



Bottom-up Roadmap for Free/libre and Open Source Software on e-Government in Europe

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2003

Abstract

This report contains the consolidated bottom-up roadmap to emerge from all previous contributions, activities and analysis carried out during the one-year roadmapping and constituency-building process implemented by project Three Roses. The analysis first discusses the trends, issues and developments in the strategic opportunity opened by FLOSS for local/regional development in Europe. It then processes and consolidates the contributions made by FLOSSeG constituents regarding short, medium and long-term content of a roadmap for a potential large-scale programmatic action on FLOSSeG in Europe. Three areas are distinguished for these contributions: Technology, Applications and Institutional Development. The final section of the report looks at strengths and weaknesses as well as actions for the future in order to advance the FLOSSeG constituency-building process for the benefit of local/regional development in Europe.

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1 Introduction - The Three Roses Process towards the Roadmap

Over the year 2003, the European project Three Roses implemented a systematic process of constituency-building focused on free/libre and open source software for local/regional e-government (FLOSSeG). This process aimed at stimulating both a constituency of FLOSSeG players (e.g., local/regional governments, companies, research and educational centres, etc.) and a roadmap reflecting their inputs into an evolutionary RTD programme that takes advantage of the strategic opportunity offered by FLOSS to the development of Europe.

Figure 1 illustrates the constituency and roadmap-building methodology implemented by Three Roses. This is the Evolving Bottom-Up Roadmapping (EBR) that implemented a highly structured series of physical and virtual events, actions and analysis, leading to a growing FLOSSeG constituency and roadmap.

The methodology started with a position paper (deliverable D6.1) identifying the strategic opportunity and issues surrounding the emergence of free/libre and open source software (FLOSS) for local and regional government in Europe. This paper was followed by the first highly-structured workshop bringing together key constituencies into working groups to discuss and identify opportunities, barriers and areas for a potential roadmap in FLOSS for e-government. The working groups of this first workshop were structured around the different constituents in order to capture their separate views, although all the views blended in the plenaries.

The flows of contributions elicited in the first workshop led to a period of analysis that resulted in three reports processing the views of Users, Researchers and Developers and Management (Deliverables 3.1, 4.1, 5.1). An additional report (deliverable 6.2) then consolidated the results of these three deliverables into an overall report that reflected the state of thinking of the constituency as far as the FLOSSeG roadmap was concerned. In Figure 1 this report is identified with the name of Evolving Bottom-Up Roadmapping No.1 (EBR1). The most important aspect of this report was the definition of four major areas of FLOSSeG short-medium-and-long-term activity, as suggested by the constituency. The four major areas are: Technology, Applications, Institutional Development and Strategic Studies.

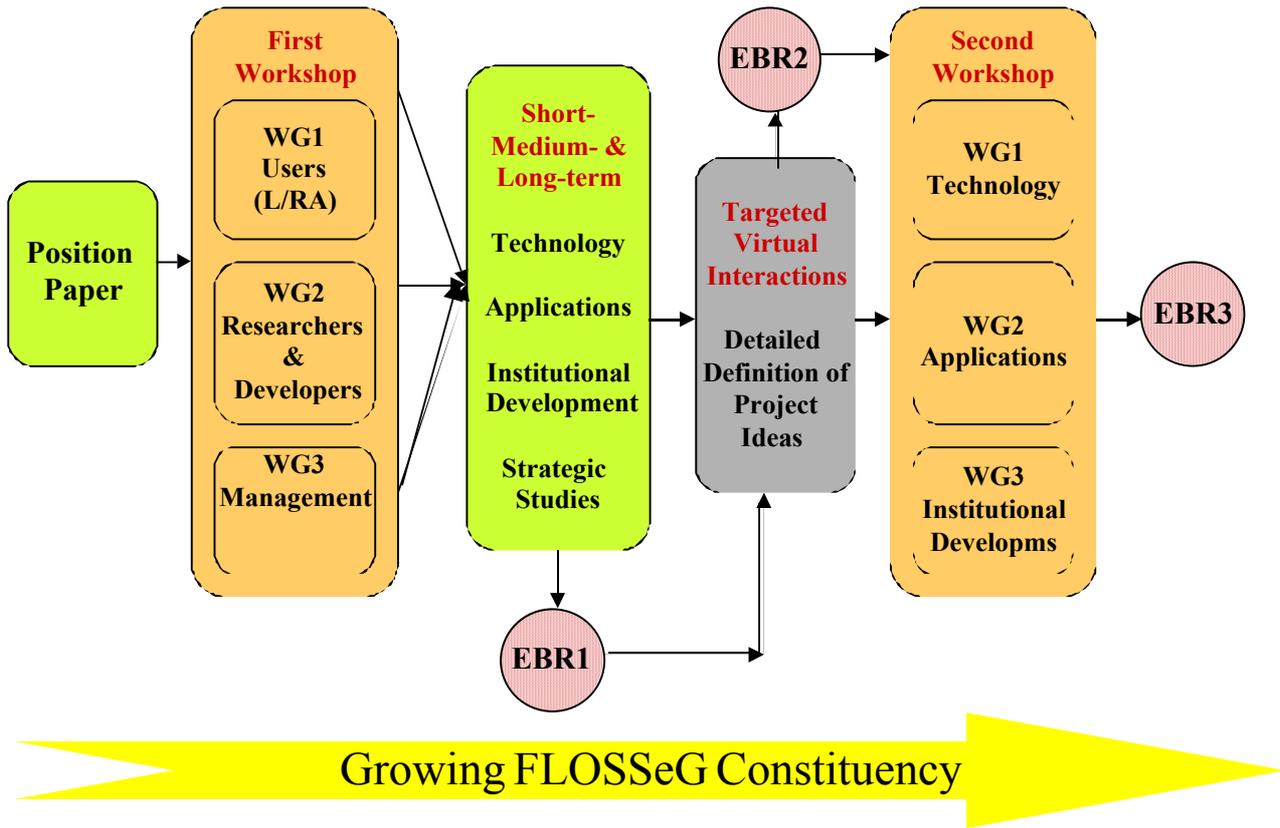


Figure 1. Evolving Bottom-Up Roadmapping (EBR)

EBR1 (or D6.2) triggered the start of a virtual phase made up of two parallel actions: (1) a *virtual forum* discussing points of relevance to the process and (2) the more structured *Targeted Virtual Interactions* aimed at deepening the definition of areas in EBR1 into a more *detailed definition of project ideas* that could be fed into the Three Roses roadmap. This process helped elicit a number of contributions in the areas of Technology, Applications and Institutional Development, in spite of a rather short period that included the summer holidays. The results of this virtual phase led to reports on the contributions to the virtual forum and the Targeted Virtual Interactions. The latter report (EBR2) became the base for the second highly-structured workshop intended to validate the progress so far and, above all, to deepen the detailed definition of projects ideas for the short, medium and long-term content of the roadmap.

The second highly-structured workshop shifted the organization of the working groups from separate constituents (as done in workshop 1) to the strategic areas of Technology, Applications, and Institutional Development with all constituents blended in each of them. This was now the appropriate blend as the Three Roses' process of constituency and roadmap building had achieved a stage of finer content definition. As usual, all constituents came together in the plenaries. This second workshop led to a new period of analysis that resulted in three new reports processing the contributions regarding

Technology (D3.2),¹ Applications (D4.2),² and Institutional Developments (D5.2).³ The second workshop also generated an additional report on legal matters contributed by Maureen O'Sullivan.⁴ At this point, the one-year Three Roses process of constituency and roadmap-building reaches its current and final activity of creating the document with the bottom-up roadmap to emerge from all the previous bottom-up contributions, activities and analysis. This is the purpose of this report, shown in Figure 1 with the name of EBR3 - *Evolving Bottom-Up Roadmap No. 3*.

The Concept of Bottom-up Roadmap in this Report

A roadmap delineates a path, activities (content) and timing to achieve an ultimate purpose. The roadmap must consider and reflect the state of development of the main factors involved in the process addressed by the roadmap as well as the trends, barriers and opportunities to make progress in the desired direction. In Three Roses, the roadmap is not a one-off, top-down, static exercise that sets in stone and once and for all the path to the desired purpose. It is an intrinsically dynamic exercise reflecting a consensual bottom-up nature captured in the name *Evolving Bottom-up Roadmapping*. For the same reason, its content can only be the result of the contributions by the constituency producing it, with all the strengths and limitations of these contributions up to the time of analysis and consolidation - in Three Roses case, the end of the one-year work in December 2003.

The ultimate purpose of the *evolving bottom-up roadmapping* opened by Three Roses is the generation of a systematic, holistic, evolutionary and short, medium and long-term process that exploits the strategic "window of opportunity" opened by FLOSS for e-government and local/regional economies. With this in mind, the critical point in reading this roadmap report is whether:

- it faithfully reflects the state of thinking and contributions of the constituency helping to construct it,
- it deals with the trends barriers, opportunities and content relevant to the achievement of the ultimate purpose of the process opened by the Three Rose process
- it contains content that delineates a path with broad strategic areas, specific activities, indicative timings, and recommendations consistent with progress towards of the ultimate purpose of the process opened by Three Roses.

In short, the roadmap set out in this report should be a sound base for a possible next phase of the *evolving bottom-up roadmapping* leading towards the ultimate purpose.

Below, the structure of this final Three Roses roadmap on FLOSS for e-government will first discuss the trends, issues and developments in the strategic opportunity opened by FLOSS for local/regional development in Europe. It will then analyse and consolidate the contributions made by FLOSSeG constituents regarding short, medium and long-term content of a roadmap for a potential large-scale programmatic action on FLOSSeG in

¹ Telecities, *Final report with framework, content and roadmap for local/regional constituency in FP6 IP based on results of second workshop and work done in task 4.4*, EU Project Three Roses, IST-2001-37967, Deliverable 4.2, October 2003.

² ERIS@, *Report on deliberations of researchers and software developers work group (G2)*, EU Project Three Roses, IST-2001-37967, Deliverable 3.2, October 2003.

³ ELANET, *Three Roses final report on the institutional and management aspects of future research, technology and innovation by European OSS constituencies (contribution to a roadmap for future IP work under FP6)*, EU Project Three Roses, IST-2001-37967, Deliverable 5.2, October 2003.

⁴ Maureen O'Sullivan, *Three Roses Report on FLOSS Law: Licensing and Legislation with the GNU GPL*, University of West England, UK, 2003.

Europe. This content will follow the areas of Technology, Applications and Institutional Development. A final section of the report will look at strengths and weaknesses as well as actions for the future in order to advance the FLOSSeG constituency-building process for the benefit of local/regional economic development in Europe.

2 The Strategic Opportunity Opened by FLOSS - Trends, Issues and Developments⁵

The history of technology shows, recurrently, that the forceful emergence of new technological processes often shakes the foundations of established industries and business practices, opening major windows of opportunities for new players to benefit from the new developments. Austrian economist Joseph Schumpeter identified this phenomenon with the phrase "gales of creative destruction," and the key point is that, as the gales blow, countries and regions are offered new avenues of technological, industrial and economic development. The exploitation of these avenues however is not easy and, at the minimum, the aspiring players must be able to implement effective strategies, policies and capacities in the new field.

Today a strategic "windows of opportunity" is emerging with force in the software industry, and the technological process bringing about the gales of change is free/libre and open source software (FLOSS). Unlike the Schumpeterian "gales of creative destruction," however, the "gales of FLOSS" are not essentially technical; they are not about completely new technologies, they are above all about new ways of making business, including development and distribution of often the "same" (i.e., clone) software.

At the heart of it all is a new concept of "intellectual property," particularly licensing, as a way of exploiting the benefits of software products and services. Thus, until recently competition between proprietary software companies has been the way of making business in the software sector. The companies have legally prevented access to the source code⁶ of their software products and have sought to gain market advantage, mainly by "locking" users to pervasive products such as operating systems and associated application software. In addition by "bundling" software around these pervasive products they have used their dominance in one sector to expand their conquest to other markets – old and new. As a result, the software market has tended to consolidate with dominant players sustained by a governance of legal exclusion of all others from access and use of the source code of their winning products.

⁵ Three Roses has produced a major report reviewing the strategic issues and trends in the development of FLOSS for government. The section here synthesizes key aspects and adds some new data where available. See *Building a Free/Libre and Open Source Software fore-Government (FLOSSeG) Constituency*, EC project Three Roses, Helios ICT, D6.1.

⁶ Some authors prefer to talk of "closed software" rather than "proprietary software" given that the latter does not excluded opening the source code for access to others. Here however proprietary will also imply closed for access to source code.

For many, this arrangement may have looked like the “natural” way of making business with software. The “gale force” market arrival of free/libre and open source software, however, has begun sweeping the edifice of this proprietary-based arrangement, by challenging directly its intrinsic “exclusion effect.” The real extent of the disruptive impact of the FLOSS on the global software sector and the fabric of society at large will only be known in the long-term, at least a decade. The fact that FLOSS is here to stay is not in dispute however. Nor is the fact that one of the market sectors wherein the FLOSS challenge is beginning to make inroads is that of government.

2.1 FLOSS - Here to Stay

FLOSS has arrived in the software market and industry to stay. A recent *Business Week* article⁷ described how at the level of operating system three years have been enough for GNU/Linux to reach 13.7% of the \$50.9 billion computer server market and this share is expected to increase to 25.5% by 2006. Simultaneously the web-server software Apache dominates the market with 62% share against 27% for proprietary Microsoft software, and 39% of large corporations are using Linux. This huge dynamism is confirmed by the rapid growth in the Linux installed base world-wide shown in Figure 2.

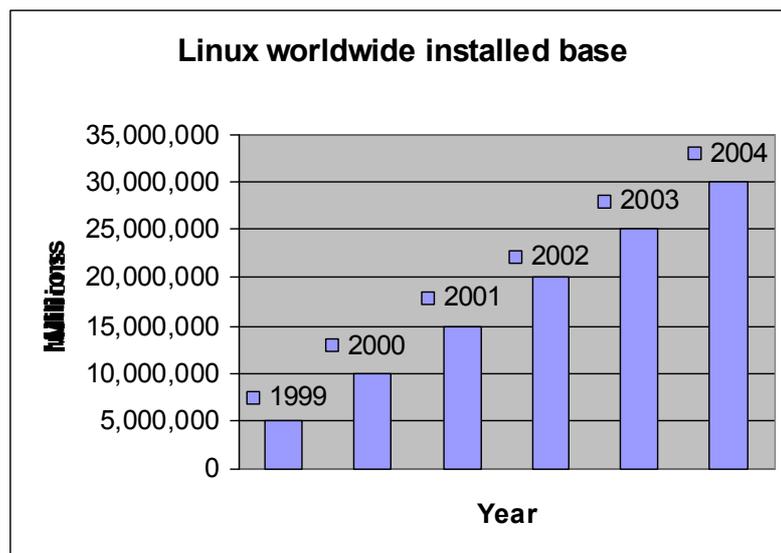


Figure 2. Growth of Linux Worldwide Installed Base (1999-2004)

Source: IDC, quoted by Abas Information Systems (Australia) Pty Ltd., 2003

From just 5 million in 1999, the Linux installed base is expected to reach 35 million in 2004, representing an annual growth of 5 million units. Gartner Research identifies similar positive trends, with an estimation that Linux will achieve mainstream enterprise acceptance by 2006, from a rather humble low level in 1998. In the words of Gartner Research:

⁷ *Business Week*, The Linux, Special Report, 3 March 2003

By 2005, we estimate that 40 percent of large financial services organizations will have deployed Linux strategically (0.9 probability). Further indications of Linux's expansion come from a recent Gartner survey of 360 large enterprises in Europe. ...Web serving on Linux is common (for example, more than half of the respondents use Linux as a Web server platform); the survey also revealed that Linux is gaining in application serving (30 percent) and database management systems (DBMSs — 25 percent) at the expense of Windows and Unix platforms. ...Furthermore, Gartner Dataquest estimates that by 2008, Linux shipments will total 23 percent marketshare (up from 12 percent in 2003), and Linux revenue will total 13 percent market share (up from 6 percent in 2003).⁸

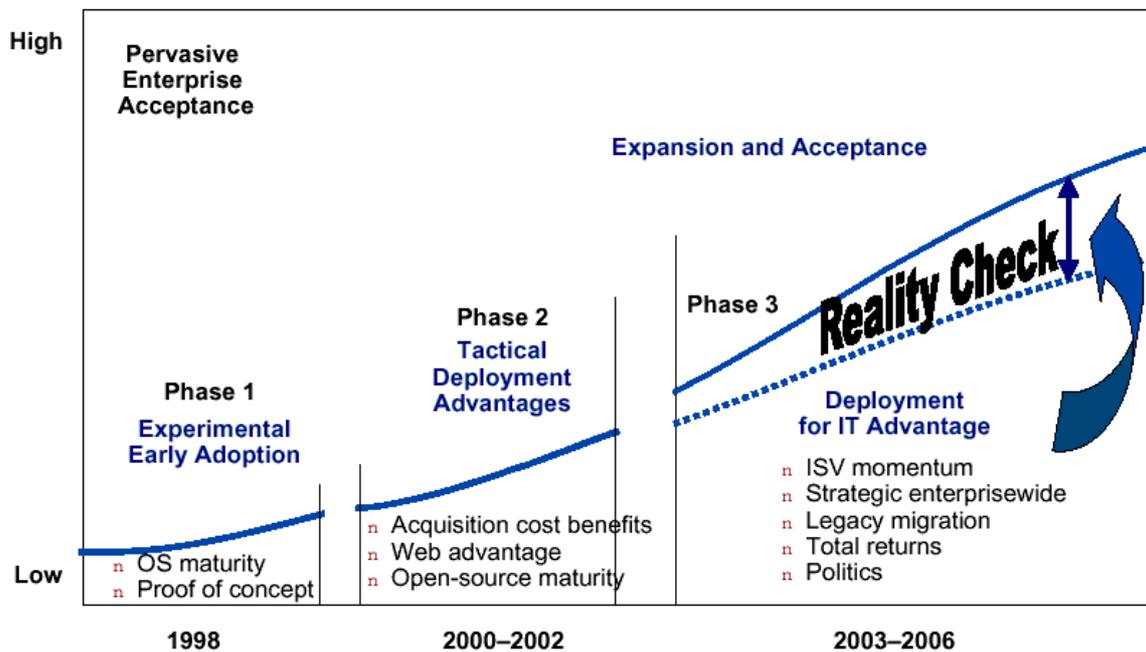


Figure 3. Evolution of Linux Enterprise Acceptance, 1998-2006

Source: Scott, D. and Weiss, G., *Linux Marches Toward Mainstream Adoption*, Gartner Research, LE-21-5013, 11 November 2003.

Gartner cautions about some important challenges that Linux has to go through to reach mainstream adoption. These include concerns regarding mission-critical readiness, support issues, and independent software vendor (ISV) momentum support (see Figure 3). In the end however it concludes that none of these issues is insurmountable and Linux will achieve mainstream adoption by 2006.

Another recent study, this time by IDC, confirms the long-term dynamic growth of FLOSS. The study has reviewed the shipment growth of Linux client operating environment (COE) products and Linux server operating environment (SOE) products during 2002 and provides five-year forecasts for new license shipments and installed base. It concludes: "Our current projections call for Linux COE new license paid

⁸ Source: Scott, D. and Weiss, G., *Linux Marches Toward Mainstream Adoption*, Gartner Research, LE-21-5013, 11 November 2003.

shipments to grow at a 2002-2007 CAGR of 25.4%, while Linux SOE new license paid shipments are projected to grow at a 2002-2007 CAGR of 16.6%."⁹

This type of growth certainly points to a long-term phenomenon with major strategic implications for the software sector, particularly for two reasons:

- most factors fuelling the FLOSS phenomenon are fundamentally long term, and
- FLOSS' comparative advantages in terms of key factors such as security, cost-savings, user responsiveness, and local/regional software development are substantial.

Thus, the following factors have been identified:

- Increasing richness of GNU/Linux environment as more and better software and hardware is being produced, with Intel, for instance, making chips for GNU/Linux, established software suppliers such as IBM, HP, Oracle, etc. offering software and services, and the many FLOSS volunteer programmers working collectively to improve and further the development of FLOSS.
- “Movement” spirit of FLOSS developers who tend to work collectively for the satisfaction of developing good software and/or the contribution they can make to society. This “movement” spirit multiplies the power of the “collective innovation” model enabled by the Internet. FLOSS programmers come from all sorts of backgrounds and places to contribute, frequently as volunteers, to develop and improve software, with results that tend to reflect the motivation to produce good software for movement’s peers. On the other hand, volunteer programmers are often too fragmented to present a credible business proposition to large customers and this prevents them from gaining the specific knowledge required to develop and work with, for instance, applications for complex business processes.
- Market opportunity offered not only to Microsoft’s competitors but also to new start-up companies such as Red Hat that makes a business by selling related software, technical support, maintenance for corporations, and distribution deals with, for instance, IBM, HP and Dell. Microsoft has argued that FLOSS undermines the software business by not charging by the operating system and other software tools.¹⁰ In fact, the business moves to other aspects as IBM, HP, Oracle, and others have already shown. Indeed, if anything the FLOSS concept affects the viability of new start-up companies that find it difficult to make a business without being able to sell the software. So far Red Hat is the most successful company and only recently was able to make its first profits. VA Software Corp. that makes Linux-based computers is still trying to break through and many of those that were focused on the dot.com market have disappeared.

⁹ Quote by IDC's Al Gillen, Research Director, System Software, found in <http://www.idc.com/getdoc.jhtml?containerId=30053>. Title of IDC Report: *Worldwide Linux Operating Environments Forecast and Analysis, 2002-2007: Transitioning to Mainstream*.

¹⁰ See article by Bradford L. Smith, Senior Vice President and General Counsel, Microsoft Corporation. Smith, B. L., *The Future of Software: Enabling the Marketplace To Decide*, March 2003. Found in: <http://www.microsoft.com/resources/sharedsource/Articles/Future.msp>

- Market opportunity offered to all those customers who for one reason or another do not wish to depend on Microsoft's software completely and hence, do not like Microsoft's market oligopoly.
- Growing development of e-government, following on the steps of e-business and e-commerce. FLOSS offers an opportunity to those governments that are uneasy with the oligopolistic and consequent strong negotiating power of single companies to acquire (even in principle) greater access and control over HW/SW processes at a time of growing investments in e-government.

Proprietary-software companies, most conspicuously Microsoft, strongly dispute the issues of costs and security. It seems however a matter of time before a more decisive body of practical evidence accumulates to clear the issue. So far, this evidence points in favour of FLOSS. For instance, the *Business Week* article argues that one of the key factors in stimulating the growth of FLOSS was the cost-cutting forced upon the corporate sector by the economic recession. Among the many stories, Morgan Stanley's Institutional Securities Division is replacing 4,000 high-powered servers with cheaper servers running GNU/Linux. Estimated saving for a five-year period is \$100 million. Also E*Trade Group Inc., replaced 60 \$250,000 computers running on Sun's Sparc chip with 80 Intel-based Linux machines costing just \$4,000 each.¹¹

Stories of similar savings come from the government sector, for instance, from the four cases reviewed in the Three Roses' deliverable D6.1 "Building a *Free/Libre and Open Source Software for e-Government (FLOSSeG)* Constituency." The cases are Schwäbisch Hall in Germany and Nottingham City Council, West Yorkshire Police, and Central Scotland Police in the UK. The West Yorkshire Police, for instance, estimates that "with an installed base of 3,500 machines, we could save up to £1 million per year and be able to extend our information systems into places where police officers work in local partnerships."¹² Likewise, the Central Scotland Police reports significant cost savings of almost a quarter of a million pounds and the consequent extension of computing applications to users who in the past would have been excluded by cost. *In the government sector, the possibility to extend and improve services, i.e., to do more and better with the same money is certainly one of the greatest attractions of FLOSS.*

2.2 FLOSS in Government: Pros and Cons

FLOSS is beginning to make significant advances in the public administration (PA) sector. Governments' double role as service providers and guarantors of the public good is a major strategic factor. Indeed, as service providers public authorities find themselves under increasing pressure to deliver better services for less cost ("more for less"), while as guarantors of the public good they are under increasing pressure for security,

¹¹ *Business Week*, The Linux, Special Report, 3 March 2003.

¹² Hayday, G., "Police put Linux on trial," *Silicon.com*, 16 October 2002, found in <http://news.zdnet.co.uk/software/0,39020381,2123999,00.htm>. Also, Williams, P., "Linux-based PCs go on duty in Yorkshire," found in <http://www.vnunet.com/news/1136041>.

transparency, accountability, and fairness regarding all citizens/customers. As a CEC FPVI report¹³ put it:

government like business requires greater efficiency, productivity, cost reductions, and treating citizens like customers. As such, they share the need for business process re-engineering. On the other hand, government, unlike business cannot choose its customers and, indeed, people are more than just customers, they relate to government as legal subjects (forced to pay taxes), users (use information), customers (hospital services) and, generally, citizens who want to be: aware, considered, recognised participants in the democratic process, expressing his/her rights. In addition, governments also have stringent requirements such as:

- exemplary public service ethics with a focus on non-economic policy issues such as welfare and health of the citizen, avoidance and/or closing of social, educational and financial gaps between all groups of the public
- access for all
- caring for a sustainable environment, affordable public transport, etc.
- mainly non-market driven supply and demand for e-service. No profit incentive.
- provision of institutional and service framework for wider economy.
- requirement for accountability, transparency and democratic practices.

These characteristics frame the growth of FLOSS in public authorities as well as the strategic debate on the advantages and disadvantages for governments of using FLOSS vis-à-vis proprietary software. Not surprisingly the advantages are largely rooted in the General Public License (GPL) approach and the “freedoms” associated with FLOSS, while the disadvantages stem largely from the fact that volunteer programmers are often too fragmented to present a credible business proposition to large customers. Of course the latter disadvantage does not apply to the FLOSS offer of large ICT companies such as IBM, Cisco, Siemens, HP, etc.

Among the strategic advantages of FLOSS for e-government, ethical and political advantages figure prominently, especially as access to the source code has significant implications for the ability of governments to fulfil key requirements of democratic responsibility and security towards their citizens. Furthermore, *the possibility for governments to do more with less is central to the potential realization of the public-good goal of e-inclusion in services for all citizens.* The example of Extremadura, Spain, is revealing in this respect. Here the regional government of Extremadura adopted GNU/Linux as the official operating system to be used in the 670 schools of the region. The adapted version of GNU/Linux is referred to as Linex (for Extremadura) and the region is training its 15,000 teachers to ensure the success of the transformation. For one of the poorest regions of Spain and Europe, an impressive first result has been the increase in the ratio computer/student to one computer for every two students in the classroom. This must certainly be one of the highest computer/student rates in the world if we consider that in Scandinavia – one of the most advanced areas in the use of ICT - Stockholm has an average ratio of 5 students per computer. The key strategic point to consider is that such a level of computer penetration in schools could not have been achieved on the basis of the licensing business model imposed by "proprietary software."

¹³ See report prepared by Prof. Alfonso Molina for the CEC under title *Technologies for Major Business and Work Challenges - Programme Consultation Meeting*, Brussels, 19-20 April 2001, CEC, Brussels, 21 May 2001. <http://www.cordis.lu/ist/fp6/fp6consult.htm>

It would have been simply prohibitively expensive. With regard to governments' mission of public good such as e-inclusion, therefore, the strategic advantage of FLOSS is clear, and the pressure is on proprietary software to provide effective counteractions.

The "public-good advantages" of FLOSS however are only part of the points made in its favour. At the same time, not all is advantages, and a number of FLOSS disadvantages have been also identified in the debate. Tables 1 and 2 list these advantages and disadvantages respectively. They constitute the source of opportunities and challenges for the development of FLOSS for e-government in Europe and the world for that matter.

Table 1. Points Made in Favour of FLOSS

- Lower costs due, for instance, to savings on continuous license fees and equipment replacement as FLOSS often performs satisfactorily on cheaper and even older equipment. The savings can then be used to help the local economy, for instance, by nurturing the FLOSS capacity in the region.
- Equal or superior reliability, performance, scalability, and security due to extensive review and access to source code
- Possibility of “forking” into alternative code base if necessary or convenient
- No software obsolescence as FLOSS can be modified to take account of new requirements
- Improvements in software skills base due to the ability access, scrutinize and analyse the inner workings of the software
- No fees per copy can be requested for modified versions
- No need for license management and policing given that there is no danger of employees using unauthorised copies
- Affordable software for individuals, enterprise and government
- Participation in global networks of collaborators from all over the world, benefiting from the sharing of expertise and experience in software development.
- Access to the international FLOSS user community, often accessible and able to assist rapidly over long distances
- Lowered barriers to entry for software businesses as no single entity controls the future of the software.
- Stimulation of local software industry, leading to better local capacity to satisfy Government’ needs and to significant contribution to human resource development, especially in the area of ICT. In this respect, government is well placed to lead the switch towards FLOSS in its jurisdiction given the role in education, e-government, e-business, etc. All this would act synergistically with the saving benefits already mentioned in the first point of this list.
- Finally, for those governments interested in issues of freedom and e-democracy through technology, a switch to free software in the original Stallman’s version also helps to “encourage the citizens to recognize and value freedom as computer users, leading society as a whole out of the burden and limitations of dependence on proprietary software.”

Table 2. Points Made Against FLOSS

- Not all software projects are useful or motivating to the volunteer programmers of the FLOSS constituency and this commonly implies a need for a large user base to provide the necessary volunteers. Of course, FLOSS operations seeking to make a business by developing and selling customised FLOSS services (e.g., website development) will not have this problem
- Risk of sub-standard code as not all programmers are good or motivated by routine tasks of software development
- Managing a FLOSS project is a convoluted process, and details are often overlooked. Difficult management of deadlines is risky, for instance, for projects with critical short-term deadlines. Funding is required for development and for a deployment system (concurrent version control, bug tracking, mailing lists, etc.).
- Difficulties in modularity potentially leading to maintenance and reliability problems of FLOSS products
- variety of motivations of volunteer programmers participating in FLOSS projects (e.g. anti-Microsoft, free software ideals, technical interest in coding) may blur definition of sharp a strategic focus for products
- Complex hybrid FLOSS business models potentially leading to breakdown of trust. This implies a great weight of responsibility on FLOSS project leaders and champions, or gatekeepers, potentially leading to burn out
- Destruction of jobs and economic opportunities by undermining software business based on proprietary intellectual property

2.3 Brief Overview of FLOSS in European PAs

In practice, it is difficult to estimate the volume of overall use of FLOSS and its particular use in the European public sector today.¹⁴ There seems to be substantial differences in both FLOSS development and use between and within EU member states, largely depending on the strength of government policies. Infonomics at the University of Maastricht conducted a major study and, among its findings, it provided a comparative overview of the “relationship between policy and developer activity” in various countries (see Table 3). This overview shows the national governments of France and Germany pursuing strong policy approaches in favour of FLOSS development and implementation. Other European countries are not that advanced as Germany and France but the trend is for an increment of FLOSS policy and implementation activities. For instance, in Spain there is as yet no official national policy but a good number of FLOSS activities are reported, with prominent roles being played by the regions of Extremadura and Andalucia.

¹⁴ Among the reasons found in Ghosh et al (2002) al. are: impossibility of counting licenses; poor indication given by number of downloaded copies; poor indication given by the number of delivered pre-installed machines, and others. See Ghosh, R., Krieger, B., Glott, R. and Robles, G., *Free /Libre and Open Source Software – Survey and Study, Part 2B: Open Source Software in the Public Sector: Policy within the European Union, Final Report*, June 2002. International Institute of Infonomics, University of Maastricht (the Netherlands) www.infonomics.nl/FLOSS;

Table 3. Relationship between Policy and Developer Activity				
	Developers Activity	Implementation	Policy	Future Trends
France	High	Ministries, Public Administration, National Education	strong	Growing Implementation, Stronger Policies
Germany	High	Parliament, Public Administration, Police	strong	Growing Implementation, Stronger Policies
Spain	Middle	Ministries, Public Administrations	starting	Growing Implementation, Developing Policies
United Kingdom	Middle	Public Health	increasing	Starting Implementation, Stronger Policies
Austria	Low	marginal	marginal	Implementation and Policy not expected in the near Future
Belgium	Low	National Army, Public Administration	starting	Growing Implementation, Developing Policies

Source. Ghosh et al. (2002), *op. cit.*, note 7.

The spread of FLOSS at the level of national government is accompanied by a similar spread at the level of regional and city government. The leading cases of Extremadura and Andalusia have already been mentioned, with both regions having approved legislation aimed at encouraging the information society by establishing the conditions for the use of FLOSS by the administrations. In Italy, local and regional authorities such as Lombardia, Tuscany, and Lazio are also starting to implement FLOSS initiatives with some regional administrations adopting legislation on the matter, for instance, the Firenze Council and the City Council of Lodi in Milan. In UK, in addition to the cases of Nottingham City Council, and West Yorkshire and Central Scotland Police Forces already mentioned, other councils are also beginning to shift to FLOSS, for instance, Penwith District Council in Cornwall, which has shifted some 300 desktops due to “lower licensing costs.” Likewise, Newham has recently commissioned a feasibility study potentially leading to the migration of its 5,000 desktop computers to FLOSS.

In Germany, Schwaebisch Hall and the City of Dortmund have adopted open source and, in May 2003, the country’s third largest city, Munich, announced their plan to move 14,000 PCs and 16,000 users from Windows to Linux, in a move to make Linux their standard desktop operating system environment.¹⁵ This FLOSS’ adoption by Munich is particularly significant, not only because of the importance of the city, but also because Microsoft seems to have made strenuous efforts to win the contract. Indeed, “The City of Munich’s decision comes on the heels of reported efforts from Microsoft to win this business, including a visit from executive Steve Ballmer to the Mayor of Munich, as well as press reports of significant discounts from Microsoft in order to win against Linux.”¹⁶

FLOSS’ advance in local and regional authorities is confirmed by the results of an indicative survey run by Three Roses on FLOSS use, plans and intentions by European

¹⁵ <http://www.desktoplinux.com/news/NS3199247984.html>, <http://linuxpr.com/releases/5893.html>

¹⁶ <http://www.desktoplinux.com/news/NS3199247984.html>

local/regional authorities.¹⁷ A total of 22 administrations responded to the survey and the results are shown in Table 4. They are indicative of local/regional FLOSS activity in Europe as well as of the concerns of ICT managers and decision-makers regarding the need for access to FLOSS expertise and capacities to be sure of realizing the promise of lower-cost and sustainability of the FLOSS model. They do not allow the extrapolation of an accurate picture of the extent and depth of FLOSS activity in local/regional authorities, but they tend to confirm that the cases we have mentioned above are certainly part of a phenomenon evolving towards mainstream.

Table 4. Use, Plans and Intentions by Some European Local/Regional Authorities Regarding FLOSS (Jan-March 2003)

<p><i>Current Use, Plans and Intentions</i></p> <ul style="list-style-type: none"> • 77% of respondents stated that FLOSS played a part in the strategic direction of their organisations, and of these 84 % felt that they could identify a FLOSS constituency in their area. • 36% of the respondents are considering adopting FLOSS as part of the IT strategy. • 68% of respondents stated that there was a definable constituency that could promote FLOSS in their respective regions • 22% of the respondent's administrations have already implemented some form of FLOSS. Of these, 100% have implemented FLOSS at the server level with Linux Apache. And 50% have utilised FLOSS for security and authentication.
<p><i>Perceived Obstacles to the Adoption of FLOSS¹⁸</i></p> <ul style="list-style-type: none"> • 100% felt that the FLOSS license posed no problems to the adoption of FLOSS solutions since their internal procurement rules allowed them to utilise FLOSS technologies. • 80% felt that the largest obstacle to adoption of FLOSS is the lack of in-house expertise as well as of software support. • 40% felt that sustainability was an issue and 10% felt that cost was a barrier.

2.4 Two Major Strategic Conclusions for FLOSS in European Government

Three Roses' analysis of the evolution of FLOSS in government produced two conclusions of major strategic importance for Europe. The first is that *for public sector's decision-makers the consideration of FLOSS in the development of strategies for future e-government investments is no longer an option to be disregarded. It is an intrinsic element of well-informed e-government strategy-making processes. In addition, as FLOSS continues to grow in strength in the coming months and years, it is bound to present an ever more powerful challenge to the hold of proprietary software in government.*

¹⁷ The survey was conducted between January and March 2003. It made use of the facilities and members of the three most important networks of regions and cities working for the information society in Europe: Telecities, ERIS@ and ELANET.

¹⁸ It must be noted that replies to this section were given by only 22% of the total number of respondents, of which 40% were FLOSS adopters; 10% were at planning stage; and another 40% had no plans to adopt FLOSS solutions.

The second conclusion is complementary and points towards the requirements to exploit the potential benefits of the “window of opportunity” opened by FLOSS. It identifies that the exploitation of this potential demand the existence of a clear set of capacities for FLOSS development, implementation and maintenance/servicing. This would include the following capacities:¹⁹

- *Capacity for software selection*, i.e., expertise to assist users to select the best option, FLOSS or otherwise. A decision to migrate to FLOSS must be based on sound short, medium and long-term business and government principles and not on subjective preferences
- *Capacity to support users*, i.e., rapid and efficient support to users with both the development of new software and the enhancement of existing software
- *Capacity for implementation and troubleshooting*, i.e., rapid and effective support to help with the operationalisation and troubleshooting of implemented FLOSS
- *Maintenance capacity*, i.e., provision of continuous maintenance support, including continuous updating, induction of new users, and maintaining/amending documentation
- *Training capacity*, i.e., proficient training for FLOSS developers and users
- *Research capacity*, i.e., research activities enabling optimal understanding of, and well-informed decision making on FLOSS, harnessing the potential of higher education institutions and schools
- *Capacity for security measures*, i.e., the security of FLOSS systems must satisfy all requirements applicable to Government ICT systems in general.
- *Capacity for inter-operability with ICT legacy systems*. FLOSS developed and implemented in e-government must be able to inter-operate with other ICT systems already in use

It is precisely the challenge of this capacity-building that gives government at all levels such a strategic place in the evolution of FLOSS and, ultimately, the general software market. It is also this challenge that gives prominence to the strategic need to implement a major effort at European levels through local, regional and European instruments such as the RTD Framework Programme, the Structural Funds and others of relevance to this process.

Ultimately, this major effort at European level is the *raison d'être* of the constituency and roadmap building process promoted by Three Roses. Certainly we are in the face of a long-term process, and Three Roses' one year has made its best to kick it off by putting on the agenda the evolutionary and holistic nature of the policy process necessary for success. It has also initiated the build up of a European FLOSS constituency with its own bottom-up potential programme of action.

¹⁹ Government IT Officers' Council, *Using Open Source Software in the South African Government, A Proposed Strategy Compiled by the Government Information Technology Officers' Council*, South Africa, 16 January 2003.

3 The Three Roses FLOSSeG Constituency and Roadmap-Building - Results and Short, Medium and Long-term Roadmap of FLOSSeG Activities

The first tangible achievement of the Three Roses process has been the creation of a constituency of FLOSS players from local/regional authorities, large companies and SMEs, FLOSS movement, and educational and research institutions. Appendix 1 gives an overview of this constituency through the attendance to the two Three Roses workshops. It is certainly a sizeable constituency, although there are weaknesses in the presence, for instance, of the research and university sector, some key local authorities such as Munich, and companies such as Red Hat. This does not however diminish the strength of the foundation created during 2003.

Most importantly, this constituency started the process of bottom-up definition of a roadmap on FLOSS for e-government (evolving bottom-up roadmapping), helping to generate results that represent the first known expression of collective RTD interests of European players regarding FLOSS for government. In addition, the Three Roses approach challenged the members of the constituency to think in terms of short, medium, and long-term RTD actions for the roadmap, to keep consistency with the evolutionary long-term nature of the challenge of exploiting the “window of opportunity” opened by FLOSS for e-government and local/regional development of digital economies.

Figure 4 shows Three Roses’ approach stressing the need for an evolutionary process aiming to attain short and medium term results within a longer-term outlook, and converging on the intended long-term impact within a period of about a decade.

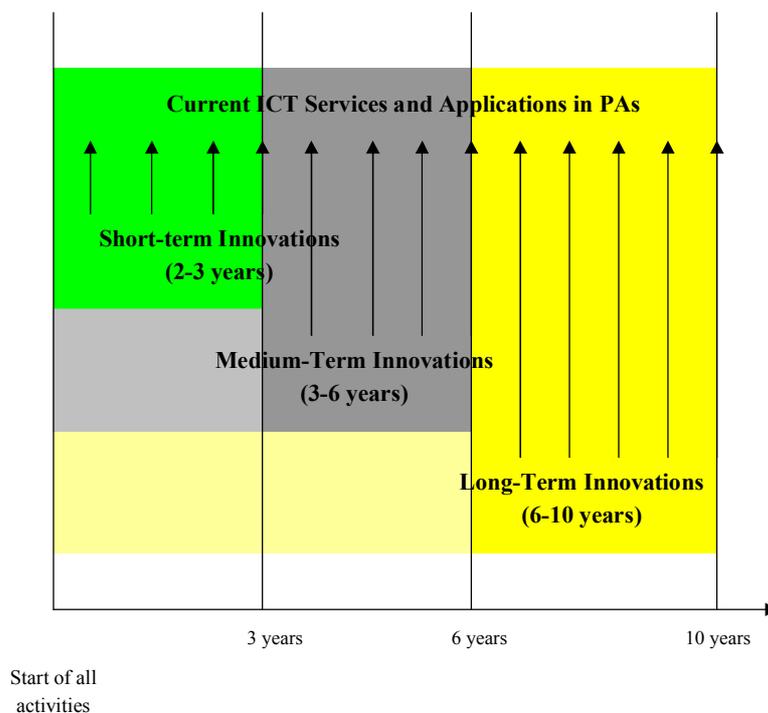


Figure 4. Illustration of Relation between Short, Medium and Long-term Content and Activities in a Large-scale FLOSSeG Initiative

This type of long-term thinking does not fit comfortably within the rather short time span of, for instance, the Commissions' Framework Programmes. This should not however deter the efforts to think and try to act long term, especially when it is clear that, for Europe, the rise, development and exploitation of the e-government and developmental opportunities brought about by FLOSS are not precisely short term.

In the following the contributions of the Three Roses constituency to the Roadmap of FLOSS for eGovernment (FLOSSeG) are separated into two parts. The first section reveals the Three Roses FLOSS constituency's own strategic views regarding the main barriers and opportunities for the take up of FLOSS solutions in the public sector. The section immediately after reveals the Three Roses FLOSS constituency's own strategic views regarding the content of a roadmap for a potential European programmatic effort on FLOSS for e-government and local/regional digital economies.

3.1 Main barriers and opportunities for the take up of FLOSS solutions in the public sector

Three Roses constituents identified an important number of barriers to the development, diffusion and implementation of FLOSSeG by public administrations in Europe. These are therefore aspects that an evolutionary constituency-building process must address in the development and implementation of effective strategies for FLOSSeG development.

At its broadest, the source of most problems/barriers facing the FLOSS constituency has to do with the emergent character of the technology and the existence of a software ecosystem dominated by 'proprietary software.' In a nutshell, the FLOSS' challenge to achieve sustainable success is the transformation of the present ecosystem with its technical, industrial, economic, educational, legal, political, etc. manifestations. Tables 5.1, 5.2 and 5.3 list some of the main problems/barriers identified by European FLOSS constituents during the Three Roses process. The three Tables show the separate contributions of FLOSS Developers and Researchers (Table 5.1) and FLOSS Users (local/regional authorities) (Table 5.2), and shared contributions (Table 5.3).

Table 5.1 Problems/Barriers to FLOSS' Growth and Diffusion - Contribution by FLOSS Developers and Researchers
<p><i>Some practical problems of FLOSSeG</i> Interoperability problems with 'legacy' systems. Some close software code does not yet allow interoperability with FLOSS applications. Some programmes cannot yet be replaced by FLOSS. Lack of continuity of support in services as a result of small market (Catch 22 situation), manufacturers do not provide drivers at the same time as Windows systems, or do not make drivers compatible with Linux. Lack of skilled people. FLOSS is not very common in universities (e.g., Seville University - 80% of learning on MS) Weakness of quality certification leading to distrust and risk avoidance Need for standardization Need for improvement in the formalization of supplier - customer contracts</p>
<p><i>Weakness of information & knowledge about FLOSSeG leading to PAs' distrust</i> General lack of information about FLOSS, including lack of knowledge about sound working applications, maintenance costs, marketing issues, legal issues, personnel, implementation processes, etc. This is needed for right decisions, to avoid not invented here and misconception about "gratis" Lack of formalization at the supplier level. Lack of confidence in the business model. Many PAs and companies do not see FLOSS as credible and sustainable</p>
<p><i>Competition</i> Counteraction by existing market "owners" The easier proprietary software is to get illegally (piracy) the less OSS will be used</p>

Table 5.2 Problems/Barriers to FLOSS' Growth and Diffusion - Contribution by FLOSS Users
<p><i>The Government environment - difficult for the small FLOSS supplier</i></p> <ul style="list-style-type: none"> • Large government software contracts are procured often through OJEU procedures. These procurement procedures are complex and long and companies require specialist teams to win these contracts. Few companies in the OSS community have the capacity to win these contracts • Procurement of support. Many FLOSS solutions are developed by the FLOSS community and this does not fit in with administrations' internal requirements about purchasing support for solutions. Their own internal rules on purchasing may require a registered company with more than 2 years of audited accounts. • Lack of marketing support. Few OSS companies have an active marketing arm. Government purchasing solutions are often made by more than just IT managers. FLOSS companies need to learn how to talk to business people, they often send only technical people to such meeting who are puzzled by business orientated questions • Lack of training providers, even where administrations want to take on FLOSS solutions they are often put off by the lack of training providers for their own staff.
<p><i>Consultancy, outsourcing and public-private partnerships</i></p> <ul style="list-style-type: none"> • Administrations often engage management consultants to advise them on e-government or large ICT projects. These consultancies often have ties with proprietary software vendors through established partnerships. Few of these consultancies tend to recommend free and open source solutions. • Outsourcing - in many cases administrations have outsourced the running of their IT departments to a private sector supplier. It is within the interests of the private sector supplier to put as much data as possible on proprietary systems as the contract allows. This puts them in a stronger position with their competitors when the contract comes up for renewal, as the cost of migrating data is often prohibitive. • Public Private Partnerships – administrations often enter into these arrangements when they require a large infrastructure project to be put in place. The arrangement often involves the private sector partner

<p>putting investment into the early phases of the project with the public partner providing a long-term payment. In many cases this is to put in place an enterprise resource-planning product, which is a completely proprietary end-to-end solution. This is perceived as being easier to manage or maintain than a number of disparate solutions.</p>
<p>Open Standards Open standards are seen as positive but are driven by industry and not governments. The recent downturn in the ICT market seems to have driven a number of vendors towards proprietary implementations of ‘open standards.’ There is insufficient understanding amongst PAs of these issues and so they are unaware of the implications of choosing proprietary ‘open standards’ over those offered by free and open source</p>
<p>Migration Whilst cost/benefits of cheaper hardware are apparent for a move away from Unix-based system, the administrations emphasise that these needed to be weighed up against the cost of migrating vast amounts of data from legacy Unix systems.</p>

Table 5.3 Problems/Barriers to FLOSS’ Growth and Diffusion - Contribution by both Groups: FLOSS Developers, Researchers and Users	
Societally-rooted barriers	
3	Administrations are not very good at cooperating with their nearest neighbours. Co-operation with an administration that is 50km or more away is much more likely. This presents a problem for small companies wishing to provide local OS services.
4	Rules that apply to government may be difficult to satisfy, e.g., companies must keep information traceable and controllable for at least 10 years. Can FLOSS people deliver this?
5	Administrations are on the whole not IT innovators and will often look to see successful implementations elsewhere before committing to an IT product. FLOSS needs to provide demonstration sites.
6	Investing in FLOSS means medium and long-term thinking
7	Local administration can change and this can mean policy changes. Importance of promotion at high political levels
8	Ageing population in many places in Europe - difficulties of learning (e.g., Extremadura)

At a more specific level, however, the problems/barriers are not the same for everybody. Indeed, the following distinction has been made in relation with (a) developers/sellers, (b) citizens/customers or end-users, and (c) public administrations, including PAs’ technical personnel.

- (a) *Developers/Sellers.* They have been used to make and sell packaged software. Now they have to find a new business model and re-training.
- (b) *Citizens/customers or End-user.* Major barrier concerns impact of change of interface and of routine ways of doing things. They are used to ‘proprietary’ standards for exchanging documents, mail, MS project, etc. There is therefore the cost barrier of training for all people in organizations to change to FLOSS
- (c) *Public Administrations.* Broadly speaking there are three main themes that all of the administrations felt were important.
 - Tower of Babel. There is a perception that there are a number of OS languages currently in the market place that all purport to do the same thing; ie Java, Python, PHP, Perl, TCL, etc. Authorities are unsure of the advantages and disadvantages of each.

- PAs' technical personnel. There is currently a skills gap but a number of PAs are pragmatic about this citing a similar skills gap at the start of the Internet revolution and the move away from Mainframe computing. The current issue is with the lack of training providers.
- Support. PAs have been used to buying packaged software that comes with a support package. With FLOSS they are often faced with the issue of having to support the product itself. This is going against what is now an established business dogma that says that local authorities are not as efficient as the private sector in developing and supporting software. There is also the issue that most FLOSS development companies are not structured to provide support for FLOSS development after its installation. The reliance on email communities is a culture shock for most PA's ICT managers who are used to telephone support.
- Alignment. In some administrations there might be a split between managers with an e-government brief and their IT departments. In these cases the e-government managers could perceive advantages in the flexibility of FLOSS for delivering new e-government solutions but might have difficulties in engaging their own IT departments and persuading them to look at alternatives to their traditional suppliers.

In short, there are many real or perceived barriers to the growth of a FLOSSeG constituency, and they can be of different kind for different stakeholders. Any roadmap for a large-scale FLOSSeG integrated project will have to address carefully this significant challenge.

3.2 *Proposed content of roadmap for a potential European programmatic FLOSSeG effort*

Developers, researchers and users participating in the Three Roses process identified an important number of ingredients for the roadmap content of a potential European programmatic FLOSSeG effort. A major opportunity seems to exist due to the fact that proprietary offerings are not optimal for all administrations. There is a relatively closed market with one or two dominant players in administration-specific applications and elsewhere administrations have to cope by trying to adapt their existing software systems to fit applications designed for different purposes. An example of this is CRM systems that are very rarely capable of working effectively without considerable expensive modification.²⁰

²⁰ Most proprietary CRM systems have been designed to track customer requirements in relatively simple environments. Public administrations work in a highly complex environment where a citizen may access basic services such as a library or local leisure centre and, at the same time, have personal circumstances that require a social worker, medical intervention and entitlement to some state benefit. The latter may in turn offer privileges at the leisure centre, etc. Most commercial CRM systems are not designed to cope with the complex legal issues around who can have permission to view certain types of data about citizens in these circumstances and, indeed, assume that an individual only has one reference number assigned to them. In reality citizens may have several different official reference numbers depending upon where they

Some other systems such as those associated with e-democracy or e-learning are likely to be more politically acceptable if they are 'owned' in a more collective manner. For instance, the development of e-democracy raises serious concern about the use of e-voting systems. Indeed e-voting applications should be open to public audit and inspection in order to ensure public confidence in the democratic process.²¹ In the case of e-learning, public administrations expressed concern about the potential limitations on young people's ability to develop IT skills if they are trained mainly as system 'operators' rather than 'developers.' For young people to be able to progress in the knowledge society they need a greater level of skills than simply understanding how to access the Internet or type a word-processor document. On the other hand, FLOSS seems to be a good solution in those areas where the local authority holds direct competence, such as on Education. An interesting example is the LINEX experience of Extremadura.

Tables 6.1, 6.2, 6.3 and 6.4 provide the first indication of content for a FLOSSeG roadmap. An interesting feature of the contributions is a significant emphasis on actions to correct (1) the lack of administration-specific applications, (2) the lack of information and knowledge about FLOSSeG in general, and (3) the present institutional and business weaknesses of the FLOSSeG constituency. The contributions on specific research and technological development (RTD) generally concentrated on administration-specific applications, open standards and key missing ingredients in the FLOSS offer. *From the point of view of the Commission's IST Programme, an important issue is the differentiation between FLOSS RTD that belongs specifically to the area of e-government and FLOSS RTD that is of a more generic software-technologies nature.*

Tables 6.1, 6.2, 6.3 and 6.4 separate in four categories the contributions to the FLOSSeG roadmap made by Three Roses constituents:

- research and technological development (RTD);
- public administration-specific applications,
- institutional developments; and
- strategic studies.

live. In the case of the UK such a citizen would require a National Insurance number, National Health Number and a local authority reference number of some kind.

²¹ It is interesting to note that free software is not in itself a guarantee of freedom. A conspicuous controversial example is precisely e-voting, because as J. Kitcat says, "Scrutiny. It's vital and inherently missing from electronic systems." For a system to be beyond any doubt voters must be "clear that what their intention was is in fact clearly and unequivocally recorded." (Personal communication with Jason Kitcat, 13 May 2003)

Table 6.1 Research and Technological Development (RTD)

Research and technological development (RTD)

- Definition of e-government specific open standards and open standards layer for interaction between different systems
- Definition of new standards to exchange documents, invoices, etc.
- Development of “clones” for MS Access and Oracle
- Create better installers & open source drivers for all hw sold in EC
- Research on clusters of inexpensive Linux boxes to build “mega-computers”
- Tools for cooperative development of FLOSS
- Improvement of “mono” platforms, development tools and specialized e-government frameworks and attract developers to them

Table 6.2 Public Administration-specific Applications

Public Administration specific applications

- Housing Management Systems
- Social Benefits administration systems
- Secure messaging systems for passing confidential files between administrations
- E-health systems – patient records etc
- Education (schools, etc.)
- Taxation systems for administering local taxes
- Procurement systems
- CRM systems – designed for use in complex legal and social environments
- E-participation
- E-voting
- E-learning

Table 6.3 Institutional Developments

- Build quality certification authorities or a kind of “FLOSSeG force”
- Establishment of European public development centre for FLOSS
- Library for administration of specific set of FLOSSeG components
- Establish on-line Directory of FLOSSeG software developers
- Generate mechanisms for development of trust in FLOSS
- Publication platform for FLOSS in e-government research
- EC to adopt FLOSS to help build confidence, and support initiatives such as Linex
- Create functioning “real pilot” solution/s in municipality for demonstration effect
- Selection of applications with large impact and financing of their development and wide distribution
- EC to support legal advice and monitoring of projects - patents and copyrights
- Increase government interaction with standardization bodies

Table 6.4 Strategic Studies

- Impact of patents on OSS development
- Evolution of standards, legal and de facto
- Business models and best practices for “reuse”
- Financial and economic models - total cost of ownership, micro-macro levels ROI for organizations in value chain
- Impact on FLOSS community of large players (e.g., IBM, HP) embracing FLOSS (What effect on small developers)
- Quality assurance: What should be assured in terms of, for instance, security, functionality, continuity
- Diffusion of FLOSS in e-government - cultural barriers
- Legal issues, for instance, is GPL easily usable in PAs?
- State of the art - what has been achieved so far? What uptake?
- Complementarity between FLOSS and proprietary software
- Survey of FP5 projects in order to look for EU-funded software that can be opened

Following the identification of content areas given above, the Three Roses process moved forward to the much more demanding stage of beginning to flesh out in greater detail the content and time-span (short, medium or long-term) of concrete task and activities to be included in the FLOSSeG roadmap. Such in-depth stage was also an opportunity to assess the strategic value of previous contributions and to add to the quantity and quality of the ideas emerging for the roadmap. Table 7 illustrates the results of the assessment and validation for the PA-specific applications listed in Table 6.1. It summarises the “broad” consensus views of the group with regard to the time scale for their development (short, medium or long term):

Table 7. Assessment and Validation of Contributions on PA-specific Applications

Application	Time Scale	Issues & Comments
Housing Management Systems	Long	Not considered to be an OSS-specific application
Social Benefits Systems	Long	Such systems vary very considerable from jurisdiction to jurisdiction and, as an applications domain, are considered to be politically difficult and sensitive.
Secure Message Systems	???	No consensus reached as to whether it should be a short, medium or long-term goal. In Nord Pas de Calais it is a high priority. There are 86 municipalities in the region and all have developed some FLOSS applications but they have been unable to exchange them. Accordingly, the regional authority has developed an intranet for exchanging these applications. Other regions, however, might adopt a different approach.
eHealth	Short	There appears to be an issue of agreeing appropriate standards to ensure widespread data interchange. Although a short-term objective, it will be necessary first to identify and evaluate what OSS solutions already exist.
Education (Schools Manage-	Short	The main problems associated with such applications are

ment)		seen as implementation, not technology, oriented and development should focus on problems of take-up (user resistance and user training).
Taxation Systems	Long	The view was expressed that local implementations should be avoided.
Procurement Systems	Short	eProcurement systems using FLOSS could be cheap to develop and implement and have the added benefit of promoting ICT take-up among local SMEs. However, there will be a need to train and support SMEs in their use. A factor of overriding importance in any such development will be the need to ensure transparency and openness of the procurement decision processes.
CRM Systems	Short	The main issue is not OSS-related but one of back-office integration and process re-engineering.
eParticipation	Short	GIS and groupware already exist. The view was “get it done” so as to ensure re-engagement of citizens in local affairs as quickly as possible.
eVoting	Short	“Easy” to deliver in the short term. However, issues of security, trust and confidence will have to be tackled to ensure adoption.
eLearning	Short	Many OSS tools exist but the main barrier is teacher resistance and teacher training (take-up issue). Use of OSS for eLearning will have a long-term impact on OSS development by training young people in the use of OSS (self-fulfilling).

All the applications proposed were viewed as high priority for the short tem. However, some were considered to be applications in which the issues related to content and not to code. Views were expressed as follows:

- Public Admin GIS Platform : OSS solutions are already available. Rather than re-invent the wheel, these should be evaluated and, where appropriate, adopted or adapted.
- Health Information Systems : Content, not code.
- Education Portal : Content, not code.
- Public Invoicing Systems : relates to tendering and issues of transparency.
- Forms on-line 24/7 : probably already exist – check REACH and other projects.
- Digital ID Management Systems : need for systems and standards to be resolved at national or European levels.
- Open City (Smart) Card Systems : was considered risky. Variations exist at Member State level and, in addition, there are important cost considerations in implementing such systems (e.g. cost of card readers).
- Property Register Systems : Such systems exist (e.g. in the Netherlands) and should be adopted/adapted with appropriate exchange of best practice.
- Document Management Systems : GIS/groupware already exists – it is just a matter of “getting it done”.
- CRM Systems : pose “huge” architectural issues.
- Authenticated e-Mail Systems : will necessitate appropriate legislation ?
- eLearning Share System (Open DiDa): success depends on “social engineering” in schools, especially with respect to teacher attitudes and training.

Additional ideas of PA-specific FLOSS applications were also identified. These are presented in no particular order in Table 8, while Table 9 contains some key questions raised by Three Roses constituents regarding FLOSSeG take up by Local/Regional Authorities.

Table 8. Additional Ideas or Issues on PA-specific FLOSS Applications	
Library Clearing House	Audit what's available (IDA Observatory)
Connecting to Legacy Systems	Workflow – tracking citizens' requests
Application Forms for each region or Member State	SME support systems and promoting SME access (through FLOSS)
eGovernment ontologies	FLOSS Assurance, long-term for PAs
eGov & eBus ecosystems	Education management systems
Definition of technical building blocks	eLearning toolbox
eInclusion & eParticipation	eVoting & eDemocracy

Table 9. Questions Regarding FLOSSeG Take Up by Local/Regional Authorities
<ul style="list-style-type: none"> • What best connects to Legacy Systems (i.e. middleware). The costs and benefits and a methodology for achieving this must be defined. How can legacy system migrate to FLOSS solutions? What is the vision regarding future public service architectures? • What long-term assurances could the public authorities have (demand) about maintenance and support? • What can / should be done to raise awareness of FLOSS in public sector areas? • What clarification is needed in regard to licensing issues? • Is it feasible to develop Good Practice Guides on FLOSS developments? • What are the business models for FLOSS development in the public domain? • How can the public authorities support networking amongst FLOSS developers? • How can meta-data systems be developed to support public service applications?

Three broad areas of FLOSS work emerge from the additional ideas just mentioned. These are:

(1) Development of basic FLOSS building blocks necessary for successful development of FLOSS end-user applications. Building blocks suggested included:

- Workflow systems
- Authentication systems
- Secure document management
- Groupware
- Modular portal development
- GIS

(2) Development of FLOSS building blocks for seamless, joined-up e-Government with a focus on the customer (citizen, enterprise). Includes development and agreement on framework conditions and standards for integration between back office and front office solutions and for inter-operability between public agencies.

(3) Development and exploitation of FLOSS applications as cost-effective means to achieve “Access for All” and to engage the citizen in local and public administration and, more generally, in public affairs at the local and regional levels. Includes development of cheap, cost-effective FLOSS applications for, for instance, eParticipation and eDemocracy.

3.3 Consolidating 3R Constituents' Contributions into an Evolutionary Roadmap

Tables 10a, 10b, 10c show an effort to place in time-perspective the contributions made by the Three roses constituents during the workshop and virtual activities of the constituency and roadmap-building process implemented by the project during 2003. The details of these contributions in the form of project suggestions are found in Appendix II, particularly for FLOSS RTD (Table 10a) and FLOSSeG Applications (Table 10b).

**Table 10a. Three Roses Roadmap for FLOSS for e-Government (FLOSSeG)
FLOSS RTD (General and PA-specific)**

<i>Projects</i>	Short term	Medium term	Long term
(I) FLOSS RTD (Ia) GENERAL FLOSS TECHNOLOGY	-Scalable BackUp Based on FLOSS -Not an Access Clone -Light Desktop Environment for Linux		
	-Workflow/workgroup/back-office -Data mining		-GRID services for Public Administrations -Groupware Instruments
(Ib) FLOSS for e-GOVERNMENT TECHNOLOGY	-Tendering - Requirements & Specs -Monitoring of availability of services -Non-proprietary framework for identification, authentication and authorisation		
	-Definition of e-gov specific open standards and open standards layer for interaction between different systems -Monitoring of SLA relative to applications -Adaptive application frameworks and tools for E-government development -Tools for extracting data procedures		e-gov models, definitions and implementation – data formats and interfaces -Research into OSS database clustering

**Table 10b. Three Roses Roadmap for FLOSS for e-Government (FLOSSeG)
PA-specific Applications**

<i>Projects</i>	Short term (up to 3 years)	Medium term (up to 6 years)	Long term (beyond 6 years)
(ID) FLOSSeG APPLICATIONS	<ul style="list-style-type: none"> -Scalable GIS Platform Based on Open Standards and FLOSS -Health Information Centre -Educational Portal -Public Invoice System -IT environment to make application forms available for citizens 24 hours a day -OpenPEC – Posta Elettronica Certificata Open Source -Open DiDa (Method e-courses/e-learning) 		
	<ul style="list-style-type: none"> -OS-EDMS (Electronic Document Management System) -Digital ID Management Portal -Open City Card -Population Registry Management -CRM systems for complex legal and social environment 	<ul style="list-style-type: none"> -Emergency Management System -PA-specific Quality Assurance Management System 	

**Table 10c. Three Roses Roadmap for FLOSS for e-Government (FLOSSeG)
Institutional Developments**

<i>Projects</i>	Short term (up to 3 years)	Medium term (up to 6 years)	Long term (beyond 6 years)
INSTITUTIONAL DEVELOPMENTS (III)	<ul style="list-style-type: none"> -Blueprint for Helping Pas Migrate to FLOSS -Online Directory of FLOSSeG software developers -Directory of FLOSSeG Reference Sites -Library for administration of specific set of FLOSSeG components -EU-Forge and E-Ten (network projects to support FLOSS constituency building) -Publication platform for FLOSS in e-government research -EC to adopt FLOSS to help build confidence (e.g., support Linex) -Stimulate “real pilot” solution/s in municipalities for demonstration effect 		
	<ul style="list-style-type: none"> - Quality Assurance and Certification Authorities of FLOSSeG Projects - Establishment of European public development centre for FLOSS - EC to support legal advice and monit. of projects - patents and copyrights - OpenDida Network - FLOSS Methodology in e-courses and e-learning -SOSS (Socitm Open OS Software) - UK Working Group of Managers -Increase government interaction with standardization bodies Training of end-user on FLOSSeG applications (e.g., citizens, SMEs, etc.) 		
			<ul style="list-style-type: none"> - Accessibility / e-Inclusion Web Spaces for people with special needs <p>Selection of applications with large impact and financing of their development and wide distribution</p>

Table 10c (cont.). Three Roses Roadmap for FLOSS for e-Government (FLOSSeG) Strategic Studies

<i>Projects</i>	Short term (up to 3 years)	Medium term (up to 6 years)	Long term (beyond 6 years)
(IIIa) STRATEGIC STUDIES	<ul style="list-style-type: none"> -Impact of patents on OSS development -Evolution of standards, legal and de facto -Business models and best practices for “reuse” -Financial and economic models - total cost of ownership, micro-macro levels ROI for organizations in value chain -Impact on FLOSS community of large players (e.g., IBM, HP) embracing FLOSS (What effect on small developers) -Quality assurance: What should be assured in terms of, for instance, security, functionality, continuity -Diffusion of FLOSS in e-government - cultural barriers -Legal issues, for instance, is GPL easily usable in PAs? -State of the art - what has been achieved so far? What uptake? -Complementarity between FLOSS and proprietary software -Survey of FP5 projects in order to look for EU-funded software that can be opened 		

An interesting aspect of Table 10a on FLOSS RTD is that it makes the effort to distinguish RTD that is truly specific to e-government and from that of a more general nature and therefore with application to other areas as well. This is important particularly in the context of the CEC's IST programme where e-government RTD and software RTD are carried out by two different organizations. In turn, Table 10c on Institutional Development also includes Three Roses constituents' contributions on "Strategic Studies." These have been placed in the short-term column given the importance of acquiring this knowledge within the coming three years.

All in all, the resulting roadmap is an expression of consensus and it is the first picture to emerge of common European interests on work on FLOSS for e-government in Europe. It is not exhaustive but it certainly provides a strong foundation to build a short, medium and long-term programmatic action on FLOSS for e-government and development of local/regional digital economies.

4 Strengths and Limitations of the FLOSS for e-Government Roadmap

The strengths of the Three Roses roadmap are certainly found in the key ingredients of the roadmapping and constituency building approach implemented for its generation:

- *bottom up* - content contributed by players themselves
- *consensual* - content discussed and agreed among players themselves
- *systematic* - content generated through systematic process of consultation the led to ever deeper definition
- *holistic* - content embracing all aspects of multi-dimensional process involved in the exploitation of the strategic opportunity and challenge presented by FLOSS
- *evolutionary (long term)* - content with the short, medium and long-term perspective necessary to tackle the huge and complex magnitude of the FLOSS challenge and opportunity.

Most importantly, the pioneering roadmap is the expression of the state of thinking of a real constituency (see Appendix I) of European FLOSSeG players. This constituency offers a strong foundation for Europe to take the lead on a serious programmatic strategic effort aimed at bringing Europe not just at the forefront of FLOSSeG development but, also, of the exploitation of its industrial, economic and societal benefits.

The roadmap presented in this report however is not free of limitations, as one would expect from the initial application of an innovative approach to a massive and complex challenge such as that of FLOSSeG. The following are some of the main limitations.

- The classification of FLOSSeG contributions in short, medium and long-term is not absolute. Indeed, there was no unambiguously clear agreement regarding the short-, medium-, and long-term priorities attached to *FLOSSeG applications*. In the view of some constituents, all are medium-to-long term. Others considered that each could be sub-divided into short, medium and longer-term objectives. Criteria for defining short, medium and long term objectives should be defined (do-ability, quick results and urgency of need for the short term, for example, but looking for areas of large impact in the longer term in, say, achieving significant cost reductions).
- Important players in the FLOSSeG arena were not active in the Three Roses constituency. This includes major local authorities playing a leading role in the adoption of FLOSS such as Munich and leading FLOSS companies such as Red Hat. Greater participation from the FLOSS movement would have also been beneficial, particularly, by FSF and OSI; and also from more university research centres working on FLOSS.
- Three Roses' international dimension was limited to invited speakers. A closer relation with key FLOSS initiatives or experiences in other parts of the world is important for a process and 'window of opportunity' with global reach and implications.
- The Three Roses process gave little attention to the critical problem of financing potential development and implementation of a large-scale programmatic FLOSS initiative on e-Government and local/regional digital economic development. There is

a need for a financial methodology that maps and examines the potential and requirements of relevant local/regional, national and European sources of funding.

These are all limitations that a future FLOSSeG action will have to address as it builds upon the results of the pioneering roadmapping and constituency-building process implemented by Three Roses.

4.1 Building on Three Roses - Some Recommendations for Future FLOSSeG Action

The roadmap of Tables 9a, 9b, 9c and accompanying Appendix II show the FLOSS activities proposed by Three Roses spreading in the short, medium and long term. This constitutes the kernel of a strategic programmatic effort on FLOSS for e-government and local/regional digital economies in Europe. An important number of the activities proposed are short-term (up to 3 years). This is consistent with both:

- The early state of development of FLOSS for e-government and local digital economies in Europe
- The requirement of local/regional authorities to produce practical results and benefits for its citizens, communities, enterprises, civil society, etc.
- The urgent need for a variety of FLOSS knowledge and institutional developments to help bring about clarity, confidence and effective instruments for the adoption of FLOSS for e-government and local digital economies.

These points are reflected in the recommendations of the Three Roses constituency for the phase following the one-year of roadmapping and constituency-building activities of EU project Three Roses. The following are some of the main points.

- ❖ The FLOSSeG roadmapping and constituency-building process should continue with its short, medium and long-term perspective and with objectives based on strong regional and local initiatives. In this context, in the short and medium term, the crucial aspect is to have certified FLOSS solutions that respond to the functional and technical specifications needed for fast adoption by public administrations and SMEs.
- ❖ Achievement of results in FP6 RTD work is crucial. In this respect, research effort should seek:
 - achievable results coming up early
 - respond to actual needs in the territories in terms of concrete and measurable e-services
 - wider deployment and re-use of partial and final results
 - increase trust by the public sector in the use of FLOSSeG solutions to modernise the public administration
 - networked services, simplification of procedures and shared standards;

In the short and medium term perspectives of FP6 and FP7, this points to a two steps RTD process. In FP6 (three years left), initiatives should concentrate in the research and validation of core technology and applications for e-government. In FP7, the

effort should be for take-up of the technology, its continuous improvement and further developments using the methods of free-libre open source software licensing that allow customisation and co-operation within the community of developers.

❖ Priority should be given to the re-use of existing FLOSS applications. This process has already started in some countries supported by different stakeholders participating in the Three Roses process. Potential for re-use is one of the key strategic advantages of FLOSS for the following reasons:

- there is a large number of software already developed under open source licensing in the fields of e-government, e-business and development of local economies. This software is ready to be used with very little additional investment and prompt action to allow for the transfer of know-how and applications.
- a planned activity aiming at re-using existing FLOSS applications would produce in the short term a significant impact in the development of e-government to modernise public administrations and its services;
- the classification of existing applications would be most useful to understand what new technological frontiers are important for RTD work and to use them as the base for new research projects.

In the perspective of reusability, the Three Roses process can play an important role. It has created the foundations for the development of a concrete initiative on re-use of applications, for instance, an efficient brokerage system allowing matching between prospective FLOSS users and the owners of FLOSS licenses. This initiative would involve appropriate partners present in the constituency and the three European networks (ELANET, eris@ and TeleCities). The implementation of a systematic re-usability initiative will require the development of a knowledge base of FLOSSeG good practices, feasibility and acceptability studies, as well as the definition and operationalization of a methodology for re-use.

❖ Priority should be given to the implementation of applied research and extensive demonstration of FLOSS solutions with a twofold purpose. First, to solve some of the bottle-necks that technology for e-government and local digital economies face and, second, to ensure the reliability, convenience, efficiency and effectiveness of these solution for large-scale exploitation at local and regional level. The concept of regions as test-beds (see below) is most relevant in this respect.

As an addendum, it was recommended that the management of mainstream initiatives regarding replication of existing FLOSS software and applied research should be in the hands of strong and skilled public-private partnerships. The basic condition for the participation of any organisation in the management of these initiatives would be a sound knowledge of the territories in which the technology is meant to be exploited, as well as of the critical factors that must be positively dealt with to ensure successful results.

- ❖ Priority should be given to a financial methodology that maps and examines all funding possibilities offered by the European co-funded programmes, included the national and regional level. Special attention should be given to the financing sources that the European Investment Bank is due to make available to public administrations.
- ❖ The FLOSSeG constituency-building process should be reinforced with the involvement of important European players not active in the Three Roses constituency.
- ❖ Strengthening of the international dimension of the constituency-building process by establishing closer relations with key FLOSS initiatives or experiences in other parts of the world.
- ❖ Continue to stimulate the key role of local/regional authorities as promoters, enablers, users, adaptors and market for ICT-based solutions in any large-scale strategic initiative on FLOSS for e-government and local digital economies. There was a large consensus in the Three Roses constituency on the following aspects:
 - Local and Regional administrations, closely co-ordinated with the national governments, have a leadership role in terms of:
 - contributing to a user-oriented strategic design
 - supporting public-private partnerships to build the management skills of the process
 - ensuring concertation and commitment in the preparatory phase as catalysers and enablers.
 - Local and Regional administrations have an important validation role of the new technologies through:
 - organisation of test-beds in their Regions to validate the core technology
 - promotion of public-private partnerships between innovation prime movers to do the work and exploit the results
 - interlocutors with SME's and other users in their territories
 - Local and Regional administrations have an exploitation role to support deployment with regional funds, modernising public administrations and favouring development of the local economies.
- ❖ Finally, although it was not the purpose of Three Roses roadmapping and constituency-building to generate detailed proposals on major areas such as business models or licensing issues, it is worth noting here that the Three Roses process elicited a proposal of significant importance for FLOSS legal status, particularly with reference to the most commonly used FLOSS license, the General Public Licence (GPL).²² The text of this proposal is found in Appendix III and the key recommendations are:

²² Maureen O'Sullivan, *Three Roses Report on FLOSS Law: Licensing and Legislation with the GNU GPL*, University of West England, UK, 2003.

1. That a *sui generis* legislative regime for FLOSS, akin to the one outlined in the text of Appendix III, be considered for implementation as an EU Directive.
2. That such legislation provide for exemptions from liability, whilst engaged in FLOSS development, for the following:
 - Inadvertent patent infringement.
 - Inadvertent copyright infringement.
 - Inadvertent violation of a proprietary software licence.
3. That no warranties should have to be provided for FLOSS.
4. Establish *locus standi* or standing to sue for infringements of this legislation.

In conclusion, the Three Roses roadmapping and constituency-building process has generated rich and multiple contributions for a holistic, evolutionary and systematic short, medium and long-term process that exploits the strategic "window of opportunity" opened by FLOSS for e-government and local/regional economies. Three Roses has been a process in which much has been learnt and achieved. As said earlier, the resulting roadmap of FLOSS proposed activities is an expression of consensus and it is the first picture to emerge of common European interests on activities on FLOSS for e-government in Europe.

Surely the results are not exhaustive and important limitations have indeed been identified. But the overall document, with its full strategic picture of trends, developments, problems, challenges, detailed identification of short, medium and long-term activities, weaknesses to be solved, and recommendations to be implemented, certainly constitutes a sound base to continue the build up of a short, medium and long-term programmatic action on FLOSS for e-government and development of local/regional digital economies.