technology -- a program for talented high school students, and the IST Faculty Academy -- an annual conference dedicated to teaching and learning with technology.

All of the initiatives have been widely used throughout the Commonwealth of Pennsylvania. In addition to the 19 location PSU Commonwealth Campus System, the Solutions Institute has delivered Online IST courses to educational partners who cannot adequately support an IST curriculum at their location. In addition, because of our close placement to corporate clients, the Institute has created many industry partnerships related to Online IST. Many of these projects have allowed us to validate the custom Instructional Design and Development model with high-level industry training courses.

The strategic direction of the IST Solutions Institute for years 2003-2005 is related to broader dissemination and revision of the Online IST curriculum, increasing the flexibility of delivery

opportunities, and refining and extending the capabilities of the D3 content management system. In order to disseminate the Online IST curriculum to wider audiences, the Institute is engaged in creating licensing models that will provide other learning institutions and corporations with the high level learning topics in support of their learning objectives.

## **Background**

As a pioneer in developing and deploying innovative curricula in Information Sciences and Technology (IST), the IST Solutions Institute is proud and committed to share the story of our Education and Training Team. In 1999, the School of Information Sciences and Technology at The Pennsylvania State University opened its doors dedicated to the creation of leaders for a global, digital society. As part of our mission, curricular sharing and technology innovation are core success factors. To this end, the IST Solutions Institute was created to meet the challenges associated with this innovative goal.

As the creative center of the School of IST, the Solutions Institute serves as the primary outreach arm through its innovative, media-rich eLearning products and services, information technology research, and student-centered solutions. Our positioning is unique to all of higher education; we are placed squarely between the School of IST and the corporate sector. This positioning allows the Institute to utilize the thought leadership of the university and apply it to real world challenges associated with industry. Because of this, we are afforded extensive opportunities for corporate partnerships, collaborative projects, and applied research initiatives. The Institute has become a leading applied research and development organization focusing on solutions for technology-assisted education and training challenges. This effort was recently recognized with the IST Innovators Award, presented by the students of the School of IST.

To learn more about the School of IST, please visit: <http://ist.psu.edu> . To learn more about the IST Solutions Institute in general, please visit: <http://solutions.ist.psu.edu> .

## **The Online IST Project**

Our core initiative, Online IST, sets the Institute apart as the leading developer of integrated eLearning opportunities. Based on a custom instructional design and development methodology developed by the Co-Director of the Institute, the Online IST project has reached over 5000 students in the last two years. The entire online curriculum is supported by the Digital Design Document (D3), a custom, database-driven content management tool that facilitates content creation, collection, instructional design, team-based collaboration for designers and developers, and flexible course publishing. The goals of the Online IST project include:

- Maintaining teaching and learning as the number one priority, regardless of delivery medium.
- The extension of a problem-based learning approach for the curriculum that focuses on solutions and outcomes to real world problems (Solutions-Based Learning).
- Development of a modular, scalable, reusable, and relevant curricular core.
- Development of content management tools, processes, and teams to oversee the storage and maintenance of our curricular knowledge objects.
- Integration of faculty and industry thought leaders in a collaborative design process that ensures broad-based coverage of relevant IST topics.
- Providing centralized support to the 19 campus IST Commonwealth System through curricular integration and flexibility (i.e. materials used as full package or as supplemental material).
- Providing the content baseline for IST core courses supplemented with extensive rich media.

- Sharing the fully developed curriculum with educational and industry partners.

Currently, there are five fully developed Online IST courses. For a full listing of the courses and links to course demos, please visit:

[http://solutions.ist.psu.edu/exchange/online\\_ist/courses/index.html](http://solutions.ist.psu.edu/exchange/online_ist/courses/index.html)

A typical Online IST course contains six hundred screens of instruction tied together through a custom Course Content Interface that organizes all materials for students. Within the course, there are, on average, 10-15 online topics of instruction, 2-3 real world problem activities, 5 virtual lab activities, and instructor and student guides (entitled “Roadmaps”). Because they are managed in the D3 system, these discrete components can be “mixed and matched” to create custom offerings due to the modular design. To break this down further, the online library currently contains 2663 screens of instruction, 670 graphics, and 147 high-level, Macromedia Flash-based interactive exercises and animations. To view samples of graphics and interactive exercises, please visit our Media Showcase at:

[http://solutions.ist.psu.edu/exchange/online\\_ist/showcase](http://solutions.ist.psu.edu/exchange/online_ist/showcase) . In short, the Online IST library is a criterion-referenced, highly comprehensive, interactive, and instantly accessible web-based resource that can be made available to allow instructors to create their own IT courses based on their specific learning goals.

In general, Online IST courses are adopted by individual faculty members and delivered to students at either the University Park or Commonwealth Campus location. To date, over 170 course sections of Online IST have been delivered by approximately fifty IST faculty members. Traditionally, faculty members have resisted usage of online or technology-based learning opportunities as course replacements. The adoption of Online IST has been effective in removing this traditional stereotype because of our focus on teaching, learning, and support.

The Online IST courses are created based on a custom, four-tier instructional design model. A seven-person team within the IST Solutions Institute manages all facets of Online IST design, development, delivery, and support. The design process is a highly collaborative one that integrates all team members and faculty/corporate subject matter experts. The Institute team has reduced design and development time to six months per course because of this innovative approach. In addition to the online course materials, the team has designed several complimentary components that serve to extend and support the reach of Online IST. Some of these include:

- The IST Solutions Exchange is the central starting point for both students and faculty for all Online IST learning opportunities. All of the opportunities below are integrated within the IST Solutions Exchange. Available at: <http://solutions.ist.psu.edu/exchange>
- Edison’s Toolbox and Services are custom registration and support tools that empower PSU faculty in the delivery of Online IST courses and students with personalized support components. In Edison Services, accounts can be created for users external to the PSU authentication system. Available at: <http://online.ist.psu.edu/Edison/index.cfm>
- The Online IST Problems Library is a problem-based learning repository that provides faculty and students with direct access to the ever-growing library of Online IST real world problem assignments. The goal of the Problems Library is to increase a faculty member’s flexibility with regard to usage of problem-based activities in the classroom. Available at: [http://solutions.ist.psu.edu/exchange/online\\_ist/problems/index.html](http://solutions.ist.psu.edu/exchange/online_ist/problems/index.html)
- The Online IST Print Library provides printable versions of Online IST Topic Packs to faculty and students. These Topic Packs are generated by the D3 System to provide easy access when users cannot be connected to a computer. Available at: [http://solutions.ist.psu.edu/exchange/online\\_ist/print/index.html](http://solutions.ist.psu.edu/exchange/online_ist/print/index.html)
- Solutions-Based Learning Live is an “always on” streaming channel designed to distribute guest lectures of visiting professors and industry experts to a geographically-

dispersed audience. Available at:

[http://solutions.ist.psu.edu/exchange/innovation/sbl\\_live/index.html](http://solutions.ist.psu.edu/exchange/innovation/sbl_live/index.html)

- The IST Expert Exchange is a community of users committed to providing answers to IST-related questions. This community consists of over 75 leading experts, as well as the IST faculty and student body. Available at: <http://expert.ist.psu.edu>

All of the initiatives have been widely used throughout the Commonwealth of Pennsylvania. In addition to the PSU Commonwealth Campus System, the Solutions Institute has delivered Online IST courses to partners who cannot adequately support an IST curriculum at their location. Some of these course-sharing partnerships have involved:

- Juniata College, a small rural private college
- Holy Family College, a small urban, non-traditional college
- Cheney State University, a Historically Black College and University in a suburban setting
- State College Area School District, a large school district in central Pennsylvania.

In addition, the Online IST courses are shared with the Pennsylvania Governor's School for Information Technology. This program, supported by the Pennsylvania Department of Education, brings 75 of the top high school juniors to PSU for a five-week, intensive residency program in the summer. Designed and delivered by the IST Solutions Institute, this program focuses on solving relevant, real world information technology challenges using modular components of the Online IST learning repository. To review last year's challenge, please visit: <http://solutions.ist.psu.edu/exchange/pgsit/>

Because of our close placement to corporate clients, the Institute has created many industry partnerships related to Online IST. Many of these projects have allowed us to validate the custom Instructional Design and Development model with high-level industry training courses. Three examples include:

- Infinity I/O (I/O): I/O is the leading provider of Storage Area Network training content. By combining the Online IST tools and methodologies with I/O content, a new standard for online training has been established.
- Lockheed Martin Material and Data Services: The IST Solutions Institute created the world's only Level 5 CMMI (Competency Maturity Model Integrated) interactive training course. This course is delivered to approximately 8000 Lockheed Martin employees.
- IBM: The IST Solutions Institute has partnered with IBM to provide NetDB2, a web-based database manipulation tool that allows students to query data without a client application, to all IST students and faculty in the Online IST 210 course (Organization of Data).

### **Organizational Growth**

The strategic direction of the IST Solutions Institute for years 2003-2005 is related to broader dissemination and revision of the Online IST curriculum, increasing the flexibility of delivery opportunities, and refining and extending the capabilities of the D3 content management system. In order to disseminate the Online IST curriculum to wider audiences, the Institute is engaged in creating licensing models that will provide other learning institutions and corporations with the high level learning topics in support of their learning objectives. Learn more by visiting: <http://solutions.ist.psu.edu/license/topics/index.html> .

Based on the knowledge we have gained in the last three years, the Institute has made the decision to provide faculty with online tools from Edison Services that empower the creation of individualized learning environments using the Online IST learning repository. A major focus of this effort will be on building easy and intuitive user interfaces with multimedia and graphical

elements to streamline the creation of learning environments. The courses and learning objects are also under a constant revision process with plans for a new Course Content Interface, as well as new versions of all courses beginning in Fall 2003.

Furthermore, the Institute will be extending the D3 System to work more closely with emerging content repository standards. These standards will allow the Institute to effectively distribute our pre-designed knowledge objects for broad-based adoption. This move will allow the Institute to engage in a true “e2e” (education to education) distribution model.

The IST Solutions Institute is slated to move into a new, state of the art building in Fall 2003. This facility has been designed to create a “living value chain” that optimizes the research, development, and dissemination of our applied solutions. It will also allow for human resource growth in the areas of data and database management and client relationship management. By hiring other key personnel to expand our team, the Institute will be able to enhance the creativity of our solutions and bring them to life in more powerful ways. Other planned growth activities include visiting faculty members every semester to engage in scholarly activity, corporate sponsorships to create research clusters around key initiatives, and expanding the technology infrastructure to support our activities.

### **Core Competencies**

The major disciplines and technical areas that the IST Solutions Institute specializes in are:

- **Content and Process Management:** The foundation of the Institute’s initiatives are built on our custom design and development model using the D3 System. These models are based on proven instructional systems design models merged with product development theory. There is a synergistic relationship between our process and technology tools. It is a distinguishing characteristic of the Institute that our content management initiatives have been in place for nearly four years and are used in an actual production environment.
- **Instructional Systems Design as applied to eLearning:** Our team’s experience is rooted in Instructional Systems Design theory. We have applied this knowledge to create “best in breed” eLearning solutions that meet the learning needs of students and provide a solid teaching basis for faculty. In addition, Instructional Technology Specialists within the Institute ensure that media is used to target multiple learning styles based on course learning goals.
- **Multimedia and Visual Design, Authoring, and Application Development:** The IST Solutions Institute has a unique ability to bring its technology solutions to life using creative design techniques. Our learning repository is filled with interactive activities that extend the thought leadership of the content. Without these media elements, it would be impossible to capture the attention of our primary audiences. All of the initiatives related to Online IST are managed using web applications for authentication, delivery, and communication.

### **Teaching, Learning, and Creative Expression**

Teaching, learning, and creative expression are core to the IST Solutions Institute mission. These elements form the foundation on which all projects are based. The obvious focus on teaching and learning occurs within the Online IST curriculum. Unique, problem-based learning models ensure that students are engaged in motivating, real world scenarios. In addition, student and faculty evaluation allow us to constantly improve the learning environments, as well as to research emerging trends and best practices for online learning. In support of this, the Institute manages and delivers an annual statewide conference, the IST Faculty Academy, which focuses on teaching and learning with technology within the “K-20” environment. For more information, please visit: <http://pafaculty.org/> .

Fostering creative thinking is critical to the overall success of the IST Solutions Institute. To this end, team members are encouraged to engage in “design experiments” several times per year. These experiments allow members of the Institute the creative space to envision new solutions without the constraints of project timelines. Many of these design experiments make their way into actual projects delivered to both internal and external audiences. The only requirement of the design experiment is documentation and presentation of results to the entire team.

Furthermore, a focus on lifelong learning is required of the Institute team. Professional development funds are made available to support ongoing research and learning by the team. Penn State University also encourages lifelong learning by providing a 75% tuition reimbursement to all university employees. This allows our team to engage in higher level learning opportunities, including masters and doctoral degrees. Externally, our advisory board and corporate partners provide the Institute with learning opportunities and insight into real world processes, technologies, and challenges.

Although we pride ourselves on our ability to compete in the corporate sector, the IST Solutions Institute’s work is grounded in the spirit of higher education. Our direct ties to an academic department provide the underpinnings of teaching, learning, research, and service for all of our initiatives. While our production capabilities rival those in business, our main focus will always be on improving teaching and learning and creatively advancing our field.