

Information Technology (IT)

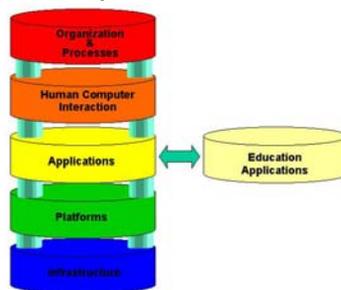
Proposal Due Date: June 13, 2007

In recent decades, information technology (IT) has provided promising new capabilities that enhance the quality of business and commerce, industrial processes, scientific and engineering analysis, education, work life, healthcare, and personal endeavors. Small businesses play a major role in generating innovative products and technologies and in fulfilling the IT promise by quickly reacting in the current highly competitive and changing economy. The opportunities offered by the NSF SBIR/STTR program allow a company to take its concepts through the feasibility and prototyping phases in preparation for entering the marketplace.

The IT topic solicits proposals to develop innovative products and technologies necessary to support the Nation's information, knowledge, and computational needs in the first decades of the 21st century. The emphasis of the IT topic is on the support of high-risk innovation in products, services, or processes that have the potential for a large payoff to industry, business, or society. Proposals must identify the users and markets of the proposed innovation and its potential for commercialization.

Information technology can be conceptualized in the form of a stack. Each layer of the stack is built upon the layers below and supports the layers above. The National Science Foundation SBIR/STTR Program conceptualizes a five-layer stack. At the same time, the SBIR/STTR Program also recognizes the unique aspects of applications that support education, which is reflected in the inclusion of a structure parallel to the rest of the stack labeled Education Applications. From the top down, the five layers include the following:

- A. Organizations and Processes
- B. Human Computer Interaction
- C. Applications
- D. Platforms
- E. Infrastructure
- F. Education Applications



Proposals must address one of the subtopics that are outlined below. **Proposals that are not responsive to the subtopics outlined below will be returned without review.** When submitting a proposal to the IT Topic, code the proposal to the corresponding subtopic under which you are submitting the proposal, e.g., B.6.b, for proposals in the area of “Information Retrieval from text and/or multimedia.” **In addition, use the code as the first item in the key words/phrases portion of the Project Summary of your proposal.**

Distinction between IT Topics and Emerging Opportunities topics

Some IT subtopics below are similar to those found in the Emerging Opportunities (Software) topic description. In cases where the innovation research addresses a topic found in both the IT topic and the Emerging Opportunities (Software) topic, a choice must be made as to where to submit the proposal. If the innovation research addresses a market opportunity within a three-year time horizon and has been significantly vetted with appropriate stakeholders, the proposal should be submitted to the Emerging Opportunities (Software) topic. Proposals with longer-term

commercialization potential or less vetting from significant stakeholders should be submitted to the IT topic.

A. Organizations and Processes

The pace of modern business activity has increased considerably within the past few years as a result of intense competitive pressure and globalization. Businesses large and small, for-profit and non-profit must respond to customer needs, manage internal activities, and adapt to competitive market pressures much more rapidly than at any other period in history. Businesses that effectively and efficiently combine computing, communication, and business process advances become leaders in their respective markets. They are dependent, in turn, on scientific and engineering advancements to become and remain successful. The need for measurable efficiency and responsiveness has created exciting opportunities for commercial applications in the following areas:

- 1. Security/Privacy:** Organizations need established processes to define security and privacy policies across departmental boundaries within the organization. Issues include defining the tools and rules for reconciling conflicting privacy/security policies.
- 2. Intelligent Process Management:** Growing network infrastructure leads to tightly coupled systems that need to be controlled with data-driven controllers.

B. Human Computer Interaction (HCI)

A challenge in HCI is to make people more productive by augmenting their capabilities through information devices and through human-machine interfaces, which provide the mediation environment for these gains. Human-computer interaction covers the design, evaluation and implementation of interactive computing systems for human use, specifically interaction among one or more humans and one or more computational machines. It also deals with the joint performance of tasks by humans and machines, and innovative HCI techniques that directly relate to HCI performance metrics. This topic includes the development of innovative and novel software that supports:

- 1. Virtual/Augmented Reality for Immersive Environments**
- 2. Representation and Visualization of Knowledge and Models**
- 3. Desktop Information and Attention Management Tools**
- 4. Universal Access**
- 5. Displays, Devices, or Software to support access, promote integration or foster independence of individuals with physical or cognitive disabilities in the workplace, recreational or educational settings.**
- 6. Human Language and Communication**
 - a. Natural Language Processing, Semantic Analysis and extraction of Meaning or Context from Text, Images, Video or Spoken Language**
 - b. Information Retrieval from text and/or multimedia**
 - c. Machine Learning and Statistics-based Algorithms**
 - d. Language translation and multi-language interfaces**
 - e. Spoken Language Systems - Speech recognition and conversational dialog management**
 - f. Speech synthesis and text-to-speech**
- 7. Spoken Natural Language Identification**
- 8. Voice Authentication and Speaker Identification**

C. Applications

Innovative projects dealing with communications, knowledge and model discovery, information

and knowledge management, networking, science, mathematics and engineering are sought. These include networks, protocols, architectures and systems. Applications that will be supported under this solicitation are as follows:

- 1. Mobile Applications**
- 2. Visualization Tools for Large Datasets**
- 3. Software as Service (SAS) Applications**
- 4. Intelligent/Semantic Web**
- 5. Tools for Software Engineering**
- 6. Dynamic Data Driven Application Systems (DDDAS)**

D. Platforms

Innovative projects are sought that either improve existing systems or develop new IT-based systems and architectures that would be of wide interest across many market segments. The goal is to significantly improve the capability of devices to perform their intended tasks or to enable entirely new classes of functionality. The subtopics that will be supported under this solicitation are as follows:

- 1. Operating Systems for Ubiquitous Sensors and Devices**
- 2. Real-Time Operating Systems**
- 3. Secure, Scalable Architectures**
- 4. Digital Preservation and Archiving**
- 5. Advanced Signal Processing Algorithms for New Computational Approaches**
- 6. Parallel & Distributed Platforms**
- 7. Virtualization-Enabled Platforms**
- 8. Quantum Computing**

E. Infrastructure

Innovative projects that enhance and extend the backbone upon which further IT innovations can be built are sought. These include networks, protocols, architectures and systems. The subtopics that will be supported are as follows:

- 1. Next Generation IP Protocol Infrastructure (IPv6)**
- 2. Auto-Configuring End-User Networks for Non-IPv6**
- 3. Wireless Communications**
- 4. Real-Time Networking Protocols and Systems for Streaming Media**
- 5. Distributed Sensor Networks**
- 6. Ad-Hoc Networks**
- 7. Coding and Compression**

F. Education Applications

Emerging technologies should play an important role in enhancing student learning, increasing problem-solving capability, stimulating innovative thinking, and participation of individuals across all population segments in science, technology, engineering and mathematics (STEM). Information Technology can contribute to every educational level, from pre-kindergarten through higher and continuing education. Emphasis is on the development of innovative technologies that: (1) improve the understanding and learning of scientific and technical principles as well as increase problem-solving capability; (2) facilitate interactive and collaborative learning; (3) broaden access to high-quality science and technology education; and (4) promote equal access for those with disabilities (for the latter, see subtopic, B.4. (Human Computer Interaction, Universal Access)).

By being aware of the commercialization history of education-based projects, it is important to be explicit about how designated staff and/or consultants will determine or monitor in an ongoing way whether a project's goals are being met and whether the proposed technology is likely to achieve market acceptance by the education community. It is also important to address issues such as portability, scalability, compliance with existing and consistent standards for K-12, pedagogical techniques, developmentally-appropriate content and instructional strategies, educational equity, metrics for success, and involvement of stakeholders in the educational community.

Responses to this subtopic, should address factors that are unique to the education market and should include brief reference to case histories of other similar education ventures. In addition to demonstrating knowledge of content, applicable pedagogical principles, and the proposed technology, the proposal should discuss business issues that are unique to the education market, viz., issues such as strategic marketing, finance, distribution channels, IP, and acceptance of the proposed technology.

- 1. Applications in Support of Teaching**
- 2. Applications in Support of Learning**
- 3. Educational Administration Software**
- 4. Assessment Technology**
- 5. Devices or Platforms for the Delivery of Educational Content**
- 6. Physical Instrumentation for Education**
- 7. Distance/Distributed Education**
- 8. Assistive Technologies, i.e. Applications that Support the Educational Needs of Individuals with Disabilities – Vision- and Hearing-impaired, Cognitive- and Motor-Related.**

Please direct inquiries for the following subtopics under this topic to the specific SBIR/STTR Program Manager listed below:

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Subtopic A. Organizations and Processes

Subtopic C. Applications

Ian Bennett (ibennett@nsf.gov) 703-292-8655

Subtopic B. Human Computer Interaction

Subtopic D. Platforms

Subtopic E. Infrastructure

Subtopic F. Education Applications