HCI Challenges in Government Contracting

A CHI '95 Workshop

Ira Winkler and Elizabeth Buie, Workshop Organizers and all the participants

Human-computer interaction specialists from government, industry, and academia met at a CHI'95 workshop to formulate a strategy for addressing the unique challenges that HCI development faces in government contracting environments around the world. Continuing the work that began at a CHI'94 SIG, workshop participants refined the problem definition, devised some approaches to solving it, and identified opportunities for the involvement of the HCI community – all aimed at establishing HCI as an integral part of government systems development processes. They produced a poster to summarize their results for the CHI'95 conference.

Introduction

Governments spend huge resources on custom computer systems, developed by contractors to government specifications under government monitoring. In far too many such projects, usability has little explicit requirement, thereby depending on developers' knowledge, perseverance, and good will. Development activities receive their funding allocations very early in the life cycle, and HCI work usually gets short shrift. Far too many government systems, therefore, suffer excessive operational risk and cost. The public bears the consequences of ineffectiveness; taxpayers bear the costs of inefficiency; government workers bear the stress of dissatisfaction.

Eleven HCI specialists from government agencies, consulting firms, system development contractors, and universities convened at a CHI'95 workshop to formulate a strategy for addressing the unique challenges that HCI development faces in government contracting environments. Participants from the US and Europe built on the work of a CHI'94 Special Interest Group (see the October 1994 *SIGCHI*

Bulletin for the SIG report). We developed a detailed list of challenges, devised a comprehensive set of approaches to addressing them, and identified a number of possible inducements for the HCI community to become more involved. Our workshop discussions focused on achieving the recognition of HCI as a specific and integral part of the development process for government systems. We summarized our conclusions as challenges, approaches and opportunities for solving the special HCI difficulties in government projects, and we presented the summary as a poster (see at end) during the rest of the CHI'95 conference.

Challenges

> *"We're from the government (contracting), and we're here to (ask for) help."*

The good news. Government organizations are paying increasing attention to HCI. For example, more and more requests for proposals (RFPs) require bidders to describe HCI design concepts or even build prototypes for consideration during proposal evaluation.

The bad news. Far too many challenges remain. Although all development environments present HCI challenges, government contract environments face challenges that commercial environments do not, and many of these tend to be overlooked by the HCI community.

Rigid specifications with little room for usability

Contractors propose and build systems according to government-specified requirements for the delivered system and the development methodology. Historically, very few RFPs have specified HCI features or usability activities beyond such generalities as "Motif compliant GUI" or "user friendly interface." Bidders hesitate

to increase their proposed price by including features and activities that an RFP does not mandate, and contractors may hesitate to add them even after winning, for fear of gaining a reputation for cost increases and overruns.

In addition, many contracts require that team members have degrees in hard science or engineering; psychology doesn't count. This increases the difficulty of building a team with sufficient HCI/usability expertise.

Insufficient access to users

Government user populations tend to be specialized and very busy. Unlike developers of commercial products, contractors cannot rely on temporary employment agencies and social organizations as sources of representative users for task analysis and usability testing. In addition, the operations organization may refuse to make its employees available for usability work.

Worse yet, the contracting process prohibits the bidders from even talking to the users during the proposal process. Although this promotes equal treatment of bidders, it makes it difficult for them to perform the usability activities necessary for developing HCI concepts and prototypes for the proposal.

Long development and operational life

Typically, several years pass between issuance of an RFP and delivery of the first (not to mention the final!) release of the system. After that, many government systems have operational lifetimes measured in decades. Technologies change; personnel change; even philosophies change.

Entrenched development methodologies

Especially in the aerospace and defense arenas, government contracts tend to

require some form of waterfall development methodology. Aiming to ensure that delivered systems meet their requirements, procurement organizations use officially mandated, well defined, institutionalized procedures for monitoring contractor activities and evaluating interim products such as designs and plans. Unfortunately, a rigidly applied waterfall methodology does not readily and obviously accommodate the iterative nature of usability work, and government organizations have historically been slow to change their processes.

Unique cost-benefit problems

Governments build systems not to make money but to satisfy the perceived needs of their citizens. Some systems arise because the needs are seen as critical (e.g., public safety and health, national defense), and financial considerations influence the specific requirements far more than they do the decision to build the system.

Historically, government organizations have been structured to separate the budgets for development and operations. Development authorities are reluctant to increase spending for activities whose cost savings would be realized in someone else's budget. Governments that allocate funding one year at a time make this problem worse, as delays in development spending tend to increase long-term operational costs.

Sparse communication between government and HCI community

With a very few exceptions, government systems folks have been neither the most visible players in the overall HCI community nor the most prolific contributors to its knowledge and techniques. We in government contracting feel that we know HCI better than the HCI community knows us, and because most of us are practitioners we need help from the more research-oriented community.

Approaches

"Reduce government waste – invest in usability!"

We've all heard stories of civil servants who prefer the familiarity of an old, inefficient system and "neglect" to use the new one because it's hard to learn. Policy makers and procurement officials have heard these stories too. Our approaches focus on

showing that the investment in usability will be both a small percentage of development costs and a major factor in reducing this kind of waste.

Influence policy makers

Raising awareness of the HCI's importance among people who make government procurement policy (e.g., lawmakers, regulation writers, budget officials) can go a long way toward creating HCI-favorable procurement practices. We should educate policy makers about the role of HCI engineering in reducing the operational risk and cost of government systems by increasing the effectiveness, efficiency, and satisfaction of user tasks.

Influence procurement

Those involved in government procurements (especially RFP writers and proposal evaluators) must become convinced that usability is a critical component of system quality. They must address the HCI explicitly (starting with the RFP), specifying not only its required features but also the HCI engineering process. We should also encourage them to take a total life cycle perspective that encompasses both development and operations.

We have already started work on this approach: An HCI seminar for US government personnel is planned for this coming winter at the U.S. National Institute of Standards and Technology (NIST).

Integrate usability engineering into government methodologies

The current push toward continuous process improvement, so widespread now in the government, makes this an excellent time to define a role for HCI engineering. We must work with existing and emerging methodologies to ensure that the HCI receives proper attention throughout the life cycle. We must define HCI planning, specification, and evaluation methods that will fit into the government's contract monitoring needs.

We also need to collaborate with the Software Engineering Institute (SEI), whose Capability Maturity Models (CMMs) for system and software engineering play a huge role in many US Government projects. Work on this effort, too, has already started; for example, the workshop coordinators participated in the 1994 Human Factors and Ergonomics Society

Seminar on Integrating Human Factors with Software Engineering, which was chaired by the SEI's Bill Hefley.

Use standards as leverage

HCI standards, especially those developed by national and international organizations such as the International Organisation for Standardisation (ISO) and the American National Standards Institute (ANSI), can not only provide useful information but also (and even more importantly) lend credibility and clout to our efforts. In some places (e.g., Europe) ISO standards can reflect official policy and even legal requirements.

Increase collaboration among government HCI/usability professionals

A substantial number of government and contractor organizations include HCI specialists, even if they don't take full advantage of this expertise. Developing and promoting synergy among ourselves can both increase our effectiveness and maintain our motivation.

We began by forming an email list after the CHI'94 SIG meeting; to join send a message to gov-hci-request@emsl.pnl.gov.

Broaden awareness of government issues within HCI community

To induce the larger HCI community to give government systems issues the attention we believe they need and deserve, we will have to publicize our issues and convince the community that they are important and interesting.

We will write papers, organize panels and workshops, and (perhaps most important) talk with our industry and academic colleagues about our challenges, approaches, and needs. We will work toward increasing the understanding of HCI and its process as they relate to government systems.

Opportunities for the HCI Community

"Whenever you fly, think about usability in air traffic control systems."

Here are some considerations we hope will induce our HCI colleagues to take up our flag.

Interesting research problems

Government systems share some characteristics seldom found in commercial environments:

- *High task complexity and criticality.*
  From emergency management to tax and drug investigations to battle management to manned space flight control, many government-system tasks involve complex, multi-person activities with serious consequences of errors.
- *Specialized user populations.* From air traffic controllers to battle commanders to public health officers to astronauts, many government system users have highly specialized knowledge and skills.
- *Unique organizational environments.* From the Department of State to the Ministry of Finance to military commands to Customs departments, most government groups have special politically sensitive areas, legislatively mandated missions, and (in some cases) even structures.

Significant social impact
Government systems affect a huge number of people. Improving usability can have a much wider impact than simply improving effectiveness, efficiency, and satisfaction for the direct users. It can also improve public health and safety and reduce taxpayer costs.

Funding sources
Although rarer than they used to be, government research grants *are* still available.

Definition of HCI Design Specification
Integrating HCI engineering into government system development processes requires defining the content of plans and specifications for HCI requirements, design, and evaluation. This effort could be an important recipient of some current HCI research, particularly that involving formal specification.

Conclusions

The special nature of government contracting poses unique challenges to HCI engineering. HCI specialists familiar with government environments have defined a number of approaches to meeting these challenges, and we invite the larger HCI community to work with us to achieve greater usability in government systems.

Participants

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HCI Challenges in Government Contracting
CHI '95 Workshop Poster*

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Reduce government waste – invest in usability!

As you fly home, think about usability in air traffic control systems.

Challenges

- Rigid specifications with little room for usability
- Insufficient access to users
- Long development and operational life
- Entrenched development methodologies
- Unique cost-benefit problems
- Sparse communication between government and HCI community

Approaches

- Influence policy makers
- Influence procurement
- Integrate usability engineering into government methodologies
- Use standards as leverage
- Improve collaboration among government usability professionals
- Broaden awareness of government issues within HCI community

Opportunities

- Interesting research problems
  - High task complexity and criticality
  - Specialized user populations
  - Unique organizational environments
- Significant social impact
- Funding sources
- Definition of HCI Design Specification

* Prepared by the workshop participants: Ira Winkler and Elizabeth Buie (co-organizers), Curt Brewer, Laura Downey, Jill Drury, John Gersh, Anna Giannetti, Rex Hartson, Hal Miller-Jacobs, Ron Woerner, Mary-Anne Wolf