

Prosperity4All – Setting the Stage for a Paradigm Shift in eInclusion

Matthias Peissner¹, Gregg C. Vanderheiden², Jutta Treviranus³, and Gianna Tsakou⁴

¹ Fraunhofer Institute for Industrial Engineering IAO, Stuttgart, Germany
matthias.peissner@iao.fraunhofer.de

² University of Wisconsin – Madison, Madison, WI, USA
gv@trace.wisc.edu

³ OCAD University, Toronto, Ontario, Canada
jtreviranus@faculty.ocad.ca

⁴ SingularLogic S.A., Nea Ionia, Attica, Greece
gtsakou@singularlogic.eu

Abstract. This paper provides an overview of the recently started Prosperity4All project. Prosperity4all aims at a paradigm shift in eInclusion. It focuses on developing the infrastructure to allow a new ecosystem to grow; one that is based on self-rewarding collaboration, that can reduce redundant development, lower costs, increase market reach and penetration internationally, and create the robust cross-platform spectrum of mainstream and assistive technology based access solutions required. This will be done through a process based on true value propositions for all stakeholders and resulting in a system that can profitably serve markets as small as one, at a personally and societally affordable cost.

Keywords: Accessibility, ecosystem.

1 Introduction

In our global society, access to information and communication technologies and services is increasingly becoming essential for everyone, leaving those who cannot effectively access and use these technologies at risk of exclusion from education, employment, commerce, health information, and almost every other aspect of daily living and civic participation. Those at risk include those who cannot use ICT and services due to disability, low literacy, low digital-literacy or aging related barriers.

In the past those who could not access these technologies could get by, avoiding technology entirely. However, ICT is now becoming so engrained in all aspects of society that this is no longer an option. If we cannot provide access to these groups they soon will be unable to participate in education, employment, commerce, our health system, transportation, or even daily independent living. This need to ensure that everyone is able to access and use ICT however is occurring at the same time we

are facing something of a *perfect storm* in accessibility; where a number of factors are all coming together at the same time to create a fatal combination.

1. *Fewer resources*: The new economic realities mean that we will have less resources to address the needs of this much larger population.
2. *Many small groups – together large*: The problem is broader than just disability and includes people facing barriers to ICT from disabilities, literacy, digital literacy, and aging. All of these groups are threatened with an inability to participate as we continually ‘technify’ everything around them. Although it is many small groups, they are cumulatively large, around 2 billion worldwide (cf. [1, 2, 3])
3. *We never were reaching a reasonable fraction*: We must recognize that, even in the developed countries, we were never reaching more than a small fraction of those who needed special access technologies or features to effectively use ICT. There are no solid data, but assistive technologies (AT) manufacturers estimates of their market penetration, although varying widely, all fall in the very low range of between 3% and 15% of those that need AT being reached, cumulatively.
4. *Focus on the “mainstream” disabilities leaving the tails unaddressed*: Current solutions tend to focus on the larger populations or mainstream disabilities, with fewer or no solutions for individuals at the tails of each disability distribution. With all the types, degrees, and combinations of disability, (digital) literacy, and aging, a large portion of the threatened group falls outside of the mainstream category where all of the current focus lies, and in one of the many ‘tails or ‘tails of the tails.
5. *Existing solutions focus on biggest few platforms*: A majority of the existing solutions are for one or two major platforms. Yet industry, consumers, and public entities are moving to a wide variety of platforms (operating systems, browsers, mobile technologies, etc.). With the rapid proliferation of platforms developers and vendors are completely unable to address all of these groups, across all of the devices and platforms that these groups are encountering in daily life.
6. *Not just devices, also e-documents, media, and services*: The problem extends beyond devices, and also includes document and media access.
7. *Not just vendors and consumer, also providers*: The rapid proliferation of platforms, devices, and solutions is leaving those who must deliver accessibility (clinicians, educators, libraries, public access points, etc.) confused, perpetually behind, and unable to track or understand what is available, much less which solutions would be best or even effective for their different target groups.

So we find that we not only are not able to provide access to everyone who needs it, but we are actually losing ground. A main problem is that our current eInclusion ecosystem cannot serve but a fraction, focuses on "majority disabilities", cannot address the tails, and is losing ground as technology accelerates and proliferates.

In our recently started EU-funded project Prosperity4All we will create the infrastructure from which a new ecosystem can grow over time that can address these problems. This work began with the FP7 project *Cloud4all*, and is part of an international effort to create a *Global Public Inclusive Infrastructure* (GPII, [4]).

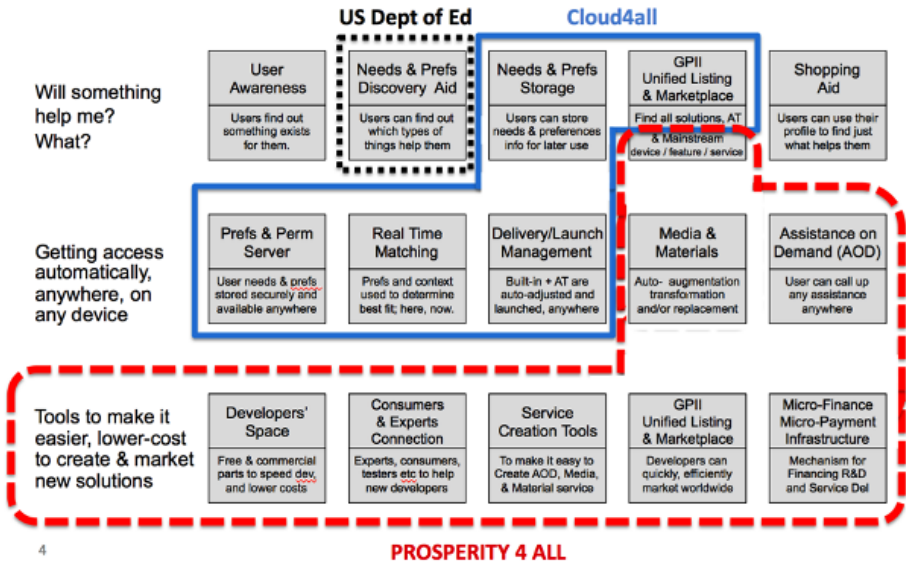


Fig. 1. The Global Public Inclusive Infrastructure (GPII) and its relation to Prosperity4All and Cloud4All

2 The Prosperity4All Vision

We have identified 14 requirements that any such ecosystem must meet. Prosperity4All is built around these requirements, with the requirements becoming the Prosperity4All long-term vision. Prosperity4All is providing the infrastructure and building blocks necessary for reaching the following post-project vision.

1. *Reduce costs*: For developers, vendors, service delivery personnel, public access points, consumers, companies, and governments.
2. *Address the full range of users*: including disabilities, literacy, digital literacy, and aging.
3. *Address the tails and the tails of the tails*: We can no longer ignore the tails and focus only on the larger groups where it is easier, where there is a larger market, or where there is more return on investment. We need some mechanism to shrink the “unprofitable” so that special measures are affordable to reach them.
4. *Address all technologies*: platforms, OSs, devices, systems, etc. that a person encounters in their lives where they have to use them in 5, 10, and 15 years.
5. *Provide a plan for creating a vibrant and profitable AT market*: Although it would be ideal if all mainstream products could have interfaces that could adapt to the needs of any user, we do not currently know how to do this in any commercially practical fashion, across all disabilities and technologies. We will need AT and will need it for a long time.

6. *Decrease costs and expertise required of mainstream companies:* Modern technologies have the ability to present flexible interfaces that can adapt to the needs of a wide variety of users. However, the expertise to do so is not within all of the company design teams who will be developing these interfaces. Companies are still struggling with usability for the masses. We need to solve this problem in some other way than expecting mainstream industry to become experts in accessible design for any but very mild.
7. *Do a better job of moving research and development to market:* Most current eInclusion R&D reaches life's end at project review or publication, and is not making it to market and into the hands of users who need. We need to direct research energies better and make it easier to get good ideas out.
8. *Involve consumer expertise in product development:* This is easy to say but hard to do in commercial development processes. This needs to be easier and more effective.
9. *Be based on realities, business cases, and value propositions:* although equal access to information technologies is rapidly being recognized as essential for equal participation, progress in this area is not likely to occur if there is no business case or value proposition for the players that are expected to carry it out. Any proposed ecosystem for the creation and delivery of such solutions therefore must be based on economic realities, business cases, and hard value propositions for the implementers.
10. *Recruit and engage more and different players:* We currently do a poor job of enticing and engaging much of the best scientific and technical talent in our society. To address the above challenges we will need to tap the best and brightest, not only in accessibility or inclusion, but the best in other focused scientific and technical areas as well. Any new ecosystem needs to provide a mechanism to allow people to contribute to this area without dedicating themselves to the area, or even having a deep interest in learning much about the area. We also need to be able to figure out how to engage our clinicians and other service delivery personnel who have deep expertise of a different type, that is equally needed and equally thin in our science and technology oriented research core. We involve them as contributors, but we need mechanisms to allow them to become developers and explorers in their own right.
11. *Not forget documents, media, and services:* Information and communication technologies take many forms and all of them must be accessible to individuals with disabilities. Access to an e-book reader but not the books is not sufficient to allow education. Access to the computers in a company but not to the documents, manuals, and communications is not sufficient to allow employment. Access to the website but not to electronic health records is not sufficient for patients. And lack of access to training materials, legal documents, etc. cannot be replaced with access to a home computer or any tablet application. Any ecosystem needs to support and promote access across all aspects of ICT if it is to support inclusion of these groups in all of these environments.
12. *Provide both technology and human accessibility service support:* Any ecosystem must recognize that technology cannot possibly meet all of the accessibility needs

of all of these populations today. Particularly where cognitive or complex aging issues are involved, we do not have assistive technologies, or interface techniques, that can make devices and information automatically usable and understandable to all users. Any ecosystem must therefore, be able to seamlessly integrate human and technology based assistance alternatives.

13. *Work across all domains of life*: any ecosystem must also develop solutions that work across all of the domains that we must operate in as a part of daily life. This includes communication and daily living, work and commerce, education and e-learning, health and safety, mobility and transport, and access everywhere a person goes.
14. *Be applicable, and work internationally*: any ecosystem must be able to create solutions that can be applied internationally. The needs are international, and only through international development can development for all users be affordable. And only through international distribution can the economies of scale be brought to the needs of those on all of the tails of all of the distributions. This means that the ecosystem must support solutions that work across languages, cultures, economies and fiscal systems, and legal systems (e.g. copyright, privacy, entitlement etc.)

The Prosperity4All project aims at delivering fully functional key elements – as opposed to “research prototypes” – of a holistic infrastructure that will entice, engage, and enable stakeholders and individuals to meet the above requirements and create or deliver the required solutions and services. It is self-evident that one project alone, even a large project like Prosperity4All, cannot solve all problems and create all required services within four years. However, we are aiming at laying a sound foundation for this and creating a solid base-infrastructure with incremental added value that will enable the full growth into such an ecosystem. As a complete proof-of-concept, Prosperity4All will also deliver numerous real-life implementations of services and applications that are accessible for all, thus proving the feasibility and applicability of the proposed ecosystem infrastructure across technology and user domains.

3 The Prosperity4All Innovative Strategies

Prosperity4All will address these challenges through the following high level innovative strategies that are woven throughout the entire project.

3.1 Introduce Holistic Approach to Inclusive Design

Rather than being focused on a particular sector or component or technology, Prosperity4All is focused on the creation of an infrastructure as a whole. It does not focus just on supply, or on demand, or on a product or a technology or a technique. Instead it focuses on creating the infrastructure for a system that can bring together the research, development, commercial transfer, service delivery, support, dissemination, and marketing etc. aspects, all of which must be in place and work together to address this problem.

3.2 Introduce Technology-Enhanced Crowdsourcing and Gaming Principles in Inclusive Design

We see crowdsourcing and gaming principles not only as powerful new tools, but essential components in any new ecosystem for this area. In the proposed infrastructure they are used in many ways including: to engage new contributors; to enable new ways to collaborate; as a mechanism to draw in new scientists to focus on very specific barriers; and as ways of better tapping the talents of professors and students in our universities as well as our lead clinicians and other service delivery personnel. We intend to incorporate gaming principles not to create game-like interfaces, but within the overall design of the infrastructure and its individual components to encourage participation and collaboration.

3.3 Create a Service-Based Infrastructure for Inclusive Design

We will be introducing and building all of the key infrastructure components for a service-based (versus product-based or device based) ecosystem to augment the current product based system. A marketplace and micropayment infrastructure will be constructed that can support not only the "leasing" of traditional assistive technologies but also selling or leasing of "features" and "enhancement", as well as document and media transformation and Assistance on Demand services of all types. This new service infrastructure has profound implications both for the future of AT and for a diverse new field of 'assistive services' that can both serve and employ less technically oriented users and providers (organizations and individuals).

3.4 Promote a Prosperity-Based Ecosystem for Inclusive Design

The entire infrastructure will be designed to identify and address the issues needed by each of the key players in the development-delivery-support system. A dedicated Sup-Project on Economic Modelling will start by identifying what the needs for each of these players are. These will then be used to shape all of the other activities involved in creating the infrastructure for the ecosystem so that the business case or value proposition for each stakeholder can be met. Where these needs cannot be met by the infrastructure, they will be identified including which other players or forces are needed to provide these components. This approach is in sharp contrast with the usual "social value" or "technology" based approaches of the past.

We see this focus on prosperity/business cases/value propositions as being a critical component to any successful ecosystem. Social justice and human rights might help drive policy and perhaps even service funding, but if policy and service funding do not translate into business cases or value propositions, nothing will happen that actually impacts users in terms of new or better solutions.

3.5 Create a System for Comprehensive Developer Support

A significant part of the project is focused on providing comprehensive support to developers to make it easier and less expensive for them to develop solutions and to

enhance the market reach and penetration of their products. This includes support both for assistive technology vendors and for mainstream product companies. It includes provision of background and starter information so that AT and mainstream developers have access to consumer-based needs, as well as information on all existing assistive technologies and access features of other products like there's. It includes both open source and commercial components that they can use to construct solutions (both standard components and special components such as head and body control interfaces, braille translations, web app components, universal remote console sockets etc.). It provides frameworks and tools as well as team support from consumers. It includes a new approach for the mainstream design of web applications that combines the concept of an interface socket or API coupled with an Individual User Interface Generator (IUIG) to allow mainstream vendors to create highly flexible interfaces that can address a wide range of disability, literacy, digital literacy, and aging related barriers without the mainstream vendors having to understand any of these. And it provides tools and components to make it easier to create assistive technology as a service, to tie into the proposed assistive-service infrastructures, and to incorporate the Cloud4all/GPII auto-personalization from user-preference capability in their products.

3.6 Create Mechanisms That Promote Consumer-Developer Connections

The development of and integration throughout the infrastructure of closer consumer-developer connections is intended to help shift the field from a "push" market (where features are determined by developers and then offered to consumers) towards more of a "Pull" market (where the features that are offered are the result of consumer need and direction). To accomplish this we will be introducing mechanisms throughout the infrastructure to allow consumers to provide a) "feedback" on existing products and features, b) "feed-peer" to allow consumers to communicate the best information on successful solutions to each other as well as strategies for using existing solutions better and in new ways and c) "feedforward" mechanisms to affect the design of future or currently 'in-design' projects. In addition, mechanisms are provided to allow vendors and developers to more closely incorporate consumers in their development process. In the Prosperity4All ecosystem, users will have the chance to identify a desired service and issue donations. Once donations and bids reach critical thresholds, the creation of the service will be possible, even allowing from contest-based decisions on the entity to build the service.

3.7 Develop New Mechanisms to Expand Market Reach and Penetration (for Vendors and Service Providers)

This includes everything from tools to facilitate localization to other languages, to guidelines for creating products that are acceptable to and support different cultures, to the Unified Listing that will allow them to better reach dispersed user bases and international audiences. The Unified Listing will be expanded from the federated assistive technology database in Cloud4all to one that also includes access features in mainstream ICT, providing enhanced motivation and reach for these products and features as well.

3.8 Develop Targeted Mechanisms to Engage New Players, with New Skills, and to Develop an Expanded Solution Providers Base

In addition to the modularization and other crowdsourcing and gamification efforts discussed above, the infrastructure will build additional specific mechanisms to reach out to specialists who can address specific technical issues such as the use of advanced machine vision to facilitate complex document access, language translation to facilitate internationalization, semantic modelling to facilitate interface transformation etc. We will also be exploring the use of visual/non-visual model-based programming technologies used to push interface development out toward consumers to provide the tools that could be used to explore the introduction of accessibility, and assistive technologies, to early primary education students as a way of both introducing the concepts of accessibility and (through allowing them to create assistive technologies for the example users with disabilities) allow them to discover that they can design, create, and shape technologies to address human/social issues. This might be especially helpful in engaging those individuals who would later be dissuaded from exploring these areas (technology and programming) by social pressures as they grow older.

3.9 Develop New Mechanisms to Target the Tails, and the Tails of the Tails

A key theme throughout the proposal is creating an infrastructure that allows these stakeholders to move beyond the "mainstream disabilities" and to be able to function profitably and successfully in the tails. This goes beyond research and through to delivery, and the ability to provide cost-effective delivery to the tails and the tails of the tails. The proposed infrastructure provides for a robust infrastructure to allow people and organization to develop and deploy a wide range of personal and commercial Assistance on Demand services to address those who cannot be easily addressed through technology. Of particular interest is the proposed user-friendly "do-it-yourself" Assistance on Demand infrastructure tool that will allow an individual to create a personal Assistance on Demand support system for someone in their family. Another important building block to successfully target the tails and the tails of the tails is the Unified Listing and Marketplace. They will make it easier for consumers with orphaned needs to find unique, small market AT. On the other hand, new and small vendors will be supported in reaching thin markets and thus, allowed successful sales to the tails. Finally, the sales of small market AT will be increased by dedicated developer tools and the Unified Listing and Marketplace.

3.10 Integrate an Open Economic Platform into the Ecosystem to Broaden Participation

Another objective is the integration of different infrastructure elements to facilitate a broader participation in the ecosystem by smaller entities and even individuals. This includes a micropayment system to a) allow developers of any size (including individuals) to be able to easily market products or even individual features internationally and have the finances/conversions etc. handled automatically for them, to allow

Assistance on Demand services including micro-Assistance on Demand (for as little as 30 seconds), and b) allow micro-financing (e.g. many users each contribute a small amount to finance future, capability or technology, ala Kickstarter) etc. The infrastructure also includes an Open Marketplace to make it easy for smaller companies that cannot provide their own international marketing to be able to offer their products in a place that can be easily found, that provides international exposure, and that is tied to the new tools being developed to allow users to find solutions that match their particular needs and preferences. The Assistance on Demand infrastructure will also allow anyone, in any country, to set up a service without having to build an infrastructure. It would allow them to provide, and market, any type of Assistance on Demand, in any language, and in a form that is appropriate to local culture and economic scales, by simply providing their service over the Prosperity4All/GPII Assistance on Demand infrastructure.

3.11 Integrate an Innovative Cascading Hybrid Technology and Human Service Delivery Approach into the Ecosystem

There are some groups, (particularly those involving cognitive, digital literacy, or aging related barriers) where what we can do today through technology alone is limited. However where technology could meet part of the needs it is often not employed because it cannot be relied upon – and when it fails it can leave the user stranded and unable to cope. By combining technology and human services in a "try harder" cascading approach it may be possible to have individuals use technology-based solutions that are backed up by human assistance.

4 The Prosperity4All Workplan

In order to realize the project's vision and ambitious objectives, an international consortium of 25 partners has been set up. The 48-months project is broken down into five Sub Projects (SP):

- **SP1 (Economic Model)** focuses on modelling the overall Prosperity4All ecosystem, including its governance scheme, but also the market and business models that will regulate its operation. SP1 aims at ensuring that the project's technical results will have market relevance and a clear potential to be adopted by stakeholders.
- **SP2 (Technological Infrastructure)** is focused on the design, development and integration of the technical infrastructure that will underpin the Prosperity4All ecosystem. This subproject will produce a large number of technologies and infrastructures ranging from perceptive accessible interfaces to technical infrastructures for payment.
- **SP3 (Real-World Applications)** is devoted to testing the applicability and usefulness of the SP2 technology infrastructure and the Prosperity4All ecosystem as a whole through the leveraging and integration of SP2 tools and infrastructures into existing applications, services and platforms.

- **SP4 (Evaluation)** is devoted to assessment, testing and demonstration activities, thus further reinforcing and ensuring a User-Centered-Design of the technology and infrastructure of SP2, as well as the implementations of SP3, but also of the deployment models and market dynamics of the Prosperity4All ecosystem.
- **SP5 (Horizontal Activities)** comprises the management, exploitation, dissemination and sustainability activities of the project

5 Conclusions

The Prosperity4All project aims at providing an infrastructure to facilitate the development of a new ecosystem for eInclusion. One that is based around cross-platform development techniques and that employs modern techniques such as crowdsourcing and gamification to both enable new strategies for the delivery of accessibility services and to enable an entirely new approach to accessibility solution development; an approach that can increase the percentage of research that actually makes it into the hands of users, increases the number of different types of researchers to contribute and enable breakthrough solutions; increase the number and variety of individuals and skills which can be brought to bear on the problem; and broaden the development process out toward users so that users and those living with them, or working with them, can get more directly engaged in the development of effective solutions.

The full development of the ecosystem, populating it with organisations, individuals and stakeholders and the full deployment of solutions are expected to take place after the end of the project, as a result of the EC-funded phase.

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