Prosperity as a Model for Next-Generation Accessibility

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Abstract. We propose a multisided platform approach that is user-based but seeks to provide an infrastructure that supports all stakeholders, making it easier for vendors to design, market and support access features, products, and services and that makes it easier for consumers to find, secure, and use access features, products and services, individually or mixed, on any device they encounter. The system is designed to support use by both mainstream and assistive technology developers and to draw new people into the ecosystem in new roles including developers as resources and users and clinicians as developers. Central to this latter role is a developer space that provides rich resources in the form of tools, component, frameworks, service infrastructures, guidelines, how-to's, mentors, testers, and marketing aids to help both experienced and new developers enter the market and to broaden the range of people contributing to include both non-disability-related researchers/developers and less technical consumers and professionals.

Keywords: Accessibility, inclusive design, personalization, GPII, infrastructure.

1 Introduction

The current accessibility ecosystem is based on a competitive push model where companies compete and consumers choose from what is offered to them that they can afford. This model has worked well for many consumer goods, especially for the mass-market and middle-of-the-curve consumers. However it has not worked well in the assistive technologies and accessibility area where it is too expensive to market to the tails' of the distribution tails (those with lower-incidence, severe, and/or mixed disabilities). The Prosperity4All project was proposed to attempt to address this problem and to help develop an ecosystem where more people can be involved in the development process, and were cooperation on common components is mixed with

competition on new capabilities to reduce duplication of effort and create a more diverse and cost effective mix of solutions.

While no project, group or consortium can create an ecosystem, the purpose of the Prosperity4All project is to build key elements of infrastructure that can help the current ecosystem grow in new directions, and develop the capability to profitably benefit all stakeholders while addressing the needs of those not currently addressed by the current ecosystem.

1.1   A User-Based, Multisided Platform/Infrastructure

Prosperity4All (Prosperity for all) is not a promise, but a requirement if any ecosystem is to succeed.   If we only attend to the needs of some of the stakeholders then the ecosystem will fail. The Global Public Inclusive Infrastructure (GPII) is an attempt to build a multisided infrastructure that provides support to all stakeholders.   Other projects are working on building the parts of the GPII that would   enable users to find the best solution(s) to match their needs, and to allow them to invoke these solutions anywhere, on any device.   The Prosperity4All project focuses on building the portions of the Global Public Inclusive Infrastructure that foster the development of more new, diverse, better, and more affordable solutions so that affordable solutions exist for all users, with all types, degrees and combinations of disability, literacy, digital literacy and aging, in all countries.

To be successful this infrastructure must address the needs of all stakeholders.

- **For users – it must result in a rich set of solutions and services that match their diverse needs.** This includes the ability to use whatever technologies they are confronted with school, work, and their communities, when they vote, when they travel, and they use their health system, when they shop, etc.It also includes the ability to live more independently yet get affordable Assistance on Demand if they need it from family, friends, communities, volunteers, or commercially, if they run into a problem that they cannot handle. It also includes the ability for consumers to be more closely connected to the development processes and people that are generating solutions for them, thus offering a better match between actual needs and abilities, and the realities of their lives.
- **For developers – it must provide the tools and systems they need to more affordably develop, market, and support products that can address the full range of platforms and technologies their customers need to access – in a profitable manner**. This includes better information on the full range of needs for the different market segments, better tools for creating and localizing products that can be sold internationally, ways to reach their users especially dispersed and low incidence users in a much more cost-effective manner, components that can be used to build new products without having to develop them from scratch, especially with regard to emerging technologies such as BCI, advanced eye gaze or gesture (hand and body) recognition, multilingual speech recognition, advanced structure recognition, AI, etc.

- **For mainstream companies - it must provide a way for them to identify the features that they can and should build into their products as well as a means to do so affordably**. If there are accessibility requirements, it needs to help them to address these in a cost-effective way. Where there are no accessibility requirements, it needs to provide them with business cases for the features and tools, information, resources, etc. needed to build them in at low enough cost and with accompanying sales to make the business case. Part of this includes the ability to ensure that those people that can use their access features are aware of the company's products and the access features that the user needs.
- **For clinicians, educators and other professionals – it need to provide a better mechanism to keep track of the rapidly changing array of solutions, the devices and platforms they will work with, which solutions will work with which other solutions without conflict, and which devices, software, or services match the individual needs of each of their different patients/students/clients**. A mechanism is also needed to better connect these professionals with the processes and people generating the solutions so that these professionals can also impact and help direct the development of better solutions for those they are assisting.
- **For schools, libraries, and other public venues that are increasingly relying on ICT, it must provide a realistic and affordable mechanism for them to be able to ensure that their ICT will work with the full range of students/patrons of their facilities**. This includes a way for them to have all of the different types of solutions that would be needed by students/patrons with their individual needs without having to purchase each new solution for each user group that comes out each month. Includes a solution that can allow their IT department to maintain the security they require. It must also provide a mechanism which can be maintained by the individuals at these venues without requiring that they are accessibility experts or even information technology experts.
- **For service providers and NGOs - it needs to provide the information these agencies need to be able to determine which types of solutions would be effective for the different individuals they are supporting, and to provide new models for funding access solutions** when they must change so rapidly in order to keep up with changing technologies in these users environments.
- **For governments - it needs to provide more cost-effective mechanisms for the governments to ensure that the people in their countries can be maximally productive and prosperous in an increasingly digital world even if they face barriers to ICT use due to literacy, digital literacy, disability, or aging**. For countries that do not have the assistive technology or access solutions they need to meet the needs of their people, the ecosystem must provide a way for them to create an effective and economically viable access technology and services infrastructure within their country that can meet the language and cultural needs of their country.

Prosperity4All aims to work collaboratively to make progress toward all of the above facilitating a holistic integrated approach to the design, development, integration,

deployment, operation and sustainability of AT technologies and interfaces, regardless of the user's needs/preferences, desired applications and location.

2   Understanding the Structure and Flow of Prosperity4All

The Prosperity4All project is based on meeting user needs. However, the users are not just the end-user or 'consumer' but also include the clinicians, teachers and others who support them, who purchase the access technologies etc. They are all important parts of the ecosystem, and the infrastructure needs to work for all of them. Figures 1 through 5 below present the overall concept of the Prosperity4All infrastructure and its interaction within the ecosystem.

We start with consumers - who need special access technologies in order to use the ICT and MATERIALS they encounter.

- But solutions are not available for
  - users with all types, degrees, and combinations of disability / literacy / digital literacy / aging
  - for all devices they encounter and have to use,
  - and at costs they can afford.
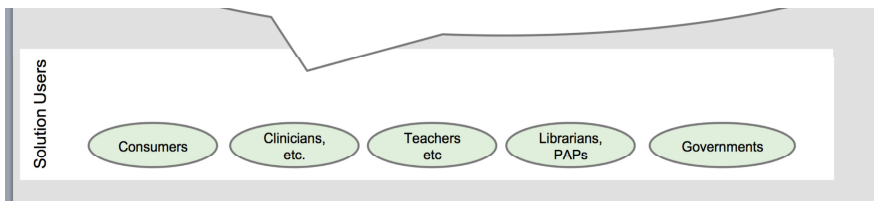- a problem that is felt both by consumers and by those who are trying to serve them

Fig. 1. Consumers, those working with them are the starting point of the ecosystem

We add the Access Solution Developers and Providers.

- Their role is to provide the access solutions the users need.
- But they have trouble reaching more than 3-15% of those they need to serve.
- They have trouble keeping up with all the technologies and platforms being introduced (and updated continually).
- They are not able to create solutions all the technologies in all of the different life domains in which users encounter technology they are required to use.
- The cost to deliver, especially to low incidence groups, is so high that they cannot get their prices down to where many users need them to be.
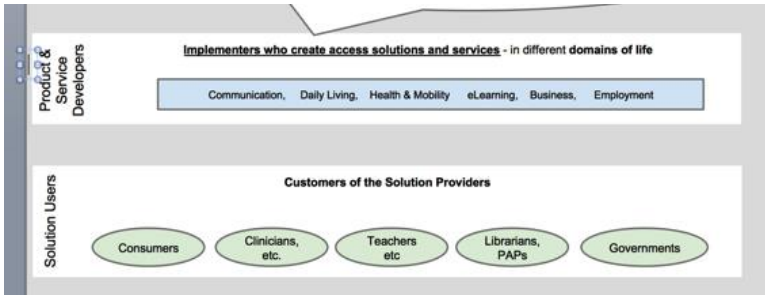
Fig. 2. Access solution developers and providers join the ecosystem in order to provide the access solutions that the users need

This project is about creating an international public infrastructure to facilitate the developers and providers in order to

- Help lower the costs to develop new solutions - and to keep up new technologies
- Help them increase their market reach and penetration - internationally
- Help them (affordably) create solutions for all of the groups who are too small for them to be able to serve today
- Open new types of assistive services they can provide to address unmet needs
- Better connect them to consumers that might use their products if they met or better met the users' needs
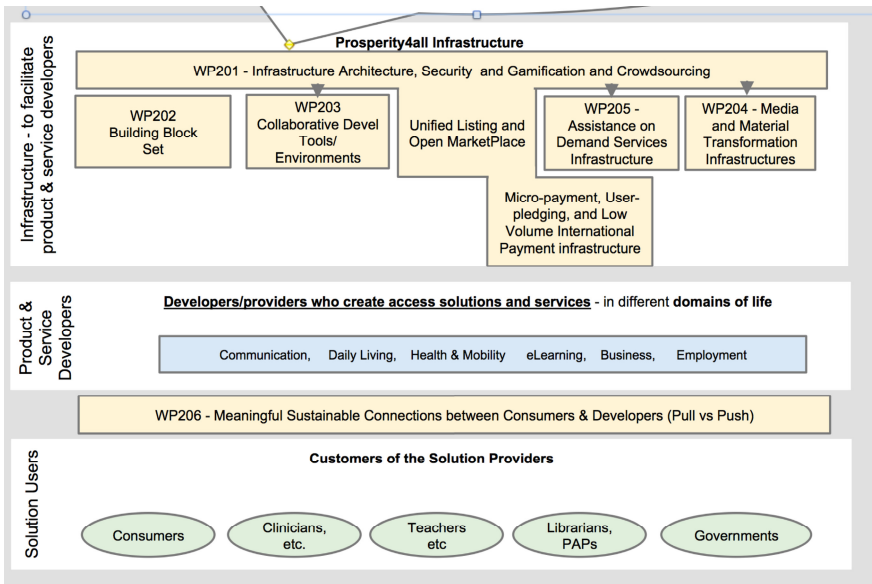

Fig. 3. The core of the Prosperity4All project is the building of the infrastructure to enable developers and providers to develop open, broadly applicable and cost-effective solutions that cover the full range of users and environments/contexts

Such an infrastructure must be constructed to function within the complete ecosystem of developers, vendors, service providers, 3rd party funders, governments and families and support groups.   And to be successful and sustainable

- it must be built on sound business and economic principles;
- civil rights, volunteerism or social responsibility will not keep all the players in place;
- rather the ecosystem must be based on value propositions for each of the stakeholders that are needed for the ecosystem to work.   They must all prosper or they will not be there to play their role.
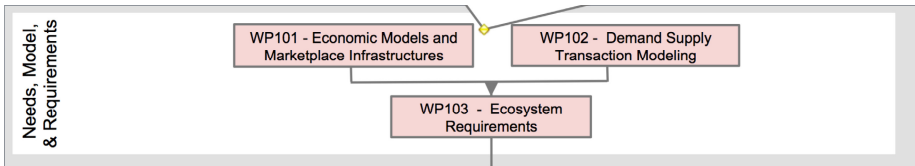
Fig. 4. The Prosperity4All Infrastructure cannot be isolated from the wider ecosystem of developers, vendors, service providers, third-party funders, governments, families and support groups

And of course, any infrastructure, and especially a new one, must be continually evaluated at many levels throughout the development process, and later, operation.
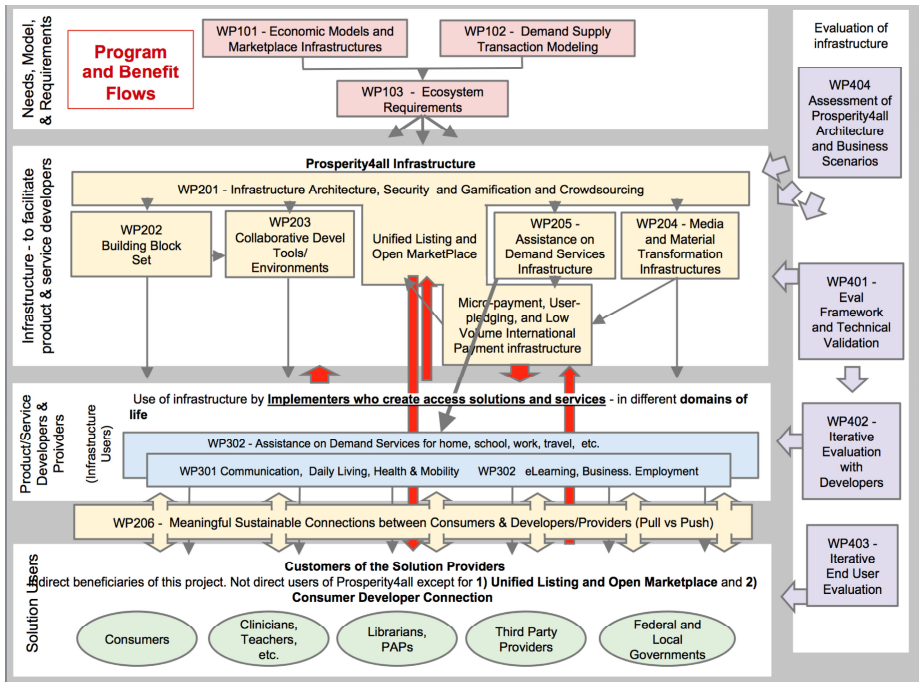

Fig. 5. Continual evaluation of all components of the Infrastructure

3   The Proposed Infrastructure and DeveloperSpace

In the center of the Prosperity4All project is the infrastructure to be constructed and the roles it plays for developers and users alike.   The DeveloperSpace is the name given to the virtual workspace in the cloud that will house the component library, the frameworks, the service infrastructures, payment infrastructures, and other components that stakeholders (incl. "professional" or "amateur" developers) need to create accessible products and services.   First we look at the function that the infrastructure/Developerspace will provide.   Then we will briefly list some of the characteristics of the DeveloperSpace (DSpace) to facilitate its use by companies, researchers, consumers and professionals alike.
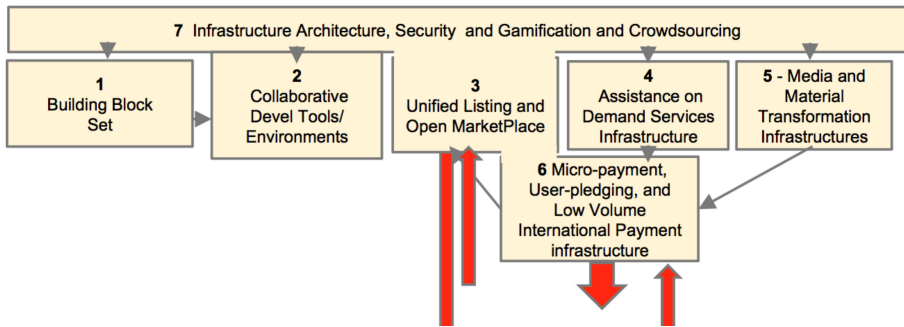

Fig. 6. Prosperity4all Infrastructure Components

Components of the infrastructure include:

1. **Building Block Set:**   A component library to make it easier, faster, cheaper to create new solutions and to contribute to field.
2. **Collaborative Development Tools/Environments:** Tools and frameworks to reduce time and expertise needed to create solutions.
3. **Unified Listing and Open MarketPlace:** A Unified Listing of ALL solutions: (both AT and Mainstream) - with an Open Market - to allow any solution to easily be discovered and Marketed Internationally
   - Vendors of any size who can't create their own marketing system or can use the Open Marketplace to reach internationally and sell in any domain, in any geographical location.   Users can find all products in all Markets (Apple, Google, Microsoft, AT Vendor, CE Vendor etc.) in one Unified Listing that brings together ICT access info from all over – and makes it available in one place – while pointing out to the various marketplaces where they can be found.

4. **Assistance on Demand Services Infrastructure:** Infrastructure to make it easy to set up both Personal and Professional Assistance on Demand Services.
5. **Media and Material Transformation Infrastructures:** Infrastructure to make it easy to set up Document trasformation and Media Access Services. – whether the intent is to deliver internally or internationally.

6. **Micro-payment, User-pledging, & Low-Volume International Payment Infrastructure:** International fiscal system interwoven into the infrastructure so that anyone, anywhere can make employment from any and all aspects of **development** and **delivery** of **parts**, **solutions** and/or **services**.
   — Users can pay for product or services in any coin in any amount and vendor or service provider gets it back in their coin.
   — Individuals can function as both users and verdors of services

7. **Infrastructure Architecture, Security and Gamification and Crowdsourcing:** Entire Infrastructure based on Crowd contribution and Gaming Principles (small tasks, challenging, failures quick but investment small, quickly-frequently rewarding, progressive, etc.) to entice and engage new 'players' with new skills

Standardized Modular Infrastructure to make it all work together seamlessly,   and work with Auto-personalization of Cloud4all/GPII to auto-deliver

   — access to ICT access;
   — accessible/transformed Materials;
   — accessible/augmented Media;   and/or
   — Assistance   on Demand;

to meet each user's needs.

4   DeveloperSpace Role and Characteristics

The Developer Space is being designed to connect designers and developers to a larger community of accessibility and usability resources, expertise, and tools. This work will include:

- the establishment of a network of contributors from across a variety of projects and communities, addressing the fragmentation of knowledge that is a typical problem within the accessibility field
- the creation of collaborative forums/tools that will help close the gap between developers and end-users, providing a means for users to influence and participate within the design, development and testing process more actively
- a means for searching, browsing, and contributing (i.e. a set of "libraries" or "shelves") relevant third-party development tools, frameworks, components, and open source applications categorized by type of development need (e.g. JavaScript frameworks, I/O libraries, testing tools, CSS frameworks, etc)
- the creation of a tool to help localize user interfaces into different languages, which can be connected to automated translation tools to allow for crowd-sourced correction. This activity will include a contributed effort from MADA, who have extensive experience with Arabic localization issues.

5   Conclusion

Described is a proposed infrastructure to allow the accessibility ecosystem to either evolve or add a dimension that can better meet the needs of people with low-incidence disabilities, or who have resource limitations that prevent them from being served today. Whether this infrastructure with its tools and services can effect this change, whether it is designed properly, and whether the ecosystem is interested in evolving in this way are open questions. The Prosperity4All project is designed to explore and test these. It is unlikely that the infrastructure will look exactly as described above at the end of this process, and input from all stakeholders is sought throughout the project as are collaborators interested in assisting with or extending any of the components of the infrastructure or ecosystem.