

Feb 20, 2015 4:45 EST: Version Closed

This document is now closed for comment, and will be preserved in it's current state for reference.
A revised version of this document is now open and ready for discussion.

[Revised Requirements Doc](#)

Preferences for Global Access

Institute for the Study of Knowledge Management in Education (ISKME)
Contract #ED-OSE-12-D-0013-0002

Deliverable Task 2.1 Requirements for First Discovery 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

IBM

WGBH

Raising the Floor International

Inclusive Technologies

The development of this document was led by PGA team members
Richard Schwerdtfeger, Gregg Vanderheiden and Anastasia Cheetham

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

December 5, 2014

Table of Contents

[1. Introduction](#)

[1.1 Overview](#)

[1.2 Global Public Inclusive Infrastructure \(GPII\)](#)

[1.3 First Discovery Process](#)

[1.4 Diverse Users of the First Discovery Tool\(s\)](#)

[OER](#)

[Seniors](#)

[Voting](#)

[1.5 Scope](#)

[1.6 Terminology](#)

[1.7 Design of this Specification](#)

[2. Requirements](#)

[2.1 Requirements Common to All Application Areas](#)

[2.2 Requirements Unique to Accessible Voting](#)

[Assessment](#)

[3. Recommendations and Ideas](#)

[4. User Needs and Preferences](#)

[5. Requirements Outside the Scope of Task Order 0002](#)

[6. Note on Universality](#)

[Appendix A: Checklist of Requirements](#)

[Appendix B: Considerations When Designing for People with Disabilities](#)

1. Introduction

1.1 Overview

This specification is part of the Preferences for Global Access (PGA) project. The PGA project is 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 tool(s) that address the creation of user needs and preference specifications in the following four application settings, or areas:

1. Accessible Voting
2. Online Educational Assessment
3. Community-based Technology support for Older Citizens
4. Open Educational Resources (OER).

This specification describes the requirements for tool(s) to quickly discover a user's needs and preferences in these application areas, to enable a user to personalize interfaces in order to allow the user to access Information and Communication Technology (ICT).

1.2 Global Public Inclusive Infrastructure (GPII)

The Task Order 0002 work is part of the [Global Public Inclusive Infrastructure \(GPII\)](#) – a cloud-based digital on-ramp to Information and Communication Technology. GPII is developing an architecture of flexible user interface (UI) component technologies and services. For Task Order 0002, the PGA project team will contribute a key component – First Discovery Tool(s) – to GPII. The tool(s) developed in this Task Order are building blocks toward the creation of a comprehensive set of GPII Need and Preferences editing tools for the Global Public Inclusive Infrastructure (GPII).

The preferences from First Discovery will lead to further discovery (beyond First Discovery) as to whether the user needs assistive technology (AT), and will allow them to leverage features of GPII such as online Shopping-Alerting Aid to choose from available AT.

The tool(s) developed in this Task Order will make use of technologies from GPII in their implementations. This will reduce the effort needed for the development of some parts of the First Discovery Tool(s), and enhance the tools' flexibility and extensibility. By using GPII technologies, the First Discovery Tool(s), though initially targeting the four application areas defined above, will be

easily extensible to other application areas in future task orders of the PGA project.

1.3 First Discovery Process

The focus of this Task Order is to create First Discovery Tool(s) for a range of environments and users.

Figure 1 below provides a broad overview of the First Discovery process as we envision it at this time.

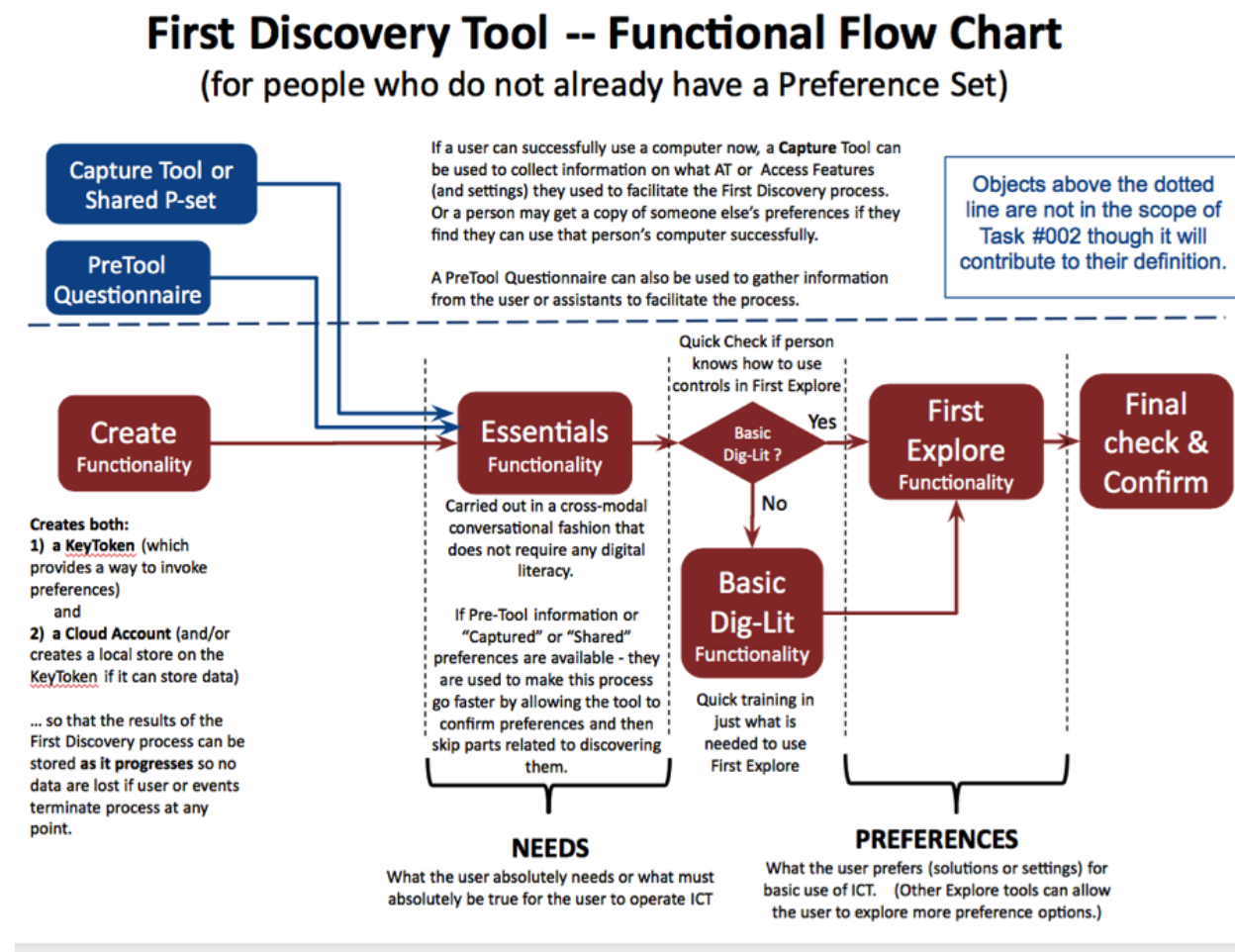


Figure 1. First Discovery Tool - Functional Flow Chart

The blocks in Figure 1 represent functions and flow, and do not necessarily represent modules or code blocks. Functionality may be implemented in different ways, iteratively or in parallel. In the process represented in the figure, First Discovery Tool(s) are used by people who do not currently have a Needs and Preferences Set. This includes both those who have never used a computer before, and those that have used a computer but do not yet have their needs and preference set.

For both groups, the process includes an **Essentials** function that determines what will work as input and output for users (e.g., if they are blind, visual presentation will not work, if they are deaf, sign language might be the most effective, etc.), and to determine the essential needs that must be met

in order for the user to be able to use a computer (or other ICT) at all. This functionality would be carried out in a manner that does not assume any digital literacy to start and would offer some minimal degree of digital literacy education for users who have no prior knowledge of computers or how to use them.

Once sufficient essential needs are determined, the user moves to **first explore** functions that allow the user to go beyond basic needs and determine which settings the user prefers (e.g., font size, font type, contrast, and highlight settings that are preferred when reading).

Task Order 0002 Notes:

It is unclear at this time where the delineation is between First Essentials and First Explore. We must go further in the co-design process to establish that delineation.

We will also explore how the First Discovery Tool(s) fit into the broader ecosystem of preference management tools and to what extent other parts of the ecosystem could be used for the exploration functionality. When do we move from the First Discovery of basic needs and preferences and when do we rely on other advanced and more expansive preference tools?

The **first explore** functions require use of on-screen controls, so this functionality would include enough digital literacy education (for those who need it) to ensure that the user can interact with the interface.

Task Order 0002 Notes:

Acknowledging that certain extreme use cases cannot be handled by any automated tool, we still need to determine if a minimum digital literacy is required for a user to engage with the First Discovery process, and exactly what further digital literacy would be taught by the First Discovery Tool(s).

Once the First Discovery process is complete, there is a final check to be sure that all the needs and preferences have been captured correctly and accurately. The functionality of these components may be implemented in different ways, iteratively or in parallel.

There are three external actions that could speed up the First Discovery process by providing information on user needs and/or preferences: Capturing, Sharing, and providing a Pre- First Discovery Tool questionnaire.

If the person is already successfully using a computer, a “**Capture**” function (which is being developed separately outside of Task Order 0002) can be used to pull information on the assistive technologies and/or access features and the settings. This can then be used to guide the Discovery process, which can significantly reduce the time needed to gather and confirm the user’s needs and preferences by narrowing the options that need to be explored.

Sometimes an individual may find that he/she can access a friend’s computer and ask the friend to share his/her own setting set (all or some of it). This shared set can then be used in the same fashion

as the captured settings. Users who bring captured settings should have the option of bypassing the First Discovery process altogether if they choose.

For those who have not used a computer, completion of a “pre-tool” questionnaire (see Requirement 18 for a discussion of a pre-tool) by the user or an assistant could be used to achieve the same ‘pre-information.’ This may not provide as reliable information as a “Capture”, but can still help facilitate the entire First Discovery process by providing guidance that can be easily checked and used to eliminate more time-consuming discovery processes.

1.4 Diverse Users of the First Discovery Tool(s)

Key to understanding this requirements document and the functionality described is understanding the range of users of the tool(s). In some cases, the end-user will use the tool(s) directly, without the involvement of an assistant, either because the end-user does not have an assistant to help or does not want assistance.

More often, however, the end-user will use the tool(s) with the assistance of another person. The assistant may be:

- a professional trained in both access technologies and the use of the First Discovery Tool(s)
- a professional trained in access technologies but **not** the use of the First Discovery Tool(s)
- a person trained in the use of the First Discovery Tool(s)
- a person with no training but interested in the user (family, friend, etc.)

The help of an assistant can greatly increase the probability of a successful First Discovery. It can be particularly helpful in recovering from problems that are caused by things that the tool(s) cannot detect, such as an interruption that could be misinterpreted by the tool as an inability to respond.

However, assistants can also complicate First Discovery, if they, for example, provide the wrong information based on incorrect assumptions about the end-user. If the tool(s) cannot detect and recover from misinformation or incorrect conclusions based on assistant input, the results may not be representative of the user.

1.5 Scope

The scope of First Discovery Tool(s) is as stated in the reports from Task Order 0001: Tools used “*to find out what the basic needs of a person are, needs that, if they are not met, would prevent the person from using the Information Communication Technology (ICT) at all.*” First Discovery focuses on initial, minimal settings required for basic access; it does not include refinement of preferences or exploration of different preferences for different tasks or environments.

The First Discovery Tool(s) developed for Task Order 0002 will be limited to the four application areas listed in the introduction of this document: Accessible Voting, Online Educational Assessment, Community-based Technology Support for Older Citizens, and Open Educational Resources (OER).

The requirements described in this document include those identified in the Workshop Report (deliverable 1.2) as well as additional requirements identified in subsequent discussions and analyses.

1.6 Terminology

Key terms used in this document are defined as follows:

Capture (functionality) - Recording information about a person's needs and preferences by looking at the access tools and features that a person is currently using, along with his/her settings.

Explore (functionality) - Allowing a user to explore different settings and different features/technologies within a context where the user can immediately see the effect of the new solutions or settings.

Preference Management Tool (PMT) - A tool that allows a person to view and/or edit the different preferences in their Needs and Preference sets, including different preferences or different preference sets that would be invoked in different contexts or by user choice. Usually a PMT will provide access to all of the preferences and sets, but PMTs could be designed that would provide more limited views or editing capabilities to meet the needs and or preferences of different users.

Integrator - A person with the authorization to add the First Discovery Tool(s) to the program for the organization; this person may also determine the allowable set of preferences to be changed. Examples include the chair of a county board of elections in the Accessible Voting area, and an educational technology coordinator of a school district and school district administrators in the Online Assessment area.

End-user - A person who uses the First Discovery Tool(s) to discover and record personal preferences.

Assistant - A person who helps the end-user in some capacity. As discussed in section 1.4 above, there are different kinds of assistants, depending on the application area and specific context.

KeyToken - Anything that a person uses to identify which preference set should be applied to meet his/her needs. The KeyToken could be a USB, a Smartcard, an NFC (near-field communication), or even a password that can allow the GPII to determine which preference set should be applied. Some KeyTokens (USB, NFC, etc.) can actually store preference sets themselves, eliminating the need for an internet connection to fetch the preferences. KeyTokens can be associated with a person's identity, or they can be anonymous (e.g., users do not identify themselves, just which preferences should be applied); some KeyTokens can be used both ways.

1.7 Design of this Specification

This specification is designed to be a working specification: Although the fundamental requirements will not change, the specification may be enhanced as new requirements are discovered during the co-design process. The design approach for achieving the requirements may change considerably as the tool(s) are iteratively developed and evaluated through the co-design process (involving stakeholder and SME input). Even the fundamental requirements and their motivations will be examined and may be extended as necessary.

For each of the requirements discussed in the section below, background information is provided describing how the co-design team identified and refined the requirement; outstanding questions are also highlighted.

2. Requirements

This section describes First Discovery Tool(s) requirements that are considered to be in scope for the prototype being developed for Task Order 0002. Additional features and capabilities deemed out of scope are described in Section 4 of this document.

The Workshop Report (deliverable 1.2) identified some requirements as specific to individual application areas. In subsequent discussions, it was found that most of these requirements were also applicable to other settings as well. A small set of requirements remained unique to the Voting area. The discussion below outlines the requirements common to all application areas, as well as requirements unique to Voting.

For tracking, analysis, and reporting purposes, the general requirements have been numbered 1 to 21, with the five Voting-specific requirements numbered V1 to V5.

2.1 Requirements Common to All Application Areas

Requirement 1: Flexible Presentation

The tool(s) must provide implementers with flexibility in the preferences they present to the end-user, the order in which those preferences are presented, and the visual design and presentation of those preferences in order to meet the needs of different application areas and organizational standards.

Background:

Different preferences will be relevant in the different application areas. For example, in the Voting area, different jurisdictions might use different voting technologies, making some preferences irrelevant. Even within a single application area, different preferences might be relevant in different organizations or contexts. In the Online Assessment area, preferences around supports for a mathematics test might include references to a calculator, but such preferences would be irrelevant for an English Literature test.

Task Order 0002 Notes:

This will be accomplished by using the Infusion JavaScript Framework, which is designed to support flexibility in configuration and interfaces.

Requirement 2: KeyToken & Save

The tool(s) must, at the start of the process, create a KeyToken (e.g. NFC, USB, etc.) – or work with a pre-created KeyToken – that can either a) store the discovered preferences internally (on the KeyToken) and/or b) be associated with a blank preference set on the GPII server so that the discovered preferences can be stored for future use. The KeyToken can be anonymous.

Background:

In order to prevent loss of information gathered during the process—should it be interrupted for any reason (e.g. equipment failure, fatigue, etc.)—the storage medium or location should be set up first. To allow the user to continue the process on another device (see Requirement 16), the storage would have to be associated with a KeyToken, but would not need to be associated

with the user in any way (unless the user chooses to associate the preference set with his/her identity).

In order for end-users to continue to use their discovered preferences, the preferences must be recorded in a way that they can be accessed at any time. The GPII infrastructure provides this functionality.

Task Order 0002 Notes:

This will be accomplished using existing GPII authentication and KeyToken support infrastructure.

We are exploring the use of both anonymous and ID related KeyTokens (e.g., a library card), the pros and cons, and the issue of user understanding of privacy implications of each. We do not seek to solve this, but are exploring it because it may have implications for the design of our tool(s).

Requirement 3: No Assumed Ability

Until it has been established and verified by the tool(s) that a user has a given ability, the tool(s) must not require vision, hearing, ability to use a mouse, keyboard, or touchscreen, the ability to read printed text, or the ability to understand and use icons, on-screen controls and other digital metaphors.

Background:

At the start of the First Discovery process, the tool(s) will not know what the person can and cannot do. A pre-tool (see Requirement 18) can give us some of this information, but that information should be confirmed with the user before being relied upon in the rest of the process. Until the tool(s) have confirmed that the person can see, hear, understand, and physically control the interfaces (both physical and on-screen), the tool(s) will need to interact with the user in a simple and parallel fashion that does not rely on any of these abilities individually.

NOTE: Someone who has none of these abilities and who requires an assistive technology or access feature that cannot be simulated by the tool(s) would be beyond the scope of the tool(s). See the next requirement regarding “Failing Gracefully” in a way that would help the user.

Task Order 0002 Notes:

This is one of the most challenging tasks of the project and one that has not been successfully done to date. A key result of this project will be significant progress on solving this problem.

Requirement 4: Fail Gracefully

In cases where the tool(s) are unable to interact with the user, the tool(s) must fail gracefully,

providing the user with a recommendation that they be seen by a professional and with guidance on how to do this.

Background:

The tool(s) created for this task order it will not be able to determine the needs and preferences of *all* users. Even with an assistant, the tool(s) will have limitations (and these limitations will vary depending on the assistant). If the tool(s) fail, users should not be left feeling that they failed, nor should the program give up and leave them without any guidance as to what to do as an alternative to use of the tool(s) to figure out what they need.

Task Order 0002 Notes:

We need to determine how to guide the user out of the tool(s) gracefully, or recommend an alternative to the user, given the fact that in some cases, the tool(s) may have difficulty communicating with the user and meeting the users' needs.

Requirement 5: Simple Navigation

The tool(s) must support simple navigation between and within screens, including keyboard navigation. The user must be able to go back to review and change previous input. This may or may not be linear, but complexity and efficiency should both be considered, and the balance may be different based on what is discovered about user needs and preferences.

Background:

Many of end-users – and their assistants – may have difficulty using the tool(s) if the navigation between or within screens is complex. Because some may need to navigate by keyboard, this navigation must be simple to understand and use.

Requirement 6: Diverse Assistants

The tool(s) must support use/engagement by varied types of assistants (formal/informal, trained/untrained) through ease-of-use and intuitive interfaces, including being simple enough to be used by non-technical users and assistants.

Background:

As described in section 1.4, there are many types of assistants with varying levels of technical knowledge and understanding of the First Discovery Tool(s) and of the end-user. The goal for each section within the tool(s) should be easily interpretable and quickly navigable by those in all assistant categories.

Some of the assistants (including sponsors or encouragers) that have been identified are: family members; community member assistants (such as found in senior centers, libraries, etc.); staff or volunteers at senior-oriented digital literacy programs; staff at government agency programs (office on aging); and clinicians at medical/clinical programs (low vision clinic). These assistants will represent a wide range of knowledge and skills with some having very little technical or disability skills or experience. Consequently tool(s) must be designed to be used easily with minimal knowledge or skills in order to be useable by all of the assistants.

Requirement 7: Essential Needs

The tool(s) must determine what the end-user absolutely needs in order to be able to perceive,

operate, and understand the interfaces used in later tools. This process must be accomplished without requiring that the user have any knowledge of, or skills with, on-screen controls (see Requirement 8).

Background:

Before end-users can explore possible preference values, the basic means of interaction with the system must be established. For example, if end-users cannot read and do not understand sign language, they need text read aloud to be able to perceive all text-based information presented to them.

If end-users cannot use a computer without access features that have not yet been provided, then they may have no knowledge or experience with on-screen controls. Until such digital literacy is taught to them (or they are tested for it), we cannot assume they could understand or operate on-screen controls, including buttons. Additionally, testing and teaching digital literacy requires that we first determine their needs regarding both output and input.

Task Order 0002 Notes:

This is related to Requirement 3, and is similarly challenging.

Requirement 8: First Dig-Lit

The tool(s) must determine what digital literacy concepts the end-user needs to understand in order to use the interface elements in the First Discovery tool(s), and must teach any concepts as needed.

Background:

While the tool(s) will not tackle the task of teaching digital literacy in general, they will use some digital interfaces and therefore need to ensure that the user understands and can use them prior to introducing them.

Requirement 9: Basic Preferences

The tool(s) must discover the end-user's initial set of basic preferences (e.g., how to display text to make it easiest for the user to read).

Background:

In addition to the essential **needs** of a user (e.g., the font must be larger than X or the person cannot read it), the tool(s) need to also capture the preferences of the user, or the preferences of the user for different tasks (e.g., which font size is preferred and works **best** for the user and for reading).

Task Order 0002 Note:

We will work with application area experts to determine what a minimal set will be. The original list is presented in Section 4.

Requirement 10: User Verification

The tool(s) must allow the end-user to verify that the preferences discovered by the tool(s) are the preferences they want.

Background:

The First Discovery process is an exploratory one and errors may be made by users and assistants along the way. Assistants might inadvertently make assumptions about the preferences of the end-user in their attempts to be helpful. It is important that end-users have the opportunity to confirm or correct any information that might have been provided by an assistant.

Before exiting the tool(s), the preferences should be double checked and confirmed. This may take different forms for different users: asking the user for confirmation for some settings, or doing a final objective test for others (e.g., limits of vision).

Requirement 11: Preference Import

The tool(s) must be capable of importing an initial GPII set of needs and preferences (captured or shared) that can be used to speed up First Discovery. Because settings may not be appropriate or optimal for the user (they may be shared settings from another, or inappropriately selected or configured AT for the person), these preferences must be verified by the user through the use of the tool(s) before being relied upon.

Background:

In some cases, the user may have access to a set of preferences (perhaps shared by an assistant or a friend) that may be helpful in getting them started in the First Discovery process.

Note: According to this requirement, First Discovery Tool(s) must **support** importing 'captured' or 'shared' preferences. It is not a requirement that the project develop such capture or sharing functionalities. These may be quite complex technically and developing the share or capture functions or tools themselves is beyond the scope of Task Order 0002.

Task Order 0002 Note:

The capture and sharing tools are still under development in other projects. This might affect how much of this we are able to do in this Task Order.

The First Discovery Tools(s) will not necessarily process all of the preferences in an imported set – only those dealt related to the First Discovery process (see note on Requirement 9). Preferences not used will be preserved.

Requirement 12: Preview

The tool(s) must inform the user of the effect of any preference setting during the First Discovery process.

Background:

It is important that the end-user learn not just what preferences can be set but what the intended effect will look/act like with a given preference set in a particular way.

Requirement 13: Undo

The tool(s) must allow users to undo the last preference setting at any instant in the process in a manner that will always be accessible to them.

Background:

Given the exploratory nature of First Discovery, end-users might try preference values and realize that they do not want them, perhaps because a chosen value makes the interface unusable, or because another preference makes another preference unnecessary. Users may accidentally or in error change a setting to one that puts the interface outside of their abilities, and therefore outside their ability to get it back to something they can use. During the exploration process, users must always be able to “back out” of any change they make.

Requirement 14: No Disability Declaration

The tool(s) must not ask end-users to declare they have a disability.

Background:

In many cases, older citizens may be unaware of their disability or may refuse to admit that they have an impairment. Consequently, the tool(s) must be designed to allow users to avoid declaring that they have a disability and instead focus on whether they are able to complete specific tasks.

Requirement 15: Auto-Save

The tool(s) must save needs and preferences as they are discovered.

Background:

The results of the First Discovery process should be stored as it progresses so no data are lost if users or events terminate the process at any point.

Requirement 16: Restart In-Place

The First Discovery process must be able to be completed over multiple sessions, and in subsequent sessions users should be able to start where they left off.

Task Order 0002 Note:

Restarting where the user left off at a different time or on a different system would require the user to identify the KeyToken associated with the intermediate preferences. We have not yet determined how this would be accomplished technically. If this specification requires association with the user, e.g., through the creation of an account, the user might be hesitant to create the account because they do not understand the implications. We will need to consider this and other factors.

Requirement 17: Reusable Preference Format

The tool(s) must save the end-user’s needs and preferences in a way that allows the end-user to retrieve and use them in other GPII-compatible systems.

Background:

The GPII uses a standard and defined format. If the preferences from the First Discovery Tool(s) are saved in this format, they can not only be used by GPII infrastructure itself, but also by any

other system that would like to make use of the needs and preferences.

Task Order 0002 Note:

We still need to determine whether or not a specific context (e.g. “desktop” vs. “tablet”) will be associated with the outcome of the First Discovery Tool(s).

Requirement 18: Pre-Tool Support

The tool(s) must support a pre-tool as a mechanism for assistants to seed the First Discovery process.

Background:

In the vast majority of use cases, an assistant will be available to provide the First Discovery Tool(s) with basic information about the end-user. This can help the tool(s) to more quickly determine what mechanisms can be used to communicate with the end-user (can the user see? read? hear? use a keyboard?). Without this minimal assistance, the process for an automated tool to discover the capabilities of the end-user may be onerous for many users.

Task Order 0002 Note:

For this Task Order, a pre-tool will cover language at a minimum. We will explore what other preferences might be included.

Requirement 19: Application Area Configurable

The tool(s) must support the ability to be configured by integrators (see definition in section 1.6) to have different preferences for different application areas.

Background:

In the OER application area, the need was identified for preferences related to cognitive supports. These needs might differ in different subject areas (e.g. math vs. art). In Online Assessment there may be different preferences for different testing areas or different types of tests. Voting may also present challenges that would best be met with different values for some preferences. Finally, tools aimed at Older Citizens may be more effective if they focus on the preferences most needed by this group.

Task Order 0002 Note:

See the Note on Requirement 1.

Requirement 20: Additional Tools Referral

The tool(s) must inform the user that preferences can be further refined using other preference explore and management tools in the GPII ecosystem.

Requirement 21: Device Support

The tool(s) must run on a device commonly found in the application areas.

Task Order 0002 Note:

We still need to determine what that device will be in each application area. Tablets will be

considered out of scope for Task Order 0002.

Requirement 22: Browser Support

The tool(s) must run on accessible browsers.

Task Order 0002 Note:

In Task Order 0002, we will test against Firefox on Windows and Linux, Safari on Mac OS.

2.2 Requirements Unique to Accessible Voting

Requirement AV-1: All Stages

The tool(s) must meet the needs of multiple interfaces and steps of the voting process.

Background:

The voting process often requires participation in numerous steps: voter registration, voter information, poll book and voting station. Not every voter will participate in all of these steps, so the First Discovery process needs to be available – but not required – at all of them.

Task Order 0002 Note:

For this Task Order, we will choose a representative sample of the different technologies used in these steps to demonstrate the concept.

Requirement AV-2: Machine Readable Output

The tool(s) must allow preferences to be output as machine readable codes.

Background:

In this application area, it is unlikely that systems will be connected to “the cloud” (where preferences would be saved), but it is possible that end-users will carry out the First Discovery process at one location (e.g., voter registration) and will need to apply those preferences at another (e.g., the polling station). The PGA co-design team discussed possibilities for the tool to output the discovered preferences in some machine-readable form that could then be carried to subsequent locations and applied automatically. Possible formats discussed include electronically on a memory stick and on paper in some form of bar code, among others.

Task Order 0002 Note:

For this Task Order, we will demonstrate this using one standard format.

Requirement AV-3: Time Limitations

The version of the First Discovery Tool(s) used in a polling place must support the time limitations at the polling place.

Background:

At polling stations, there are frequently lines of people waiting to vote. This creates social pressures to minimize the time spent at the poll. Any preference-setting process will need to be fast.

Requirement AV-4: No Internet

The version of the First Discovery Tool(s) used in a polling place must be able to function without any connection to the Internet.

Background:

At a minimum, it must support this while in the voting booth. But many precincts may not allow Internet connection– or it may not be reliable. Voting should not be prevented if this occurs.

Requirement AV-5: Machine Preferences Only

The tool(s) must be able to restrict preferences to functionality available on the voting machine.

Background:

If a voting machine does not have certain capabilities, the tool(s) should not bother to present preferences related to those capabilities.

2.3 Requirements Unique to Assessment

3. Recommendations and Ideas

The following recommendations and ideas are provided for consideration by the PGA co-design team. They are not requirements but rather further recommendations, or ideas for meeting one or more of the requirements above.

Recommendation 1: Inference Use

In all application areas, the tool(s) should support efficient use through inference wherever possible.

For example, the tool(s) might prompt users to make preference settings based on their performance during the First Discovery process.

Background:

For example, if a user repeatedly has difficulty hitting a button accurately, the system can infer that buttons might need to be larger.

Recommendation 2: Motivating

The tool(s) should be designed to motivate participation by end-users where that participation is voluntary through personalization of examples, gamification, etc.

Background:

In application areas where use of the tool(s) is voluntary, it is even more important for the tool(s) to be engaging, easy to use and fast to ensure end-users actually participate. In areas where the process is less voluntary, this requirement is less important.

Recommendation 3: Progress Indicator

The tool(s) should convey to the user how long the process will be how much left of it they have to

go where possible.

Background:

One of the primary concerns that the co-design process identified is the need for the First Discovery process to avoid being lengthy or intrusive. A conversational style was discussed, for example, a sequence of questions or screens. The team discussed the concern that a one-at-a-time process might leave the user wondering how long the process was going to take, and felt that some form of status or progress indication would address this concern. However the fact that the answers to some sections may eliminate the need to carry out other sections means that it may not be possible to tell how much more is yet to be done.

Recommendation 4: Embeddable

The design should consider the fact that the tool(s) may be embedded in other applications.

Background:

In the discussions, it was mentioned that in some applications it may be desirable to embed the discovery process in another tool or process. Exactly what that process would look like is not known so it is not possible to ensure this. But during the design this type of implementation should be kept in mind.

Task Order 0002 Note:

This recommendation is facilitated by the open source nature of the software, and by its use of Infusion and the GPII architecture. This infrastructure is designed to support the creation of tools that are to be embedded in other applications.

Recommendation 5: Embeddable First

It should be possible to embed the tool(s) in an existing system such that it is the first thing that a user encounters.

Background:

Because the First Discovery process is, by nature, the first thing that some users will have to do, it must be possible for an integrator to add the First Discovery Tool(s) to a system as a first step.

Recommendation 6: Security & Privacy

The tool(s) should support the ability to add whatever privacy and security measures are employed by integrators in different environments.

Background:

Despite the need for transferability of PNP files between devices, contexts and locations, most contexts require some degree of security and privacy. Each application area has particular requirements.

Recommendation 7: Documentation

Documentation should be provided describing how to configure the tool(s) and how to use the interface.

Design Idea 1: Multi-screen

The tool(s) might support multiple screens.

Background:

In an assessment environment, an education professional may be present with a student to ensure that the student's mandated accommodations are provided. The educator should be *able* to monitor student progress and the settings the student is selecting. The educator should be able to assign some settings but allow the student to adjust them. For example, if a student has been approved to use text-to-speech, the teacher might enable that, while allowing the student to set a voice, speech rate, and volume. Depending on the context (high stakes assessment or assessment during learning) there may be some preferences the student is not permitted to select.

Task Order-002 Notes:

Can we derive a formal requirement from this? How do we engage assistants? This method might not be the only way.

4. User Needs and Preferences

This section identifies the specific user needs and preferences that may be made available through a First Discovery Tool(s). The tool(s) would capture, manipulate and apply these needs and preferences, as applicable to the area they are designed for. These needs and preferences include those identified in PGA Workshop 1 as well as others that have arisen in subsequent discussions. This list is still a work in progress, and the final list of needs and preferences to be covered in the Task Order 0002 First Discovery Tool(s) prototype will be determined through additional work and discussions by the team, the application area experts, and other stakeholders. The needs and preferences include:

- Language: which natural language the content would be presented in
- Text size: the size of the text on screen
- Letter-spacing: the spacing between letters in words
- Line-height: the height from the bottom of one line to the bottom of the next
- Color scheme: what color combination the user needs/prefers for text and background
- Contrast level: whether the user needs/prefers high or low contrast
- Magnification factor: the magnification factor based on ratio of heights
- Volume: the auditory volume level
- Text-to-speech: whether text presented to the user will also be read aloud to them
- Highlighting: whether text should be highlighted as it is read aloud
- Screen voicing: whether all information presented visually should be read aloud (including icons, image, information conveyed through layout, etc.)
- Speech rate: the rate at which speech is read aloud, expressed in WPM
- Braille: whether information should be output in braille
- Captions: whether all speech and other important audio information should be presented as text
- Show sounds: whether all alerts and sounds should be presented visually

- Sign language: whether all text should be presented using sign language
- Voice (male, female): the type of voice used for speech output
- Alternate to touch screen: whether to enable an alternate pointing method instead of a touch screen
- Keyboard control of mouse (e.g. mouse keys)¹: whether to enable keyboard control of the mouse pointer
- Full keyboard control: whether to enable full control of the device using the keyboard only
- Voice control: whether to enable voice control of the device (this need has an obvious limitation in the Voting area)
- Breadcrumbs (high priority for OER): whether to enable an indication of the path the user took in getting to the current screen, including the ability to jump back to any point on the path
- Reminders (high priority for OER): whether to provide reminders of tasks to be completed
- To-do lists (high priority for OER): whether to provide a list of items the user needs to complete
- Tremor filtering: a function that applies a low pass filter to remove tremor from pointing motions
- Bounce Keys: a function that applies a delay before accepting the same keystroke twice, which can remove keyboard errors due to tremor
- StickyKeys: whether to enable full keyboard without any simultaneous key presses
- SlowKeys: adjusts the amount of time between when a key is pressed and when it is activated
- plain language: whether to enable simplified language

Task Order 0002 Notes:

The iterative co-design/development process will identify which subset of these preferences will be implemented for Task Order 0002, as well as which would be considered part of “essentials” (i.e., needs) vs “explore” (i.e., preferences).

The interaction between preferences for text-to-speech and screen voicing will need to be investigated: For example, if a need for text-to-speech is identified, would a new user understand the difference between text-to-speech and screen voicing?

5. Requirements Outside the Scope of Task Order 0002

Task Order 0002 is limited in time and funding, and some desired features needed for First Discovery are not attainable. First Discovery requirements deemed out of scope for Task Order 0002 are listed here for implementation in future releases. These requirements are designated by OOS (Out of Scope) followed by a number representing the requirement number.

OOS 1: Assistance on Demand

¹ Alternative input devices that work by mimicking a mouse or keyboard do not need a preference to turn them on; systems would accept them automatically. If supporting software is required, a preference is inadequate.

The tool(s) must provide Assistance on Demand.

Background:

Assistance on Demand (AoD) is a vehicle to provide remote assistance, with the intent of replacing or supplementing in-person assistance by a professional or non-professional. AoD offerings should be contextual in that they must be aware of where the user is in the First Discovery process.

While this is desirable, it is out of scope to provide it as part of this project. It is also hard to see how this would be prevented. It is listed here to be sure we do not do something accidentally to prevent this in the design of the tool(s).

OOS 2: Dashboard

The tool(s) must support a dashboard tool with settings and metrics about learner performance that also enables user input on preferences.

Task Order-0002 Notes:

This requirement needs further discussion. Does this relate to metrics for learning, or assessment? Or metrics regarding the First Discovery process?

OOS 3: Authorization Model

The tool(s) must provide an authorization model for preference tool configuration.

Background:

This refers to identifying preferences, and otherwise configuring the tool(s). Only an authorized person should be able to do this.

OOS 4: Administrative Interface

The tool(s) must provide administrative interface that allows assistants (professionals, teachers, etc.) to configure the tool(s) with respect to reading level, alternate presentation of preference choices, etc.

OOS 5: Educational Data Import

The tool(s) must collect data from other forms of educational assessments.

Task Order-002 Notes:

We need to determine if this is actually within scope of First Discovery.

OOS 6: APIP Verification

The tool(s) must verify existing Needs and Preference statements as used in an APIP statement.

Task Order-002 Notes:

This will be supported so long as the GPII includes a translation for the APIP preference set.

6. Note on Universality

As part of the PGA co-design process, we frequently encounter an important issue in our design exploration regarding whether universal First Discovery Tool(s) are possible. That is, can we design a tool or tools such that any user, with any constellation of needs and preferences, can enter, use, and complete them? Assuming we can frame interface options in such a way that no unjustified assumptions are made, that we can create a flow that encompasses all possible user capabilities in a correct order, such a tool is theoretically feasible. For example, we could ask about the need for captioning before asking about audio volume preferences.

However, such a tool might be confusing, overwhelming, long, and thus daunting to most users, many of whom might abandon it if they could. This would be especially true for people with cognitive disabilities, those who are using the tool voluntarily, and those who are using it without assistance. That is a large enough segment to warrant concern.

We believe we have proposed requirements to address these issues: importing current device settings; using as much information about the user as possible; modularity and flexibility that reflect the use environment so that user experiences are manageable; allowing different versions to be created, etc.

In the end, only suitable user testing and expert walkthroughs in real environments of use will be able to provide answers to this design dilemma.

Appendix A: Checklist of Requirements

The tables below are a compilation of First Discovery requirements, and will serve as a means of tracking and a checklist throughout the co-design process.

Requirements Common to all Application Areas

No.	Requirement Name	Requirement Met?
1	Flexible Presentation	
2	KeyToken & Save	
3	No Assumed Ability	
4	Fail Gracefully	
5	Simple Navigation	
6	Diverse Assistants	
7	Essential Needs	
9	First Dig-Lit	
10	Basic Preferences	
11	User Verification	
12	Preference Import	
13	Preview	
14	No Disability Declaration	
15	Auto-Save	
16	Restart In-Place	
17	Reusable Preference Format	
18	Pre-Tool Support	
19	Application area Configurable	
20	Additional Tools Referral	
21	Device Support	

22	Browser Support	
-----------	-----------------	--

Requirements Unique to Voting

No.	Requirement Name	Requirement Met?
V-1	All Stages	
V-2	Machine Readable Output	
V-3	Time Limitations	
V-4	No Internet	
V-5	Machine Preferences Only	

Appendix B: Considerations When Designing for People with Disabilities

- Never automatically advance in a presentation or webpage.
 - It might take some users longer than the allotted time to read and comprehend the material.
- Avoid using a first-person perspective for the computer.
 - The user might try communicating with the computer as if it is a human.
- Higher contrast is not always better.
 - Some users have difficulty reading text with extremely high contrast and require alternative text and background colors.
- Never rely on “No Response” as a response option.
 - Similar to automatically advancing a presentation, the response may not be what the user intended if it takes a user longer than the allotted timeframe to process the information.
- When repeating a message in sign language, always include motions to get the user’s attention.
 - We cannot assume that a user is looking at the screen at all times, so starting with “Let me say it again...” or something similar can be used to draw the user’s attention to the screen.
- Talking very slowly is actually counterproductive.
 - When someone talks slower, users could forget what was said earlier in the sentence.
- Tell a user what to do rather than what not to do.
 - If a sentence is in the format “Don’t do _____,” the user might hear the last part of the sentence and simply do it. (e.g. “Don’t press the red button” ---> User might only hear or remember “Press the red button”)
- Always provide instructions with the Available Option first and Action Required second.
 - If the required action is described before the user is told the outcome, the user might perform the action before hearing what the action does. (e.g. “For English, press 1” rather than “Press 1 for English”)
- To understand how a screen might be viewed by someone with low vision, try looking at the screen through a “soda straw”.
 - When only a small portion of the screen is visible at one time, a layout that otherwise seems intuitive can be confusing.

- Use 1.5 line spacing when possible.
 - White space between lines prevents users from rereading or skipping sentences.
- Minimum of 18 point font preferred when possible.
 - Larger text is easier to read for everyone.
- Break up multiple-step tutorials so only one step occurs at a time.
 - Reduces mental load. Some users have difficulty remembering several things at once.
- Remove screen clutter when possible.
 - Reduces mental load. Presenting multiple elements on the screen can be distracting.
- Use plain language whenever possible.
 - Reduces mental load. Some users have limited vocabulary. Some users aren't able to understand metaphors or new definitions for common terms. Some users take things literally.
- Provide direct and immediate feedback when possible.
 - Explaining mistakes immediately can help users learn concepts faster.
- Encode information in several formats (location, shape, color, etc.)
 - Users might not be able to understand or perceive one of the formats, so having multiple increases the likelihood that they will be able to receive the information.