



# **Government Digital Inclusion Programs and Open Source Software: Technology Perspective**

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## Contents

Contents.....	2	Moving Forward.....	5
Executive Summary.....	2	Success Stories.....	8
Introduction: Promoting Digital Inclusion.....	2	Conclusion.....	7
Open Source and Policy Considerations.....	3	Learn More.....	7
Platform Architecture.....	4		
Hardware.....	4		
Software.....	4		

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## Executive Summary

Seeking to enhance economic vitality and competitiveness, governments around the world are undertaking digital inclusion initiatives designed to increase computer literacy and extend PC usage and Internet access. Many governments are examining open source software (OSS) and the Linux\* operating system as a basis for their technology investments. This white paper discusses the strengths of open source solutions for digital inclusion programs as well as identifying areas where government and technology companies must work together to identify and improve existing open source components. By understanding the issues and advantages of Linux and open source solutions, government decision-makers are better equipped to make sound decisions regarding their technology deployments.

Intel has a deep commitment to closing the digital divide and a wealth of experience in working with policy-makers and business leaders to develop successful digital inclusion strategies. Intel is sharing our expertise and experience with governments as they plan, develop and deploy robust digital inclusion programs that meet their educational and economic objectives. This white paper looks at general lessons and a specific example drawn from Intel's experience facilitating digital inclusion programs.

## Introduction: Promoting Digital Inclusion

The world we live in is powerfully impacted by information and communication technologies (ICT). Governments, corporations, small businesses and individuals rely on ICT infrastructure to do business worldwide, share and access information, and save time and money.

Governments around the world are increasingly aware that ICT can have a tremendous impact on national economic performance. Investments in ICT often spur job creation, introduce new sources of innovation and enhance problem solving, all of which can fuel economic growth and boost a country's ability to compete in the global economy.

However, ICT is unevenly distributed, and even in developed nations, rural and less industrial areas generally benefit less from ICT than more urban areas. Small and medium-sized businesses often have less developed ICT infrastructures and less technical expertise. In developing countries, the challenges are even greater. National ICT infrastructure may be underdeveloped, and both access to and familiarity with technology are limited.

Many governments understand the relationship between ICT investment and economic results and are crafting policies that promote digital inclusion and ICT proliferation. These policies can include tax incentives, regulatory policies, procurement policies, laws governing public/private partnerships, research and development (R&D) grants, standards, education and skills initiatives, and public awareness campaigns.

Of particular interest for this white paper are digital inclusion initiatives such as government-assisted PC programs (GAPP) and digital cities initiatives. GAPP initiatives aim to promote digital literacy through policies that increase the in-home use of PCs and the Internet. Digital cities initiatives overlap with GAPP by making broadband access more available; they also help increase government efficiency and make a region more attractive to business expansion. Both digital cities and GAPP initiatives aim to bridge the digital divide and promote economic development and a rising standard of living.

Digital inclusion programs vary in the segment of the population targeted and the methods of encouraging the target population to participate. Population targeting tends to fall into four purchase program categories:

- **Employee purchase programs (EPPs).** Employees lease or purchase computer equipment through their employer.
- **Student purchase programs (SPPs).** Students or parents purchase computer equipment through their school or university.
- **Small and medium enterprise (SME) purchase programs.** SMEs can constitute the vast majority of a nation's business. Helping SMEs become more competitive through greater use of ICT can enhance the national economy.
- **Demographic-based purchase programs (xPPs).** xPPs might also target rural areas, impoverished urban areas or organizations representing disadvantaged people.

Incentives to participate can be provided in many ways. Here are three typical models:

- **Direct payment.** Government directly discounts the cost of purchasing a PC through a program such as a voucher or rebate.
- **Lease and individual tax incentives.** Employees receive some form of tax relief if they lease or purchase a PC through their employer. The relief might be through mechanisms such as pre-tax payroll deductions or by eliminating sales tax.
- **Business and individual tax incentives.** For example, a hybrid program might allow individuals some sort of tax relief when making a purchase through an employer and also allow employers to take computer equipment purchased for EPPs as a tax deduction.

## Open Source and Policy Considerations

Concerns about cost, choice and security have led many governments to look to open source software, and particularly the Linux operating system, as a potential way to maximize the impact of their technology investments. In addition, effective digital inclusion programs must be aligned with other ICT policy factors. Using open source software and the Linux operating system can help to further this alignment.

- **Choice.** Many governments have adopted explicit policies of encouraging or requiring the choice of open source software. Policy-makers implementing digital inclusion programs in this situation must have a realistic assessment of their needs so they can select the best open source solution. Choice can also be influenced by the need to interoperate with ICT infrastructure that's already in place. Here, developing nations often have more freedom of choice because there is relatively little legacy ICT infrastructure to impose compatibility requirements.
- **Security.** Security is a key issue, and governments are deeply concerned to assure that their computer systems are as safe from intrusion as possible. Because the source code of open source software can be fully inspected and modified, some governments see open source as a viable way to control computer security.
- **Cost.** Making PCs more affordable, and therefore more accessible, can increase demand, particularly in developing countries where discretionary spending is minimal. Cost is an important consideration for any government initiative and open source software can lower initial purchase costs by avoiding licensing fees. However, obtaining Linux from an established vendor may add cost for technical support.

While these are all reasons why government would consider Linux and open source software for their digital inclusion programs, open source solutions are not without their risks:

- **Support.** With no single vendor standing behind Linux, support can be an issue. The open source community provides support by rapidly fixing software problems. This means that a broadly used OSS solution may rely on community support. Support may also come from a dedicated Linux distributor such as Red Hat, Novell or Red Flag (in China), a dedicated open source support company

such as SpikeSource, an enterprise support organization such as IBM Global Services, or a hardware systems provider such as Dell. However, in developing countries, not all these commercial choices are available. This support challenge can also be seen as an opportunity, as local support companies are emerging to meet the support needs.

- **Uniformity.** Linux does not have a single standard for usability. The major desktop environments (Gnome\* and KDE\*) follow different approaches, and more than a dozen major window managers are available for a Linux system. However, usability guidelines for Linux are maturing through a process of open standards and participation by key industry groups, which will lead to greater uniformity. The Linux Standards Base, as one example, is creating a standard so Independent Software Vendors (ISVs) can write a single binary that is assured to work across all participating Linux distributions.
- **Compatibility.** Particularly in developed markets, compatibility with an established software base is essential. In an infrastructure role, this often does not affect programs such as Linux or Apache\*. But in a middleware context, such as interacting with Microsoft Exchange\*, or in a desktop context, such as interacting with Microsoft Office\*, compatibility can be a major issue. At the desktop application level, open source software has progressed significantly. For example, Open Office\* now has a high degree of compatibility with Microsoft Office. However, other application areas are still under development. For example, Linux lacks an ActiveX\*-compatible Web browser, which is required for many intranet applications.

## Platform Architecture

For a successful digital inclusion initiative, when open source software is chosen, government and technology companies must work together at the hardware and software level to identify existing components and possibly improve or create elements for their particular desktop solution.

## Hardware

For any given hardware function a Linux PC must perform, a hardware vendor exists with a Linux-compatible offering. However, among hardware peripheral devices, such as network cards, graphics cards, sound cards and printers, hardware incompatibilities with Linux may exist. Putting all the right elements together requires a coordinated effort:

- Governments must communicate with hardware vendors to demonstrate that Linux-oriented digital inclusion programs have demand. As digital inclusion programs are implemented, governments must work with system integrators to understand and communicate their hardware, documentation and hardware-support requirements.
- System integrators, who are the middle link in the communication chain, must communicate with governments, and help identify the appropriate hardware for a platform to meet that segment's needs. By also communicating with hardware vendors, system integrators can help communicate requirements and work with the hardware vendors to understand what well-supported hardware options are available for Linux.

## Software

The Linux OS and supporting open source applications have matured and now support a variety of PC functionalities, particularly for digital inclusion usage models. However, continued improvement requires coordination and communication, particularly between the Linux developer community and ISVs:

- The Linux developer community must recognize and respond to the support challenges, particularly in developing markets. Barriers of geography and language may prevent Linux distributors from making their own support services available in all markets.
- ISVs need assurance that the demand for Linux is real and offers a significant market size for which to write applications. ISVs must also communicate with the ICT users who are the recipients of digital inclusion strategies to determine which application areas have the most immediate need for the Linux desktop.

Software available on the Linux desktop today covers a full range of application areas, including web browsing, e-mail, word processing, spreadsheets, music and video players, scientific visualization tools and many others. These applications vary in maturity and ease of use, and sorting through the wealth of choices can be daunting. For example, SourceForge.net, perhaps the largest repository of open source software, currently lists more than 100,000 registered projects. Governments must therefore work with trusted advisors to establish user-ready solutions.

At least in the near term, it is also important to realize that not all Linux solutions need to be open source solutions. Windows\* emulation programs, such as Wine\*, as well as products such as Codeweaver CrossOver\*, Win4Lin\* or VMWare\*, can enable a Linux platform to run key Windows-based applications. This approach is particularly applicable in small to medium-sized businesses, where one or two machines may need to run certain Windows-based applications while the rest can run a simple Linux desktop configuration.

## Moving Forward

Successful Linux and open source deployments for digital inclusion require careful coordination between all stakeholders: governments, technology providers, businesses and citizen users.

**Governments** must coordinate with technology companies, major employers and consumer groups to identify the most immediate opportunities to positively impact economic vitality and bridge the digital divide through ICT adoption. Gaming stations or multimedia centers, for example, are probably not the best short-term opportunities. Basic productivity applications or Internet access are far more useful and likely to be embraced, and Linux today is quite suitable for these areas. Governments also have a significant responsibility to see that a Linux-oriented digital inclusion program is implemented in a way that abides by intellectual-property laws.

**Employers** generally know better than anyone else where the Linux desktop might best fit into their employees' home and office lives. This knowledge can be tapped only when employers understand the capabilities, application environment and support structure of Linux. For a Linux-oriented GAPP to succeed, employers must understand and communicate back to governments and policy-makers the ecosystem of which Linux is part, and must identify any shortcomings in knowledge, documentation or support that will need to be overcome to ensure the success of the program.

**ISVs** trying to port or write needed applications for Linux can minimize what would otherwise be stumbling blocks by recognizing the early-stage markets for Linux-oriented digital inclusion programs and focus their software development on the applications most relevant to those markets.

**System integrators** ultimately determine what a default Linux load looks like in a given PC market. Communicating effectively with governments and employers will tell integrators what suite of applications is most needed. Communicating with ISVs and Linux-distribution companies will help ensure that the needed suite of applications is available, tested and supported.

Today, momentum toward collaboration between technology companies and open source community members is building, thanks to organizations such as the Free Standards Group (FSG)<sup>1</sup>, the Linux Standard Base (LSB)<sup>2</sup> and Open Source Development Labs (OSDL)<sup>3</sup>. Linux developers and open source community members will, for the near future, lead application development. By reaching early adopters in these new markets, Linux developers and others in the open source community help encourage and develop these markets. It is important that this work not happen in isolation, but rather in coordination and communication with governments that determine digital inclusion strategies and major technology providers that coordinate with government policy-makers.

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<sup>1</sup> [www.freestandards.org](http://www.freestandards.org)

<sup>2</sup> [www.linuxbase.org](http://www.linuxbase.org)

<sup>3</sup> [www.osdl.org](http://www.osdl.org)

## Success Stories

Many countries around the world have successfully deployed digital inclusion strategies using open source software. In Europe, for example, Spain and the United Kingdom both have digital inclusion strategies that use open source software, and the EPPs and SPPs in Scandinavia have given that region one of the world's highest rates of home PC use per capita.<sup>4</sup> Each of these programs depends on careful planning about target audience, strong communication about the program to recipients and close coordination with technology companies.

In the last 10 years, many governments have experimented with GAPPs with measurable success. For example<sup>5</sup>:

- Sweden's EPP program, enabling employees to purchase a PC tax-free, has been in place since 1998. In the first three years of the program, PC ownership per household rose from 41 percent to 80 percent.
- Thailand's Ministry of Information and Communications Technology has subsidized a "people's PC project," offering 1 million PCs preloaded with Linux StarOffice\* at very affordable prices to increase computer literacy.
- Italy has used a range of direct payment programs since 2003, including rebates on PC purchases for students, families and professionals, and a discount purchase program for teachers to buy PC notebooks.

As governments continue to explore ways to increase economic competitiveness and broaden access to technology, many are looking to the growing popularity of Linux and open source software as part of the solution. Some countries, such as Brazil discussed in the next section, see the opportunity to combine GAPPs with open source software as the program of choice to accelerate ICT growth.

## Brazil: A Successful Digital Inclusion Program

The Digital Inclusion Program Brazil (DIPB) aims to improve overall computer literacy in the country, particularly among the urban poor, and to move the country to an ICT infrastructure largely based on open source software, starting with ICT within government ministries. Brazil has instituted a tax credit program offering roughly \$150 tax credit per PC. The program is expected to increase the number of PCs used in Brazil by 5 million over the next three years<sup>6</sup>.

At present, 20 percent of all computers in Brazil's government ministries run Linux, with a target of 100 percent by the end of 2006. Cost control was a key driver in the move to Linux. Linux makes highly efficient use of hardware, enabling the government to get the most out of its hardware budget. Choosing Linux also meant no up-front licensing fees. According to Beatriz Tibirica, coordinator of the e-government project, "The government is the biggest software buyer. We can save a lot of public money using the free software solution." Tibirica estimates their overall up-front savings at 75 percent following this approach.<sup>7</sup>

Outside of government ministries, DIPB aims to increase the percentage of Brazilians who have access to the Internet. Currently that number is about 10 percent, with computer and Internet usage fairly high among middle- and upper-class Brazilians. Therefore, DIPB targets the poor and working class. The approach is to create a number of telecenters in large urban areas, essentially cyber-cafes offering access to Internet terminals. Sao Paulo was one of the first cities to establish telecenters. Access is free, but demand is so high that users are limited to one hour per day.

In planning these programs, Intel has worked closely with the Brazilian government in an advisory role. Once the low-income demographic was identified, Intel helped develop the PC specification most suitable for those users' needs. Intel then worked with local original equipment manufacturers (OEMs) and system integrators to develop a solution around that specification. Finally, because a Linux client PC is still a relatively new platform in this market, Intel works on an ongoing basis with these OEMs and operating system vendors (OSVs) to ensure that the program is backed by a strong support model.

<sup>4</sup> Intel Corp., *Achieving Digital Inclusion: Government Best Practice on Increasing Household Adoption of Computers*, 2005.

<sup>5</sup> Information on GAPP initiatives in Sweden and Italy can be found in Intel Corp., *Achieving Digital Inclusion*.

<sup>6</sup> Intel Corp., *Achieving Digital Inclusion*.

<sup>7</sup> As reported on the BBC, <http://newswww.bbc.net.uk/1/hi/technology/3250876.stm>

## Other Intel Efforts

Intel works with a number of governments worldwide as a trusted advisor to help develop and deliver digital inclusion solutions, regardless of software environment. Intel also has a long history of collaboration with the open source software community and support for Linux on Intel architecture. Intel was a founding member of the OSDL, provides software development tools for Linux and is participating in the development of standards, such as the OSDL desktop spec, the Linux Standards Base (LSB) and the Free Software Group (FSG).

Intel is also addressing the customer demand for Linux and open source software by providing the Intel® Quick Start Kit for Linux, a PC platform integration kit, which, when combined with Intel desktop boards, enables high-quality, stable, Linux-based desktop PCs. The kit includes software drivers, documentation, tools and resources to enable Intel Channel Program members to more easily build and deploy Linux on Intel platform-based desktops.

## Conclusion

A wide range of digital inclusion programs are gaining momentum as a means of supporting ICT development and promoting national competitiveness through improving citizens' skills and the ICT infrastructure of business. Today, digital inclusion and digital cities programs are well-established tools that every policy-maker should consider and every technology company should be prepared to support.

Intel is available and willing to work with policy-makers to help plan and implement innovative digital inclusion programs that meet the social, technical and budgetary requirements of a government. Intel brings a depth of experience in implementing large-scale digital inclusion programs, relationships with a large, diverse ecosystem of supporting software and hardware distributors, a long history of working with the Linux and Open Source community and a track record of delivering world-class PC performance and quality.

## Learn More

Additional information can be found at:

<http://www.intel.com/go/government>



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