Preferences for Global Access

Institute for the Study of Knowledge Management in Education (ISKME)

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**Deliverable 1.2: Workshop Report**

**Cloud-Based Accessibility For Individuals with Disability**

Tools for Creating Specifications of User Needs and Preferences for Online Interactions in Several Different Application Settings

Prepared by:

ISKME

Ontario College of Art and Design University

WGBH

IBM

Raising the Floor International

Inclusive Technologies

*Inquiries about this work can be addressed to lisa@iskme.org*

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***About this Report***

This report is part of the Preferences for Global Access (PGA) project. The PGA project was funded by the National Institute on Disability and Rehabilitation Research (NIDRR), a component of the U.S. Department of Education's Office of Special Education and Rehabilitative Service, under Task Order 0002 of ED-OSE-12-D-0013 - *Tools for Creating Specifications of User Needs and Preferences for Online Interactions in Several Different Application Settings*. The purpose of Task Order 0002 is to develop and evaluate example First Discovery Tools that address the creation of user needs and preference specifications for users in the following four application settings: Accessible voting, online educational assessment, community-based technology support for older citizens, and open educational resources.

This report describes the activities, analysis and outcomes of the project’s first workshop to *gather specific stakeholder input* on needs and preference sets and First Discovery Tools for each of the four application settings.

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# Introduction: Workshop Purpose and Goals

The Preferences for Global Access (PGA) project team, funded by the National Institute on Disability and Rehabilitation Research, hosted a two-day workshop on online accessibility on September 15-16, 2014 in Washington, D.C.

The purpose of the workshop was to gather stakeholder input on needs and requirements for online accessibility tools in four specific application settings:

* Accessible voting,
* Online educational assessment
* Community-based technology support for older citizens, and
* Open educational resources (OER).

Invited participants included experts and researchers working within the four application settings, as well as subject matter experts from the PGA team. A full list of the 25 participants is included in Appendix B.

The workshop was designed to inform the development of web software to assist users with disabilities in creating online user profiles that specify their preferences for how online information and services should be presented to them within the four application settings. After an introduction to the Global Public Inclusive Infrastructure (GPII) and to concepts for preference creation tools developed in Task Order 0001, the workshop led the participants through a discussion of the goals and benefits of personalization, and the First Discovery work in particular. The initial sessions of the workshop also addressed a process for engaging stakeholders in the next phase of the project – the co-design work for the design and development phase of the project to help ensure the tools match the needs and constraints of the application settings. During the workshop, participants worked in breakout groups by application setting to create First Discovery personas involving the identification of a real person and a real goal to be met by that person, as well as the concrete steps involved interacting with First Discovery Tools, and a list of constraints and requirements surrounding that interaction.

The workshop sessions were structured to surface answers to several key questions, including: what preferences must be supported in each application setting; what, where and when First Discovery tools are needed for each setting; and what constraints and contextual factors potentially influence the First Discovery process, requirements and tools. Through analysis of the workshop notes and artifacts that emerged from the workshop, the PGA team identified needs and preferences, use cases, and requirements for the First Discovery Tools across each of the application settings. These findings, discussed in the sections below, have been used to inform the creation of a living “[Requirements Document](https://docs.google.com/document/d/1_5WBtBPXidwAYGuwF524K_b0c4AuJxHspBOVp9aGpOI/edit#heading=h.fz359hc88snb)” that outlines constraints, preferences, and recommended tool types within and across the application settings. The Requirements Document will be revised and augmented throughout the co-design process by project participants and stakeholders to incorporate new knowledge iteratively.

# Workshop Data and Analysis

Both the large group discussions and application setting breakout sessions yielded a number of artifacts that served as data and information to be analyzed after the workshop, including:

* [Detailed notes](http://wiki.fluidproject.org/display/fluid/PGA%2BWorkshop%2B1%2BNotes%2B-%2BPlenary%2BSessions) taken by PGA project team members on the workshop sessions
* [Personas and use cases](http://wiki.fluidproject.org/display/fluid/%28PGA%29%2BUse%2BCases%2Bfrom%2Bfirst%2BStakeholder%2BWorkshop) developed for each application setting on flip chart paper, including individuals’ names, ages, interests, goals, and needs and preferences
* [Storyboards](https://docs.google.com/presentation/d/1gKkSPHqFu7SNJOrrX3ogDF3ggelZkdraq18VGk5NVTA/edit#slide=id.g3a3d363e8_119) of users interacting with a First Discovery tool for each application setting
* [A list of requirements](http://wiki.fluidproject.org/display/fluid/%28PGA%29%2BRequirements) and constraints for each application setting based on the personas and user interaction storyboards developed

In analyzing the above data, an analytical framework was developed based on the eleven core research questions that were the focus of the workshop. The research questions were grouped into four categories:

1. Initial Considerations,
2. Preference Tool User Interface,
3. Other Preferences Discovery Mechanisms and
4. Effectiveness.

Each of the eleven questions were then described and operationalized. Finally, examples of language or wording that were indicators of the categories were developed for each definition to enable consistent coding and comparison of the data across each application setting. Table 1 below outlines the analytical framework used. Any one response could be coded in multiple categories.

Table 1: Analytical Framework for Workshop Data

| **Code/Category** | **Research Questions** | **Data Coding Definitions**  |
| --- | --- | --- |
| 1.1 / Initial Considerations | What preferences must be supported in the application setting? | Preferences that must be included in each setting, that are either required (by law, or through guidelines or recommendations in a given setting) or that are important to have based on user needs and scenarios identified during the workshop. Can be audio, visual, and/or input preferences. |
| 1.2 / Initial Considerations | When and where would the preference tools be used? | Preference tool timing, including when the tool would be used by a user within the setting (e.g., in voting, can be prior to the polling place, during registration, or during the actual voting session). Also includes the context of use, such as location, environment, and setting. |
| 1.3 / Initial Considerations | Should all of the preference creation tools in this application setting be designed for use by the end user independently, or should initial preference-setting tools to be designed to be used with staff support?  | Indication of whether tools are used with or without the support of assistants, and under what conditions. Includes helpers of all types that have some connection to the user, and that are available to help the user move through the tool. Helpers can be informal (e.g., family members), formal (professionals) and non-formal (non-professionals).  |
| 1.4 / Initial Considerations | Is there any other input deemed necessary to develop First Discovery tools to work in the application represented by the stakeholder? | "Primary" or initial inputs that must be included in the first discovery tools before they can be successfully used.  |
| 1.5 / Initial Considerations | Are there any constraints on the allowable accommodations for the application? | Constraints on the preferences that can be supported in a given setting. Can be legal, policy, or regulatory constraints, as well as other constraints within a given setting. |
| 1.6 / Initial Considerations | Are there any technical constraints on the format/storage of the needs and preferences so as to work within the context of the application? | Technical constraints on the storage/format of the preferences within the setting.  |
| 1.7 / Initial Considerations | Are there contextual factors relevant to the applicability of the First Discovery Tools? | First Discovery Tool contextual constraints. Can be constraints related to security, privacy, interoperability, time allowed/available, etc. |
| 2.1 / Preference Tool UI | What user interface features and characteristics would preference tools need to have to serve this application setting? | User interaction (UI) features either required (by law, or through guidelines or recommendations in a given setting) or that are important to have based on user needs and scenarios identified during the workshop.  |
| 2.2 / Preference Tool UI | What are the personas and scenarios that might influence the need for requirements?  | Personas and scenarios developed during the workshop, including a user’s background, interests, needs and preferences, and how he/she might interact with a set of first discovery tools in a given setting. |
| 3.1 / Other Preference Discovery Mechanisms | What are the opportunities in the application setting where preferences could be suggested on the basis of inference from user actions (e.g., in practice assessments) as opposed to being explicitly set in a First Discovery Tool? | Opportunities for preference suggestions based on inference within each application setting, and the conditions or use scenarios where that inference is recommended to occur. |
| 4.1 / Effectiveness | What would be evidence of effectiveness, and how might it be measured/described? | Tool success indicators. Can be indicators of amount of use, efficiency of use, ease of use, etc. |

The findings from the workshop analysis are presented in Section 3, below.

# Findings

In conducting the analysis, the above coding schema was applied to the workshop data by application setting. The PGA team then compiled the data from each application setting to identify common requirements, and differences in requirements across settings. The analysis reflects a broad understanding of preferences, needs, requirements and constraints for the application settings, is based on all of the collected artifacts from the workshop, and is qualitative in nature.

## Initial Considerations

### Preference Logistics

1. *What preferences must be supported in the application settings?*

The breakout sessions for each application setting revealed insights into the type and scope of preferences that must be supported. On the whole, modes of communication and interaction were identified as common preferences across all settings, with inclusion of assistive technology such as magnifiers, screen readers and alternative input mechanisms (e.g., onscreen keyboards/touch screens, and additional devices) taking priority, as well as multiple/alternative communication modes such as audio. Low literacy was also raised as a preference area that must be addressed across all settings (however, this was not discussed extensively and needs to be further fleshed out).

For Voting, there are a limited number of preferences that can currently be supported; this is because for today’s voting technology, ballots are relatively simple (no video/multimedia/images/animation), and thus preferences related to advanced features are not applicable. In addition, voting technology developers do not offer as full a range of accessibility features and settings as general purpose technologies do.

Preferences identified that should likely be supported for Voting include volume and text to speech (audio), as well as text size, color contrast, and line spacing (visual). The fine adjustments within the visual features will be few, as having a single high contrast theme meets the legal requirement in many jurisdictions. Ballot language was also identified as a required preference, as language options that meet the needs of a given voting district (based on census data) are a requirement under the Voting Rights Act. The preferences identified as required for Voting are in line with the Usability and Accessibility Requirements within the federal government’s [Voluntary Voting Systems Guidelines](http://www.eac.gov/assets/1/Documents/VVSG%20Version%201.1%20Volume%201%20Public%20Comment%20Version-8.31.2012.pdf) (VVSG), which most states voluntarily adopt “as is”, and other states adapt based on unique needs. For example, the VVSG requirements include:

* *Text/font* - Minimum font size requirement overall (height of capital letters at least 3.0 mm, x-height of a least 70% of cap height, and stroke width at least 0.35 mm); at least two font size options shall be displayed/available (3.0-4.0 mm and 6.3-9.0 mm); fonts should be sans serif
* *Contrast* - Color contrast ratio requirement (10:1); high contrast mode shall be available (20:1)
* *Color* - Color coding shall support correct perception by voters with color vision deficiencies; color coding shall not be the sole means of conveying information/meaning
* *Audio -* Must provide an audio-tactile interface (ATI) that supports the full functionality of the visual ballot interface
* *Language* - Districts must ensure that the voting system is capable of handling the languages meeting the legal threshold within their districts, as mandated by the Voting Rights Act of 1975; all text must conform to best practices for plain language
* *Navigation* - Page scrolling shall not be required for voters to use the system

For Older Citizens, it was discussed that this application setting should at least support text size, line spacing, color contrast, volume, touch screen, text to speech, possibly tremor filtering; also for this setting, workshop participants discussed that the number of preferences offered during First Discovery should be simplified—however this recommendation must be further explored and tested during the co-design (and user testing) process. For OER and Online Assessment, a few preferences were called out that are unique for these application settings: OER should potentially support preferences related to memory and task management (e.g., breadcrumbs, reminders, and to-do lists); Online Assessment should support preferences by subject area (for example, a student might need text-to-speech for some subjects but not others).

1. *When and where would the preference tools be used? Is there a need for more than one tool for this application setting?*

The workshop analysis revealed that across all application settings, the preference discovery process would involve multiple, context-aware tools, which would be accessed on multiple systems and at varied locations. For example, in the Voting setting, users should be able to access First Discovery where they register. They should also be able to access First Discovery at their home, workplace or other setting – ahead of arriving at the polling place, as well as at the polling place itself. Given the regulatory difficulties in connecting to the Internet from the polling place in many states, the workshop discussion revealed that there is a better chance of pulling preferences from or pushing them to the cloud from these other venues. Because it might be problematic for users if the capabilities of a home based system are too divergent from the voting place systems, demonstrations of what to expect at the voting place could help. Furthermore, in recognition of lines at polling stations, the polling place was viewed as an ideal setting for providing a mechanism/device for voters to set preferences while queued to cast a vote.

The workshop analysis also revealed the potential need for a *“pre-tool,”* which would not have the same responsive real-time adjustment options that one might see in the First Discovery tool running in an application setting; however, it would serve to focus and shorten the First Discovery session, especially for those application settings where the co-design process reveals the need for a more extensive or involved First Discovery session. The pre-tool would primarily be for use by assistants[[1]](#footnote-1), and as such, it was recommended that end-users have the opportunity to verify that the settings are correct and to make adjustments as needed before any further discovery process was enacted or to bypass the discovery process altogether. In other words, the First Discovery tool must be aware that someone else selected some initial values, and the end-user should be given the opportunity to verify or adjust them as part of the First Discovery process. Moving beyond the workshop, further discussion on the pre-tool is needed to determine, for example, if it is a “separate” tool, part of the First Discovery process and toolset, and/or part of the preference setting process overall.

For OER as well as Online Assessment, it was discussed that a dashboard tool to support metrics and feedback on learner performance be integrated into the preference discovery mechanism; however, this discussion needs further exploration in terms of alignment to the project’s goals and scope.

1. *Should all of the preference creation tools in this application setting be designed for use by the end user independently, or should initial preference-setting tools be designed to be used with staff support?*

Analysis of the workshop data indicated that assistance and support are a reality in all four application settings. Some initial differentiation was made between formal support (often provided by professionals) and informal support (often provided by non-professionals). This will be elaborated upon briefly below, and more fully later in the project.

Assistance and support were particularly salient in the Older Citizens and Online Assessment settings, where support in tool set-up was routinely recommended – including having an assistant set initial preferences. For Older Citizens, it was noted that this setting is likely to represent informal assistants who are not trained in assistive technologies, and who are often likely to be family members or senior peers that would “seed” the First Discovery process with initial preference settings. For Voting, having staff assist with preference setting at the polling place, prior to the voter reaching the ballot box, was deemed worthy of exploring further. These assistants would also presumably be untrained, informal assistants (often retired, seniors or volunteers) who would not pressure voters in any way toward preference setting.

Across all settings, control by the user was considered important even if there was support in setting preferences through an assistant. In the Online Assessment setting, it seemed permissible, at least temporarily, to enable the teacher to have more control of the preference settings for the end user than in other settings. However, some students may not need teacher assistance even to start with, and all students will still need the ability to fine-tune settings or even select new ones from among those that are permitted.

The possibility of preference sharing and recommendations based on similar users/peers as a starter set or set to repurpose was a recommendation for the Online Assessment, OER, and Older Citizens settings.

Partly in recognition of the need to have a balance between independence and assistance for seniors, verification of preferences that are added by others or other mechanisms was identified as a critical starting point for the first discovery tool process in the Older Citizens setting. Although the population of seniors with technology skills will increase as more individuals who use technology routinely age, technological competence and confidence may always lag in this population. Each generation, as it ages, will face similar challenges in using new technologies that are generally designed by and for younger generations. Increased cognitive and sensory impairments related to aging will likely continue to fuel the need for assisted preference setting; however, the independence of these adults to make final decisions about needs and preferences was also important.

Overall, the workshop emphasized that user autonomy in preference selection be viewed as a developmental task, so that users learn to reflect upon their own experiences and become more self-directed in making interface selections. Of relevance to this project is the possible role of tools in supporting and even documenting the acquisition of this particular metacognitive skill.

Note: The discussion around assistants will be further developed and tracked [here](http://wiki.fluidproject.org/display/fluid/Q3%3A%2BAssistance) through the co-design process.

1. *Is there any other input deemed necessary to develop First Discovery tools to work in the application represented by the stakeholder?*

Discussions at the workshop identified preferences seeded through a “pre-tool” as an input to the First Discovery process.

The term pre-tool refers to a process by which an assistant sets up the first discovery process before the end-user begins. The pre-tool would allow an assistant who is familiar with the capabilities of the end-user to provide some very basic information about the end-user (such as whether or not the end-user can see at all, or what language to use) to allow the first discovery process to dispense with some very preliminary questions. This would make the first discovery process faster and less cumbersome for the end-user.

Allowing assistants to seed the First Discovery process with preferences through a pre-tool was also deemed as particularly important within the Older Citizens and Online Assessment settings. In the Online Assessment setting, for example, preferences could be input by a teacher (assistant) based on a student’s Individualized Education Plan, and adjusted by the student when accessing the First Discovery interface through his or her own device.

In any such cases, the First Discovery tool system would need to be able to determine whether there are preferences that have been pre-loaded by an assistant, in order to know how to direct the user’s experience through the First Discovery process.

### Preference Constraints

1. *Are there any constraints on the allowable accommodations for the application (i.e., are there some accommodations that are either not permitted at all or that are only permitted in certain contexts - such as audio description being permissible for instruction but not for assessment)?*

The four settings differ in the degree of how voluntary they are from the user perspective, which affects their constraints. For example, the Older Citizen setting is relatively voluntary for seniors, assistants, and senior centers; the Voting setting has a mandatory accessibility requirement on the provider side, with voluntary participation on the voter side; the Online Assessment and OER settings have mandatory aspects for schools, teachers and students. The Workshop clarified that there may be design implications for different degrees of voluntariness. For example, if high completion rate is a goal, a voluntary tool may need to be easier to use and more engaging than a mandatory tool. We identified voluntariness as an important dimension, and created a [wiki page](http://wiki.fluidproject.org/display/fluid/Voluntariness%2Bdimension%2Bof%2Bapplication%2Bsettings) to continue the dialogue about its implications.

Other constraints on the allowable accommodations center around policy or regulatory constraints. For example, voting systems do not allow users to connect their own assistive technology (AT) devices or Internet-based assistive services in most states. Also, states design their own ballots, so a design that includes a preview of the ballot must accommodate this. Some of these laws and regulations will constrain the tool’s design directly, and some, due to different jurisdictions and professional norms, will mean that the tool will need to be designed so that it is flexible enough to be adapted to the implementation context.

1. *Are there any technical constraints on the format/storage of the needs and preferences so as to work within the context of the application?*

The Voting and Online Assessment discussions at the workshop identified formats and transfer of personal needs and preference (PNP) files as a significant concern. Considerations were also raised for Voting as well as Online Assessment around transporting preferences from where they are being captured or stored, to the environment/application and back again. In both of these settings, the user preferences need to be transferred securely, tied to the user through authentication, and need to be transported in a way so as not to compromise the intent of the context the user is operating in (e.g., measuring aptitude or voting). In Voting, user authentication gets additionally complex, because if the tool is a part of the voting system itself, the authentication somehow needs to ensure anonymity of the ballot.

### First Discovery Tool Constraints

1. *Are there contextual factors relevant to the applicability of a Discovery tool, for example, compatibility with specific security or privacy requirements; interoperability with existing tools and infrastructure?*

For practical reasons, it is essential that the tool be compatible with the technological infrastructure commonly found in the application setting; the application setting should not need to acquire any new technology in order to implement the tool.

Across all application settings, privacy and security were recognized as key components of the tools. This general requirement was balanced against the desire to have transferability of the PNP files between devices, contexts and locations. Maintaining security and privacy while facilitating mobility of the PNP settings is key to a successful system. Within OER and Online Assessment, there are specific needs around integration with Learning Management Systems (LMS) and compatibility with standard forms and policies such as the Individual Education Program (IEP). It is important that the settings and terminology be compatible with those of the IEP. As noted earlier, it is also desirable for the settings to integrate with the content that is provided in the learning context. Interoperability with AT that may be operated by the end-user was also a specific requirement that would be appropriate in all application settings. In the Voting setting – and at the polling place in particular – interoperability is required with AT that is integrated into the voting technology itself, as users in this setting are not able to bring their personal AT devices into the polling booth.

Several contextual factors come into play specifically for the Voting setting, including that internet connectivity is not allowed at polling places – thus, voters cannot connect to the cloud to access preferences. In light of this, the Voting breakout discussion at the workshop brought forth the idea of the First Discovery tool supporting the user in producing their preferences elsewhere and bringing them to the polling place via a machine readable code, for example, a bar code printed on paper, or an electronic record on a memory stick. The use may use a First Discovery tool as part of the voter registration (VR) process; those preferences could be stored in the VR database and be automatically transferred to the polling station. Also for Voting, the workshop revealed that there are different voting rules and voting systems in each state. For example, some states only have paper ballots, others require postal ballots, and there is a lack of budget to buy new voting systems to support preference tools in states where electronic voting is prevalent.

In the OER setting, OER are often designed to be flexible; resources might be used “as is” (e.g., students may be given a link and a prompt by a teacher to explore or view a resource, or to read a text), or they might be embedded within other environments and resources (e.g., on a course webpage, within a learning management system, or coupled with questions as part of an in-class assessment). To support these varied use cases, the First Discovery tools will need to be interoperable across multiple settings and online learning environments; the tools will need to be able to communicate across multiple platforms and levels of authentication, in order to accommodate OER that are represented through multiple provider and consumer channels. The tools will also need to address preferences that meet specific subject and context-area needs such as different supports for different subjects (e.g. a calculator for math, but not for English), as well support preferences to address layered and embedded resources with multiple media formats, each of which may be associated with different preferences and needs.

## Preference Tool User Interface

1. *What are the personas and scenarios that might influence the need for requirements (for example, personas that require the identified needs and preferences, and scenarios that show the identified user interface attributes and features at work)?*

For each application setting, personas and user interaction scenarios were developed as a mechanism to surface preferences, needs, and requirements for the preference tool(s). The transcribed scenarios from the workshop can be found [here](https://docs.google.com/presentation/d/1gKkSPHqFu7SNJOrrX3ogDF3ggelZkdraq18VGk5NVTA/edit#slide=id.g3a3d363e8_119).

1. *What user interface features and characteristics would preference tools need to have to serve this application setting?*

Central user interface (UI) themes that crossed all application areas were that the preference tool UI be engaging, fast, flexible, forgiving, intuitive and informative. These themes express a number of different requirements for features of the UI and are discussed further below.

Workshop participants noted that it would be important to make the interface engaging to the end-user. Engagement could take many forms including graphical or video instructions, personalization of the interface to the user’s interests, gamification of the process, and positive reinforcement during the discovery process. At the same time, the process of preference settings should not be intrusive or lengthy. There is concern that preference selection can neither become nor be perceived as a barrier to accessing the actual application. Engagement could also be enhanced by matching the expectations of the user given the application or context. For example, the interface design could follow the mental models that a user already has. Accessible language was also viewed as a mechanism for ensuring enhanced engagement.

The ability to preview settings and to change or back out of settings easily were also important. Additionally, it was desired in multiple settings that the application be responsive and “mindful” of the effectiveness of selected settings. Mechanisms that enable the interface to provide prompts with suggested settings or with checks to verify that settings were helpful or effective were important within all four application settings.

The UI must have flexible modes of input and output, and operate with assistive technology such as screen readers and magnifiers. Speech input and touch input were singled out as a priority across multiple application settings, as were output forms including speech output, subtitles, vibration and sound queues. The interfaces must also be flexible in the way that they present: controls, volume (in and out), text, contrast, language, and font face must be adjustable.

In all application settings, it was suggested that the process for setting needs and preferences be related to the context, and that the process be transparent and logical to the context. It was recommended that the pathways for the first discovery tools mirror the context or mental models that the user would hold for a context. Furthermore, the tool should be responsive to the way the stakeholder engages with the application (e.g., speed) and tailor the discovery process accordingly.

Additionally, it was required across all application settings that users have the opportunity to adjust preference settings at the end of the First Discovery process, or to back out of preference settings, by way of an “undo” button.

Each of the application settings also had unique UI considerations, as raised by the workshop discussions:

* *OER* - The importance of personalization related to individual interests, and use of engagement mechanisms such as gamification; also, the ability to enable needs and preferences to relate to not only the interface but also the educational content delivered by the interface.
* *Online Assessment* - The potential ability to have multiple screens or “sides” to the interface to enable teacher control and monitoring, and to enable the student to manage and interact with the UI; and similar to OER, the ability to enable needs and preferences to relate to not only the interface but also the educational content delivered by the interface.
* *Older Citizens* - The potential ability to gauge and encourage progress through feedback mechanisms, though, for example, progress bars or indicators delivered through other sensory modes. Simple navigation and preference options were also an important UI requirement in this application setting.
* *Voting* - The potential ability to transfer the preference settings to all interfaces within this setting (e.g., the registration interface and the actual ballot interface).

## Other Preference Discovery Mechanisms

1. *What are the opportunities in the application setting where preferences could be suggested on the basis of inference from user actions (e.g., in practice assessments) as opposed to being explicitly set in a Discovery Tool?*

The participants indicated that in all application settings, taking opportunities to prompt the user to make preference settings based on usage were an important discovery mechanism. Again, this mechanism for discovery – even embedded throughout preference discovery “usage cycle” and based on user actions – must have a balance between being helpful and being a hindrance. Development of internal feedback loops and algorithms that make judgments on effectiveness of chosen preferences and offer prompts to the user about alternative options would be a helpful part of a discovery mechanism. Also, providing suggestions based on similar activities and usage patterns or declared preferences by peers would also be an important part of other preference discovery mechanisms.

In Voting, the above opportunities are less relevant, partly because voters may set their preferences using a separate system than the “ballot marking” systems at the polling place, but primarily because there would not necessarily be a “usage cycle” in the polling place.

In multiple application settings, the opportunity to customize the discovery process – such as the order of the questions and starting point of the process – was indicated as important. This would be more of a real-time alteration--for example, the user's answer to a question might alter what the next question is, or alter the flow of the process.

## Effectiveness

1. *What would be evidence of effectiveness, and how might it be measured/described?*

Although not explicitly covered at the workshop, the PGA work has begun to surface a framework for measuring the effectiveness of the First Discovery tools. Effectiveness measures initially identified include:

* *Uptake of the tools* - measured by number of user accounts created for preference sets in the GPII server, and number of downloads of developer toolkits.
* *Ease-of-use* - measured by tool analytics data showing, e.g., frequency of use of a “back button”, and of a “get assistance button”; analytics data on the ratio between the number of users who start the first discovery process and the number that complete it.
* *Efficiency of use* - measured by analytics data showing, e.g., the average length of time taken to complete each task of the discovery process.
* *Satisfaction with the tools* - measured by surveys and interviews with end-users.

During the co-design process, additional measures will be developed and aggregated on the following [wiki page](http://wiki.fluidproject.org/display/fluid/Q11%3A%2BEvidence%2Bof%2Beffectiveness).

## Summary of Findings

The findings from this workshop act as first thoughts on the many questions that have been developed in order to best consider and design for user needs across a variety of application settings. At this stage, primary focus was on usability and accessibility of the design, flexibility and responsiveness of the First Discovery Tools, engagement and desired interaction with the tools, and the balance between assistance and independence in preference setting. Tables 2-4, below, synthesize the workshop findings regarding the preferences that should be supported, constraints and tool requirements by application setting, and indicates where commonalities exist across settings. Note that the list of preferences, constraints and requirements in the tables below is not comprehensive and final, and will continue to be analyzed and fleshed out through the co-design process and the [Requirements Document](https://docs.google.com/document/d/1_5WBtBPXidwAYGuwF524K_b0c4AuJxHspBOVp9aGpOI/edit#heading=h.fz359hc88snb).

Table 2: Summary of preferences that should be supported as identified in the workshop

|  |  |
| --- | --- |
| **OER** | • Cognitive: Breadcrumbs, reminders, to-do lists |
| **Online Assessments** | * Subject-specific preferences (e.g., text-to-speech might be needed for some subjects but not for others)
 |
| **Older Citizens** | • Input: Tremor filtering |
| **Voting** | * Cognitive: Plain language
 |
| **All Settings** | • Visual: Text size, line spacing, color contrast, magnification factor• Audio: Volume, text-to-speech• Cognitive: Language picker, preferences to support low literacy needs• Input: Touch screen |

Table 3: Summary of tool constraints as identified in the workshop

|  |  |
| --- | --- |
| **OER** | * Must be integrated with LMSs, and with the content provided in the learning context
* Must support varied use cases, and be able to communicate across multiple platforms and levels of authentication
 |
| **Online Assessments** | * Preferences need to be transferred securely and tied to the user through authentication
* Must be integrated with LMSs and compatible with standard forms/policies such as the Individual Education Program
 |
| **Voting** | * Preferences need to be transferred securely and tied to users through authentication
* Voting systems do not allow users to connect own AT devices in most states
* Each state has its own voting rules, systems, ballots and accessibility requirements
* Time limitations at the polling place
 |
| **All Settings** | * Privacy considerations
* Potential lack of technological self-efficacy of users
 |

Note: The workshop did not surface constraints that are unique to the Older Citizens setting

Table 4: Summary of tool requirements as identified in the workshop

|  |  |
| --- | --- |
| **OER** | • Engage users through personalization, gamification |
| **Online Assessments** | • Support preferences by subject area • Support multiple screens• Support a dashboard |
| **Older Citizens** | • Include a progress bar  |
| **Voting** | • Allow preferences to be output as machine readable codes• Meet the needs of multiple interfaces and steps of the voting process• Support time limitations at the polling place |
| **All Settings** | * Flexibility to adapt to the implementation context and compatibility with technological infrastructure commonly found in each setting
* Support simple navigation; support efficient use of the tool (e.g., through inference)
* Be engaging and personal
* Support use/engagement by varied types of assistants (formal/ informal/trained /untrained); a pre-tool as a mechanism for assistants to seed the FD process
* Support end-user verification of preferences that are added by assistants
* Allow users to adjust or undo preference settings during First Discovery
* Support “voluntariness” across settings
 |

In order to foster usability and accessibility of the First Discovery Tools, the workshop findings reveal that care must be taken to consider the appropriate amount of options for users so as to provide reasonable choice without overwhelming the user. Choices should be provided with context or examples to enable the user to better understand how the setting would impact their experience of the application. Interoperability with assistive technologies (AT) and conformance to accessibility standards is a must; however, there may be contexts in which some ATs may not be appropriate or allowed (e.g. in the assessment environment), thus secondary controls for AT preferences would be required for control within the application setting. While the First Discovery Tools would provide options for improved accessibility, the tool interface would also have to respond to user preferences. Initial configurations of the First Discovery Tools will require ongoing discussion and research.

The workshop further revealed the importance of flexibility and responsiveness to user needs and behavior. Flexibility includes ability of the user to return to the tool and change or tweak settings as often as desired. There was also a great deal of interest in a “smart” preference tool that would continue to monitor the user’s behavior in the application and make suggestions for changes to the settings that might improve accessibility of the application when appropriate. The algorithms that would govern this artificial thought process would require further collaboration.

It is important that the tools not become intrusive, off-putting or prescriptive. There was an emphasis on that the First Discovery Tools not becoming an additional barrier to accessing the actual application. For this reason, user control over the tools is important, and it was suggested that the tools have mechanisms to limit or even turn off its function. When the First Discovery Tools are active, it should provide options at a pace that is engaging for the user. The tools must also find a balance between actively responding to user input and providing a stable, consistent interface.

The possibility of a pre-tool was considered across applications settings. A pre-tool was viewed as a mechanism for setting some preferences prior to engagement with the first discovery process. The pre-tool was generally viewed as a tool whereby an assistant would help to set preferences and make the discovery process more focused, efficient, and simple. The discovery, tool, however, should provide the user with the ability to confirm and/or change settings as desired. There may be cases or application settings where a pre-tool is used by the individual prior to engaging with the application without the use of an assistant (e.g. in line at the polling station). Further exploration of these possible cases is required.

The workshop was a successful introduction of the co-design process and the preliminary findings provide a basis for ongoing design discussions and planning that now take place on the [PGA Project Wiki.](http://wiki.fluidproject.org/display/fluid/Preferences%2Bfor%2BGlobal%2BAccess)

# Implications

The workshop process identified many requirements and ideas that will inform and drive the process as the project moves forward. The implications of key findings are described below.

* Throughout the workshop, the concern was reiterated that the First Discovery process should not be lengthy, nor should it be a barrier to accessing the application. For this reason, the range of preferences that will be set through First Discovery (FD) may very likely need to be limited to some degree. The full range of preferences that *could* be collected is extensive, and a tool that attempted to collect all of them would likely be quickly abandoned by many potential users. The co-design process will have to identify which preferences are a priority for the FD process, and the FD Tools should indicate to users that further refinement of preferences can be carried out at a later time, if desired. Additionally here, the need for a focused, efficient and engaging First Discovery session also raises issues around UI. For example, the workshop suggestion that the Online Assessment setting would benefit from multiple screens (based on the end-user) must be considered in light of the project’s goals to make the FD process as simple and streamlined as possible.
* The workshop surfaced more commonalities among application settings than were expected, and fewer unique areas than expected. While this points to the possibility of a shared framework for any tools that are developed, the co-design process will need to ensure that considerations are made for the specificity of each setting, and that those are brought into the design process continuously. For example, the need for subject-area-specific preferences in the Online Assessment setting must be considered as part of the design process. See section 5, below, for a full discussion of the tools being proposed based on the workshop findings.
* While the value of a pre-tool was clear, First Discovery should not *require* its use: It would have to be designed to function with or without being “seeded” in this way. To support this, the team would need to devise a mechanism that allows the tool to follow a different path through the First Discovery process based on whether or not it has been seeded with preference data.
* The need for security and privacy was clearly recognized at the workshop. It is helpful to recall that this project is being conducted in partnership with the [Global Public Inclusive Infrastructure (GPII)](file:///C%3A%5CUsers%5CLisa%5CDesktop%5CGlobal%20Public%20%09Inclusive%20Infrastructure%20%28GPII%29) [<http://gpii.net/>] team. It is expected that the First Discovery Tools will work in the context of the GPII architecture, which will include authorization and authentication mechanisms.
* Workshop participants recognized that a First Discovery Tools would be incorporated into a variety of different systems (such as different LMSs, for example) and that saved preferences would need to be compatible with these different systems. Here, as with security and privacy, conformance with the GPII architecture will support this compatibility, since a primary goal of the GPII is to ensure interoperability between varied technologies and saved preferences.
* Discussions at the workshop about providing assistance to end-users included recognition that in some settings such as Online Assessment, assistance would be provided by trained professionals such as educators, whereas in other settings such as Voting, assistance would be provided by untrained professionals such as polling station volunteers. This distinction will have to be taken into consideration in any design decisions around user interfaces specific to an assistant, and in terms of whether additional supports might be needed in a given setting for those assistants.

# Proposal

The design and development of the First Discovery Tools will be iterative; that is, small parcels of functionality will be implemented and evaluated frequently, and the evaluations will provide feedback for subsequent iterations, which will build upon and expand the functionality. This iterative process allows the design of the tools to more effectively incorporate insights gleaned from ongoing evaluations as part of the process, rather than conforming solely to fixed initial ideas arising from the workshop. Based on the analysis and findings presented above, the outcomes of the workshop suggest the direction of the initial design and development for the tools.

This project is part of the [Global Public Inclusive Infrastructure (GPII)](http://gpii.net/), which is developing an architecture of flexible user interface component technologies and services. The PGA First Discovery Tools will make use of this technology in its implementation. The GPII technologies – and the Infusion JavaScript Framework upon which they are built – are designed to support flexibility and extensibility in ways that will be particularly helpful in the PGA First Discovery context:

* The Infusion JavaScript Framework has, as a core feature, the use of “components” – self-contained objects encapsulating specific functionality, designed to be combined with other components to create a tool or application.
* Web applications or tools developed using Infusion are driven by external configuration, that is, the structure of the application (the components being combined) is controlled by information provided by the integrator, not the developer. A single Infusion application can be configured very differently by different integrators. For example, the GPII is developing two preference editing tools: the Preferences Control Panel (PCP) and the Preferences Management Tool (PMT). These tools present different preferences and look quite different from each other, but they share almost all of their underlying components.
* Infusion supports complete separation of the user interface from the underlying functionality, allowing the specific design of the user interface to be varied or customized without modifying the underlying functionality. This means that the same functionality can be made to look very different in different contexts simply by changing the HTML and CSS. This also means that the interface can be modified programmatically during the use of the application, making it capable of accommodating the needs of a user as they are discovered.
* Because Infusion is a JavaScript framework, it can be embedded into any existing web application. Infusion was designed to support the development of tools that can be incorporated into other systems, not just stand on their own. For example, Infusion tools have been added to OER repository interfaces, websites and LMSs. The tools do not have to exist as separate entities.

Based on this, we propose that First Discovery Tools be developed as a single code base that can be configured to be a different tool in different application settings according to the unique needs of that setting. The single code base would include, by default, support for preferences that have been identified as common to all application settings, and would support the addition of different additional preferences in each of the specific application settings, as well as supporting even finer variations within application settings, such as different polling stations in different voting jurisdictions, or different subject-specific preferences in an assessment setting. The development team will create the unique configurations required for the participating stakeholders in each of the application settings. Developing a single code base that can be deployed as multiple different tools will simplify the development process and save time.

# Appendix A – List of Supporting Documents and Wiki Pages

*Workshop Artifacts*

* **Detailed notes** taken by PGA project team members on the workshop sessions

[http://wiki.fluidproject.org/display/fluid/PGA+Workshop+1+Notes+-+Plenary+Sessions](http://wiki.fluidproject.org/display/fluid/PGA%2BWorkshop%2B1%2BNotes%2B-%2BPlenary%2BSessions)

* **Personas and use cases** developed for each application setting, including individuals’ names, ages, interests, goals, and needs and preferences

[http://wiki.fluidproject.org/display/fluid/%28PGA%29+Use+Cases+from+first+Stakeholder+Workshop](http://wiki.fluidproject.org/display/fluid/%28PGA%29%2BUse%2BCases%2Bfrom%2Bfirst%2BStakeholder%2BWorkshop)

* **Storyboards** of users interacting with a First Discovery tool for each application setting

[https://docs.google.com/presentation/d/1gKkSPHqFu7SNJOrrX3ogDF3ggelZkdraq18VGk5NVTA/edit - slide=id.g3a3d363e8\_119](https://docs.google.com/presentation/d/1gKkSPHqFu7SNJOrrX3ogDF3ggelZkdraq18VGk5NVTA/edit#slide=id.g3a3d363e8_119)

* **A list of requirements** and constraints for each application setting based on the personas and user interaction storyboards developed [http://wiki.fluidproject.org/display/fluid/%28PGA%29+Requirements](http://wiki.fluidproject.org/display/fluid/%28PGA%29%2BRequirements)

*Documents to Support the Co-Design Process Going Forward*

* **Preferences for Global Access Project Wiki**

[http://wiki.fluidproject.org/display/fluid/Preferences+for+Global+Access](http://wiki.fluidproject.org/display/fluid/Preferences%2Bfor%2BGlobal%2BAccess)

* **Wiki page on “assistants”,** how they are defined and the implications for designprocess [http://wiki.fluidproject.org/display/fluid/Q3%3A+Assistance](http://wiki.fluidproject.org/display/fluid/Q3%3A%2BAssistance)
* **Wiki page on the dimension of “voluntariness”** in each application setting
[http://wiki.fluidproject.org/display/fluid/Voluntariness+dimension+of+application+settings](http://wiki.fluidproject.org/display/fluid/Voluntariness%2Bdimension%2Bof%2Bapplication%2Bsettings)
* **Wiki page on measures of effectiveness** for the First Discovery Tools[http://wiki.fluidproject.org/display/fluid/ Q11%3A+Evidence+of+effectiveness](http://wiki.fluidproject.org/display/fluid/%20Q11%3A%2BEvidence%2Bof%2Beffectiveness)
* **Requirements document** that outlines constraints, preferences, and recommended tool types within and across the application settings (Working draft of deliverable 2.1)
[https://docs.google.com/document/d/1\_5WBtBPXidwAYGuwF524K\_b0c4AuJxHspBOVp9aGpOI/edit?pli=1#](https://docs.google.com/document/d/1_%205WBtBPXidwAYGuwF524K_b0c4AuJxHspBOVp9aGpOI/edit?pli=1)
* **Voluntary Voting Systems Guidelines** [http://www.eac.gov/assets/1/Documents/VVSG Version 1.1 Volume 1 Public Comment Version-8.31.2012.pdf](http://www.eac.gov/assets/1/Documents/VVSG%20Version%201.1%20Volume%201%20Public%20Comment%20Version-8.31.2012.pdf)

# Appendix B - Workshop Participants

Dana Ayotte,Inclusive Designer, Inclusive Design Research Centre, OCAD University,Toronto, Ontario

Stephen Bauer, Project Officer, National Institute on Disability and Rehabilitation Research, Washington, D.C.

Anastasia Cheetham, Inclusive Developer, Inclusive Design Research Centre, OCAD University, Toronto, Ontario

Scott Code\*, Aging Services Technologies Manager, Center for Aging Services Technologies, Washington, D.C.

Matthew Collins, Senior Managing Consultant, IBM Global Business Services, U.S. Federal Team, Washington, D.C.

Shanee Dawkins\*, Computer Scientist, National Institute of Standards and Technology, Gaithersburg, MD

Cynthia Jimes, Director of Research and Learning, Institute for the Study of Knowledge Management in Education, Half Moon Bay, CA

Philip Kragnes\*, Adaptive Technology Specialist, University of Minnesota, Minneapolis, MN

Mari Langas\*, DLM Technology Project Manager, Dynamic Learning Maps, Lawrence, Kansas

Kathleen McCoy, Consultant, National Institute on Disability and Rehabilitation Research (NIDRR), Washington, D.C.

Jess Mitchell, Senior Manager in Design Research & Development, Inclusive Design Research Centre, OCAD University, Toronto, Ontario

Emily Moore\*, Research Associate, PhET Interactive Simulations, University of Colorado Boulder, Boulder, CO

Lisa Petrides, CEO, Institute for the Study of Knowledge Management in Education, Half Moon Bay, CA

Whitney Quesenbery\*, Co-Founder, Center for Civic Design, Cambridge, MD

Jan Richards, Project Manager, Inclusive Design Research Centre, OCAD University, Toronto, Ontario

Madeleine Rothberg, Project Director, National Center for Accessible Media at WGBH, Boston, MA

Kirsten Schroeder, Partner, IBM Global Business Services for Education, Fairfax, VA

Rich Schwerdtfeger, Chief Technology Officer, Accessibility, IBM Software Group, Austin, TX

Jim Tobias, President, Inclusive Technologies, Matawan, NJ

Jutta Treviranus, Director at the Inclusive Design Research Centre, OCAD University, Toronto, Ontario

Shari Trewin, Research Staff Member, IBM Research, Yorktown, NY

Gregg Vanderheiden, Co-Director, Raising the Floor International, Geneva, Switzerland

Amy VanDeVelde\*, National Program Manager, Organization for the Advancement of Structured Information, Standards, Burlington, MA

\* Indicates external stakeholders from the application settings.

1. An assistant is a person helping the target user engage with and complete the tool. Assistants can be professional and formally attached to an institution serving the target user (therapist in a school district) or non-professional and personally attached to the target user (niece helping senior get started with a tablet). [↑](#footnote-ref-1)