SOFTWARE

Impacts of PITAC 1999 Report

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SOFTWARE

***Major recommendation*:**

Make fundamental software research an absolute priority

Followed by four other recommendations and a budget recommendation

Make software research a substantive component of every major information technology research initiative.

- High Confidence Systems (HCS) Program Component Area (PCA) renamed as High Confidence Software and Systems (HCSS) PCA
  - Expansion of coverage to include information assurance and safety in addition to security
- New Software Design and Productivity (SDP) PCA
  - Coordinate research leading to more productive software development methods and higher-quality software with predictable characteristics that is cost effective
- Human Centered Systems (HuCS) PCA restructured as Human Computer Interaction and Information Management (HCI&IM) PCA with an expanded research agenda

Software efforts in other areas of PITAC Report

- High End Computing (HECC) PCA — examples include:
  - Applications codes
  - Reusable libraries
  - Implementation technologies / compilers and run-time systems
  - Tools to debug/monitor/simulate execution
- Large-scale Networking (LSN) PCA, for example:
  - Middleware management software
  - Middleware networking needs for visionary scenarios
- Potential cross-agency efforts to address software problems that span PCAs

Fund more fundamental research in software development methods and component technologies

- Component-based software design
- Technologies for automated analysis, simulation, and testing of components and systems
- A library of certified domain-specific software components
- Predictable, reliable, and secure components and systems
- Technologies for interoperable distributed applications
- Model-based design for embedded software

Support fundamental research in human-computer interfaces and interaction

- Virtual reality and virtual environments
  - Faster computations and faster hardware to update visualizations
  - Haptic devices, CAVEs, etc.
  - Training for the military, NASA mission rehearsal, flight simulation, fire fighting, police training, piloting ships and submarines (generally rare and/or dangerous scenarios)
  - Applied to distance education, training, learning
- Universal access
  - The goal is to "provide easy access for all people, regardless of economic circumstances, physical impairment, or intellectual limitations" [February 1999 PITAC report].
  - Develop technologies for military applications. These have possible dual use for the disabled.

Fund more fundamental research in information management technologies to (1) capture, organize, process, analyze, and explain information and (2) make information available for its myriad uses

Multi-agency Digital Libraries Initiative begun in 1994 continues and is expanded

- Digital library collection building, management, and dissemination responsibilities (NSF, AHRQ, DOE, NASA, NIH, NOAA)
  - Joint Conference on Digital Libraries (June 24-28,2001) http://www.jcdl.org/
- Biomedical Information Science and Technology Initiative (BISTI) underway at NIH
  - ISCAR: Information Storage, Curation, Analysis, and Retrieval

Budget recommendation: Increase funding for software research

- NSF, with greatly increased funding of software research, implemented the PITAC's recommendations in Information Technology Research (ITR) initiative begun in FY2000
  - Larger individual grants
  - Support for more researchers
  - Support for thematic programs

Example of a Thematic Program: CISE Quantum and Biologically Inspired Computing (QuBIC)

- **The program will support interdisciplinary research to improve the fundamental capabilities of computer science by incorporating insights from either biological systems or quantum foundations or both.**
- **Group proposals representing multiple disciplines will receive priority but single investigator proposals that are cross-disciplinary will also be considered.**

Software Funding Overview
FY 1999 - FY 2004

	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004
Total PITAC Software Recommendations (Change from FY1999)	**n/a**	**+112M**	**+268M**	**+376M**	**+472M**	**+540M**
SDP	**0**	**58.8M[1]**	**120.3M[2]**			
HCSS	**100M**	**92.0M[1]**	**98.3M[2]**			
HCI&IM (without NIH)	**132M**	**168.0M[1]**	**235.7M[2]**			
HCI&IM / NIH	**3.0M**	**62.0M[1]**	**99.0M[2]**			
TOTAL: SDP, HCSS, and HCI&IM (includes NIH)	**235M**	**380.8M[1]**	**553.3M[2]**			
Total Change from FY 1999	**n/a**	**+145.8M**	**+318.3M**			
TOTAL: SDP, HCSS, and HCI&IM (without NIH)	**232M**	**318.8M[1]**	**454.3M[2]**			
Change from FY1999 (without NIH)	**n/a**	**+86.8M**	**+222.3M**			
		[1] FY2000 estimate	**[2] FY2001 request**			

Some software R&D is in the HEC and LSN PCAs.