CSTB Study for the National Science Foundation

Assessing the Impacts of Changes in the Information Technology Research and Development Ecosystem

Perspectives on the IT R&D Ecosystem Workshop
November 2, 2006

The Keck Building of the National Academies

"Perspectives on Studying the IT R&D Ecosystem"
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Good morning.

Thank you agreeing to serve on this very important study committee, and for permitting me to be your first speaker. I have served on several such committees and sponsored many more in my roles at NSF, and I think this is easily one of the most prestigious I've seen.

We have high expectations for this study, and the composition of the committee only heightens those expectations! My hat is off to the chairs and the staff for assembling such an illustrious group.

We have an hour in this session, but I want to make most of it interactive in order to maximize communication between us and to help you in your task. In my brief remarks I want to provide you a few comments on the context in which this study was conceived, talk about our motivation for undertaking the study, and address our expectations for what we hope you will achieve.

CONTEXT

Let's start by stipulating a few things that we all understand and I believe agree on:

- IT is the generic term that for better or worse is used to describe everything from fundamental, theoretical research on computability to assessing the economic

value of applications. But computer science is the dominant and most fundamental discipline on which most of the rest is largely based;

- IT has changed the world significantly in a very short time, and continues to do so, as many studies have documented;

- Essentially all IT products and applications can be traced back to an idea, concept, early demonstration, or other research result – or, to a person who very often cut their teeth in a research environment – again, as a number of studies have shown;

- Proper funding for IT R&D is essential for this Nation's well-being in just about every sphere – it is NOT just to satisfy curiosity or permit game playing;

- While a large amount of money goes into IT R&D, the largest amount goes into development, not research;

- As a fraction of almost anything, or compared to other high-tech areas, the amount that goes into research is modest;

- The fraction that goes into *basic* research – from which the most fundamental ideas and lots of very practical ones emerge – has been decreasing compared to the size of the benefits that we have been reaping;

- This increasing exploitation of a diminishing supply of new ideas endangers our supremacy and leadership in IT nationally;

- New products, services, and companies do not just spring forth magically from a research project but almost always come forth in a complex ecosystem.

I could go on with this list – and I encourage you to do so – but I believe this sets the general stage.

Now, let me provide a somewhat more parochial list of what we were seeing at NSF more than two years ago when we first started talking with the CSTB about this study:

- A dramatic increase in creative new ideas and applications coming out of the ITR program;

- An even more dramatic increase in the number of proposals we received, with the expected catastrophic drop in success rates for proposals;

- A change in funding patterns so that under a strict definition of fundamental CS research, NSF is providing 86% of all Federal funding for such research, which in turn is a very large fraction of all basic CS research;

- A cessation in significant growth of funding at NSF – and elsewhere – for IT research.

Again, I could further elaborate this list, but I leave that to you to do in whatever appropriate way you decide on.

Let me now turn to our motivation:

MOTIVATION

Let me start with a quote. .

> *"There is a growing mountain of research. But there is increased evidence that we are being bogged down today as specialization extends. The investigator is staggered by the findings and conclusions of thousands of workers - conclusions which he cannot find time to grasp, much less remember, as they appear."*

That quote is from Vannevar Bush in 1945, probably more responsible than anyone for creating the NSF, and applies to traditional research, of course. But, if you simply make a few global word replacements, you get:

> *"There is a growing mountain of* information. *But there is increased evidence that we are being bogged down today as specialization extends. The* decision maker *is staggered by the findings and conclusions of thousands of* narrow interests - *conclusions which he cannot find time to grasp, much less remember, as they appear."*

This altered quote expresses our fundamental perception and concern that helped motivate this study, namely:

> **Most decision makers in government – all three branches – at best are bogged down in a mountain of information about IT, where it is going, and someone's opinion about where it came from. But they rarely, if ever, have a comprehensive framework in which to understand and evaluate this information. The result is all too often a decision that is shortsighted at best and potentially disastrous at worst.**

Very simply then, our motivation is help change this state of affairs for the good of the Nation.

An obvious corollary that we hope you'll pay close attention to is that the intended audience for your report will be those decision makers. In the past, CSTB studies have done a good job of presenting findings and conclusions in a manner that is not only readily accessible to decision makers, but that is well-grounded in facts and politically well-focused so that they will not be rejected out of hand. We hope that the CSTB staff will assist you in this as needed.

CHARGE

The proposal that CSTB submitted to us and that is represented in the scoping statement for this workshop states the general intent that we had, but let me try to sharpen that

beyond my exhortations for a quality, data-driven, politically adept report that I've already noted.

I would end my formal remarks with several, explicit but NOT exclusive charges:

We hope that you will:

- Focus on the big-picture ecosystem, explicating what the parts are, their interrelationships, how this has changed over time, what the exogenous forces are, and what the risks for the future are;
- Make sure that the big picture you paint is comprehensive, including the role of environment, laws/regulations, and attitudes;
- Pay special attention to the role of fundamental research;
- Pay special attention to the role of education in the ecosystem;
- Not get bogged down in which research areas are favored or not, which agencies are in favor or not, and so on;
- Pay special attention to the role of research community maturity and organization;
- Provide motivating examples and lots of references to other studies and data, without losing sight of the objective of producing an accessible and understandable report;
- Not just repeat or update previous studies (although that is needed), but go beyond them to provide decision makers a framework and some of the data they need to make informed decisions;
- Deliver us a report in a timely manner.

I invite any and all questions in the time remaining.