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## TABLE OF CONTENTS

I. BACKGROUND ..................................................................................................................................4

II. FOUNDING RATIONALE .............................................................................................................4

III. CICTR ACTIVITIES ....................................................................................................................4  
  3.1 RESEARCH ACTIVITIES ...........................................................................................................4  
  3.2 EDUCATIONAL ACTIVITIES .................................................................................................5  
  3.3 INFORMATION TRANSFER .....................................................................................................5

IV. PARTNERSHIPS .......................................................................................................................6  
  4.1 INDUSTRIAL AFFILIATES PROGRAM ................................................................................6  
  4.2 DIRECTED RESEARCH FUNDING ........................................................................................7  
  4.3 FEDERAL FUNDING ................................................................................................................7  
  4.4 STATE FUNDING .....................................................................................................................7

V. CICTR ORGANIZATION AND MANAGEMENT STRUCTURE ............................................7  
  5.1 CICTR DIRECTOR ..................................................................................................................7  
  5.2 PROJECT LEADERS ...............................................................................................................7  
  5.3 RESEARCHERS .......................................................................................................................7  
  5.4 INDUSTRIAL ADVISORY BOARD .........................................................................................8  
  5.5 INTERNAL ADVISORY BOARD .............................................................................................8

VI. INTELLECTUAL PROPERTY ..................................................................................................8  
  6.1 COMMUNICATION AND REPORTING PROCEDURE .......................................................8  
  6.2 PUBLICATION POLICY .........................................................................................................9  
  6.3 PATENTS, INVENTIONS AND SOFTWARE ...........................................................................9  
  6.4 CONFIDENTIAL COMMUNICATIONS ..................................................................................10

VII. OVERHEAD RETURN POLICY ..........................................................................................11
I. BACKGROUND

There has been much excitement lately promoting the synergism of industrial and academic research activities. In general, academic research targets fundamental breakthroughs which lead to major technological advances. This research may be classified as high-risk with the potential of high-gain in an industrial development setting. Industrial research and development addresses production cycle processes, integrated design approaches, and customer-based design methodologies.

The Information & Communications Technology (ICT) is a burgeoning field in the technological marketplace. The use of *ICT* in this document encompasses the transmission, storage, transformation, and networking of digital information. The appetite of the general public for on-demand information access appears to be insatiable. The information is embodied by video, voice, and data formats which must co-exist in the transmission and storage network.

Technology must continually advance to meet these demands. For example, in video information processing improvements in coding procedures must continue to facilitate the increased throughput demands placed upon the information network. On a higher level, information network protocols must be refined and improved.

II. FOUNDING RATIONALE

This center is founded on the premise that there is a need for research which promises “current-generation” and “next-generation” solutions to technological problems. The term *applied research* is used in this context. Applied research is intended to solve the technological problems unattended by near-term product development and long-term basic research, as might be funded by the National Science Foundation (NSF) or DoD laboratories. University research has often focused on solving fundamental scientific and mathematical problems related to engineering providing the potential of technological advances. However, it has been recognized, both inside and outside academia, that this approach to research need not produce the enabling technologies required by the industrial-based sector of our technical community. Many high-tech companies do not have a research organization, per se, and rely on research institutions like universities to provide potential directions for product and process improvements. The CICTR is founded with this need in mind.

III. CICTR ACTIVITIES

3.1 RESEARCH ACTIVITIES

- Applied Research
- Feasibility Studies
- Software / Hardware Prototype Development
- Technology Transfer

3.2 EDUCATIONAL ACTIVITIES

- Course work--new specialized short courses will be developed.
- Senior Design Projects--capstone design projects which are tightly coupled to sponsor technical areas.
• Hands-on work—prototype development using software and hardware integration skills.
• Internships—a tighter coupling between the student’s academic experience and the industrial experience.
• Industrial Instruction

3.3 INFORMATION TRANSFER

• Technical Reports—the standard output of research and development projects.
• World Wide Web: http://cictr.ee.psu.edu/ a WWW site to provide technical and personnel information.
• Internships—both faculty and student internships in an industry.
• Seminars—occur at both university and industrial setting by both CICTR and sponsor personnel.
• Workshops—dissemination of specialized technical information as the need arises
• Publications—international journals and conferences.
• Newsletter—available on the WWW site for the dissemination of the CICTR activities to both CICTR sponsors and non-CICTR sponsors.
• Library—a compendium of CICTR technical reports and publications and sponsor-related publications such as recruiting information and product information.

IV. PARTNERSHIPS

All the activities of CICTR are collaborations between University personnel and industry and government sponsoring organizations. Sponsors guide the direction of research and education programs at CICTR. They are the bridges between academia and practical deployment of new technology. The operational funds of the CICTR are provided by the grants of faculty members be it from industry, governmental funding or federal and state funding. Each faculty member is in charge of his/her own funds. In the case of collaborative funded efforts, the involved members jointly administer the funds.

4.1 INDUSTRIAL AFFILIATES PROGRAM

University-industry interaction is critical to education, research, and technology transfer efforts of CICTR. The CICTR Industrial Affiliates benefit from timely access to CICTR technology, facilities, and personnel, while CICTR students and faculty benefit from the industry support and interactions. Funding received from affiliate members sustains the operations of the CICTR, which address the concerns of industry in general and its sponsors in particular.

Specific benefits of Sponsorship include:

• Voting membership on the Industrial Advisory Board.
• First option to license intellectual property developed under the CICTR.
• Participation in Annual Research Reviews.
• Focused Participation in the PSU Internship program.
• Opportunity to initiate research collaborations on specific topics of interest to individual Sponsors.
• Invitations to seminars and copies of speakers’ viewgraphs and reprints.
• Priority registration at discounted fees for CICTR workshops and other public events.
• Opportunities to confer with CICTR personnel on subjects of current importance.
• Copies of all CICTR technical papers and theses as they are completed.
• Priority access to CICTR faculty, students, and research staff for assistance with recruitment.
• Updated lists of CICTR facilities in conjunction with their relevant research applications.
• Access to CICTR facilties, subject to advance scheduling.
• Copies of design and analysis, data acquisition software, and other software following execution of appropriate licensing arrangements.
• Regular updates of CICTR projects and student resumes.
• Opportunity to direct resources and thesis topics within CICTR.
• Opportunity to develop close business ties to other CICTR industrial affiliate companies.
• Annual technical reports concerning all CICTR research.
• Sponsor may send personnel to work at CICTR in collaboration with CICTR staff.

4.2 DIRECTED RESEARCH FUNDING

Sponsors may elect to sponsor a specific research project with a specific CICTR project team, exclusively. The results of this research will not be shared with any other organization. The funding levels and contractual conditions will be negotiated on a project-by-project basis. Non-sponsor organizations may also elect to sponsor a specific research project under the same conditions and be entitled to the same privileges.

4.3 FEDERAL FUNDING

The CICTR applies for federal funding that is earmarked for university-industry collaboration. Current examples of these collaborative funding opportunities are:
• Grant Opportunities for Academic Liaison with Industry--Encourages faculty to conduct research within an industrial setting, establishing or redirecting their research efforts with a greater awareness of national competitive issues and needs. Funding mechanisms include faculty in industry, industry presence on campus, graduate student internships, and collaborative research projects.
• Small Business Innovation Research (SBIR)--Feasibility projects related to experimental or theoretical research. Also, funds R&D efforts on prescribed agency topics.
• Small Business Technology Transfer (STTR)--Encourages technology transfer through cooperative research between small business concerns and research institutions.

4.4 STATE FUNDING

The Ben Franklin Partnership Program is an economic development program funded by the Pennsylvania Department of Commerce. The program invests matching funds in the development of new technologies, products, and processes in Pennsylvania’s manufacturing and technology-based firms, or those firms that create jobs in the state of Pennsylvania. The program supports university-industry interaction in research and development, technology transfer, feasibility studies, and centers of excellence, which provide a base for new process and product development.
V. CICTR ORGANIZATION AND MANAGEMENT STRUCTURE

5.1 CICTR DIRECTOR

The Director is responsible for the selection of the research topics to be addressed within the CICTR. These decisions are influenced primarily by the advice and recommendations of the Industrial Advisory Board and secondarily by the research staff of CICTR.

The Director’s responsibilities include:

- Implementation of CICTR and Penn State policies
- Management of operations
- Liaison with Sponsors, government agencies, and University administration
- Selection of research proposals for funding
- Selection of personnel, including postdoctoral fellows, research students and staff
- Budget preparation
- Administration of funds
- Management of intellectual property in accordance with Penn State policies as interpreted by the Intellectual Property Office
- Approval of information for publication

The director of CICTR is Dr. Mohsen Kavehrad, AMERITECH (W.L. Weiss) Chair Professor of Electrical Engineering.

5.2 PROJECT LEADERS

The Project Leaders are Penn State University faculty members or other affiliates of CICTR including postdoctoral fellows, visiting scholars, and personnel of sponsor organizations. They are responsible for the execution of specific research projects and they serve as a liaison between CICTR and their academic departments within the University. Their duties are to:

- Propose, organize, and conduct research
- Advise students
- Recommend and implement educational programs including degree requirements, new courses and syllabus changes to existing courses
- Interact directly with CICTR Sponsors
- Disclose findings for patent consideration
- Publish findings

The salaries of Penn State faculty members are paid from some combination of University general funds plus their own research funds. Postdoctoral fellows, who devote full-time effort to the CICTR research, are paid from external research funds. This will enable the sponsoring organizations to have information access to CICTR projects.
5.3 RESEARCHERS

Teaching and research functions of CICTR come together in the activities of its researchers. Practically all of the research projects involve the efforts of students, most of them pursuing Master of Science, Doctoral degrees, and Postdoctoral fellows in Electrical Engineering, Computer Science & Engineering. CICTR also encourages a large number of undergraduates to participate in research projects. A substantial fraction of CICTR budget goes to student support including stipends, benefits, and University tuition fees.

5.4 INDUSTRIAL ADVISORY BOARD

The Industrial Advisory Board meets once a year at CICTR. It monitors operations, policies, and programs. Composed of representatives of CICTR Sponsors, the Board is the channel for communicating the ideas, goals, and requirements of the Sponsors to the CICTR management and staff. The Board’s membership and responsibilities are designed to achieve these ends.

Each Sponsor organization nominates one voting board member. While each Sponsor has one vote on the Board, Sponsors customarily send additional non-voting observers to participate in Advisory Board discussions. The Board member is the point-of-contact between CICTR and a Sponsor organization. The Board member is responsible for disseminating CICTR information such as Technical Reports and program announcements within a Sponsor organization. The Board member also conveys information from relevant Sponsor personnel to CICTR.

The Board elects a Chairperson and a Secretary who serve two-year terms. Customarily the Secretary has become Chairperson on the completion of his or her term of office. Industrial Advisory Board responsibilities include:

- Review and evaluation of current and proposed research projects
- Suggesting new research directions
- Advising the Director on Center policies
- Recommending new projects and programs

5.5 INTERNAL ADVISORY BOARD

The Internal Advisory Board meets once a year at CICTR. Composed of the Dean of Engineering, Associate Dean of Graduate Studies & Research, ARL Director or his designee and the Heads of the Departments involved in the CICTR works. The Board monitors operations, policies, and programs and ensures fairness to all parties involved.

VI. INTELLECTUAL PROPERTY

6.1 COMMUNICATION AND REPORTING PROCEDURE

CICTR technical reports serve as the principal method of communicating CICTR research results to its Sponsors. After internal reviews for clarity and accuracy, these reports are sent to Sponsors. The technical reports are of publication quality and a high proportion of their content is eventually published in leading journals and presented orally at public conferences. Sponsors are encouraged to make reports available to all interested members of their companies.
Annual Research Reviews acquaint Sponsors with work in progress and give them an excellent opportunity to express their views to CICTR research staff and management. The Industrial Advisory Board meets after each Research Review. At Board meetings, members evaluate CICTR programs and provide official recommendations to CICTR management.

In addition to formal written and oral exchanges that involve all Sponsors collectively, there are many opportunities for communication between CICTR and individual Sponsors. CICTR hosts Sponsor visits for discussions of projects of particular interest to selected personnel. CICTR researchers also welcome opportunities to visit Sponsors to discuss specific topics as well as to present a summary of CICTR activities to a wide audience.

6.2 PUBLICATION POLICY

CICTR contributions are prominent in leading technical journals and conferences on ICT. Approval of the CICTR Project Leaders is required before CICTR research results can be submitted for publication or presented orally at a public meeting. Normally, there will be no delay built into the approval process. Prior to publication or presentation at a conference, CICTR research results are available to Sponsors in the form of Technical Reports, which in most cases contain more detail than publications. These reports are in the hands of Sponsors on the order of one year to 18 months before they are available in the open literature. The sole and exclusive rights to publication of these investigations and the results thereof is hereby reserved to and shall remain the property of the University.

The Sponsor shall have the opportunity to review any paper containing any of the results of the research program prior to the submission of the paper for publication. Where a Sponsor considers that the paper overlapped material proprietary to that Sponsor, that Sponsor upon a written request within sixty (60) days from the date the proposed publication was received by the Sponsor shall be granted a delay in the publication not to exceed six (6) months from the date of the request to permit the filing of either U.S. or foreign patent applications.

6.3 PATENTS, INVENTIONS AND SOFTWARE

Patent policy of CICTR is the standard Penn State University policy designed to better accommodate the goals of cooperative research with industry.

U.S. Patent Rights:
Sponsors will receive a first option to obtain a nonexclusive reasonable royalty-bearing license under the U.S. patent rights for inventions having substantial Center Sponsorship support (Center Inventions). Such option shall extend for a period of 180 days. If at least one Sponsor accepts a nonexclusive U.S. license, then all U.S. licensing of that invention will be nonexclusive; if no Sponsor accepts such a license, then an exclusive field limited license under the U.S. patent rights may be negotiated with a Sponsor. If more than one Sponsor elects to request an exclusive field limited license, barring any conflict of interest, the choice of Sponsor for negotiation will be arbitrated by the Board. If no Sponsor accepts an exclusive field limited license under such U.S. patent rights within an additional 180 days, such a license can then be offered to Non-Sponsors.

Foreign Patent Rights:
At the time of offer of the nonexclusive U.S. license, each Sponsor will be asked to elect in writing whether they desire a license under corresponding foreign patent rights and if so, in which countries. If at least one Sponsor elects to accept a nonexclusive license for any foreign country, then all licensing of that foreign patent will be nonexclusive. If no Sponsor accepts such a license
then an exclusive field limited license may be negotiated with a Sponsor for that country. If more than one Sponsor elects to request an exclusive field limited license, barring any conflict of interest, the choice of sponsor for negotiation will be arbitrated by the Board. If no Sponsor accepts an exclusive field limited license under such foreign patent rights, such a license can then be offered to Non-Sponsors.

**Licenses:**
Licenses offered to Sponsors shall include the rights to make, have made, use and sell the patented subject matter. Licenses granted under U.S. patent rights shall include the right to sell and use devices covered by any corresponding foreign patent rights, however, not including the right to make or have made said devices under said foreign patent rights.

**Patent Prosecution and Maintenance Fees:**
Except in unusually complex prosecutions, the University will be responsible for the costs of obtaining U.S. Patent Protection. The costs of obtaining foreign patent protection will be divided upon a pro-rata basis among those Center Sponsors who have elected foreign patent rights.

**New Sponsor Rights:**
Whenever a Center Invention has been licensed nonexclusively, organizations not Sponsors at the time of the making of that invention may be granted the same rights as Sponsors, only after becoming a Sponsor and, at the minimum, paying the accumulated yearly Sponsorship fees to the Center initiating from the year of the disclosure. 50% of the fee will be contributed by the Center to further Center research and 50% of the fee will be treated by the University as a license issue fee. Such provisions shall be evaluated and subject to consultation and direction from the Board.

**Other Support:**
If Governmental support has been provided to the Center Invention, the above procedures will be modified to correspond to applicable Governmental patent regulations. If other external sponsorship supports separate Center research, rights granted to the external sponsor shall take precedence over the Sponsor's rights set forth above.

### 6.4 CONFIDENTIAL COMMUNICATIONS

Sponsor understands that University will be sending to Sponsor Center Invention Disclosures. In such event, Center Invention Disclosures shall be sent by University directly to the Sponsor's Official Representative as identified in the agreement and shall be clearly marked "CONFIDENTIAL" or "PROPRIETARY." Sponsor agrees to use the same degree of care it uses to protect its own commercially valuable proprietary information in protecting information made hereunder. Sponsor shall only make said information available to those employees who have a need to know. Subject to the requirement to license issued patents under Article 5, Sponsor shall be permitted to use said Center Invention Disclosures internally, but shall not be permitted to disclose said information to third parties or to those employees who do not have a need to know. Sponsor's obligations hereunder shall not apply to information which was: 1) part of the public domain; 2) independently developed by Sponsor, or 3) obtained by Sponsor from a third party. Such obligation shall expire 3 years from the date of the Center Invention Disclosure.
VII. OVERHEAD RETURN POLICY

For all the benefits CICTR brings to the Departments involved in the works of the center, the Department Heads agree to return to CICTR the University overhead portion paid back to the Departments by the College. Naturally, this is the portion that relates to the CICTR work.