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# Barriers to FLOSS in SMEs: the lack of knowledge and skills

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**Abstract:** While open source is becoming a topic of mainstream business, the level of awareness and depth of understanding of open the source paradigm still varies considerably and represents a significant barrier to broader adoption. FLOSS usage rates in the public sector were above average, while in the business sector the smaller organisations stay behind in comparison to larger ones. Even though research and experiences shows there are advantages to the use of FLOSS applications and solution, take up by SMEs is very slow. They face generic barriers to adoption including trust and transaction security and IPR concerns, and challenges in areas of management skills, technological capabilities, productivity and competitiveness. This paper addresses the reasons why smaller (and to some extent medium) enterprises are reluctant to adopt FLOSS solutions and applications, focussing mainly on the barriers related to competencies, knowledge and management skills.

## 1. Introduction

*"Excellent firms don't believe in excellence -- only in constant improvement and constant change." --Tom Peters*

Open source software is becoming the most interesting ‘new’ phenomenon of the entire information technology landscape, generating a level of interest similar to that of the first moments of the Internet. However the open source software phenomenon is not historically new, although in recent years it has reached a critical mass, which has allowed it to enter the mainstream software market.

The impact of open source technology is expected to be quite noticeable in the software industry, and in society as a whole. It allows for novel development models, which have already been demonstrated to be especially well suited to efficiently take advantage of the work of developers spread across all corners of the planet. It also enables completely new business models, which are shaping a network of groups and companies based on open source software development.

While open source is becoming a topic of mainstream business, the level of awareness and depth of understanding of open the source paradigm still varies considerably and represents a significant barrier to broader adoption.

Before looking into the issues related to the adoption and take up of Open Source, it is necessary to have a look what is understood by this phenomenon. There are many definitions, and even the terms vary, e.g. Open Source versus Free Software. In general terms it is considered that the term “open source software” tends to emphasize technical advantages (such as better reliability and security), while the term “Free Software” tends to emphasize freedom from control by another and/or ethical issues. This paper will not differentiate between the terms mentioned above, and will use the following definition:

*Exhibit 1: FLOSS Definition*

*FLOSS=Free (libre) Open Source Software*

*The concept refers to the unrestricted right to execute, copy, distribute, study, change and improve software programme (developed with open source code). It integrates the following freedoms:*

- *Freedom to execute the programme for any means*
- *Freedom to study how the programme functions and adapt it to the individual needs*
- *Freedom to redistribute copies of the programme and in this way help others*
- *Freedom to improve the programme and liberate these improvements to the public, benefiting in this way the whole community.*

Or to put it in another way: the source code of the software (the instructions that computers follow) is publicly available for anyone to change, improve and distribute. This contrasts with most current software which is ‘proprietary’ – that is to say, users have to pay for branded programs or products in which the source code is kept hidden from the user.

Looking at the European software market, a survey by Audoin [1] shows a 31 billion Euro market for 2002 and predicts up to 45 billion in 2006, a growth rate of 9.1%. Within this market there is a growing share of FLOSS applications, a leading type of is the Linux server, which is currently used on approximately 16% of server worldwide [2], another example is apache, which is used over 60% of the internet web servers all over the world [3]

## **2. FLOSS take up**

The take up of FLOSS has been increasing in both in the business world as well as in public administration. Motivations vary; for public administration, a reason for using FLOSS is simply to reduce costs, taking into account a variety of factors, such as reliability, performance, and so, posing in this sense no difference with the reasons of a business organisation. Additional reasons for which public administration adopts FLOSS can be related to advantages to users if they can examine the source code, modify the software to suit them, or redistribute the software at will. Other reasons that have been given are represented in table 1.

*Table 1: Reasons for FLOSS adoption in Public Administration [4]*

<i>Reason</i>	<i>Explanation</i>
Supporting industrial policy	Support FLOSS to encourage the development of local companies who can train, support, and tailor products
Increasing competition / reducing dependence on, or control by, any one company	Prevent any one company from completely controlling the computing infrastructure of the government or its country.
Public good	Promoting software use in the public sector as a public good
Transparency of government data	Enables complete review of exactly what is done and what data is stored, so that the public can freely receive that data without being required to buy products from any particular vendor.
Localization	Can also be trivially localized, a critical advantage where there are languages with a smaller number of speakers. Users do not need to convince a vendor to support their language, they can simply add that capability themselves

A very small, not representative survey done with 66 IT managers in the public sector in different European Union countries, representing all together 1250 servers and 18.540 clients, shows that 63% of them use some form of open source software, mainly in the educational sector and for server applications [5]. Overall approximately 27% of European companies and public administration use FLOSS.

FLOSS penetration in large enterprises is significant, and growing. A study realised by Andago [6] shows that 89% of the IT and general managers of Spain's mayor corporations had heard about FLOSS, and although only 25% stated that their company uses these applications and solutions, 27% of those that do not use FLOSS indicated that they planned to incorporate these technologies on the short term, which would lead to a FLOSS penetration of 50% in large organisations in Spain. The tendency is similar in Germany, where 44% of the large enterprises use FLOSS, and with the United Kingdom, where the percentage is 32. FLOSS is most used in internet server applications and databases [7].

The European study by Berlecon research confirms the above as it found that FLOSS usage rates in the public sector were above average, while in the business sector the smaller organisations stay behind in comparison to larger ones.

This paper addresses the reasons why smaller (and to some extent medium) enterprises are reluctant to adopt FLOSS solutions and applications, focussing mainly on the barriers related to competencies, knowledge and management skills.

### 3. SMEs and FLOSS

Small and Medium sized enterprises have been integrated more and more in the information society, the use of Internet and related applications has increased enormously. SMEs are facing strategic technological decisions on what type of applications and solutions are to be installed, as the options are huge and very varied. The choice for one technological solution or another, leads to an investment of thousands of euros of technology related costs, which in many occasions are not fully exploited or depreciated. FLOSS is becoming an alternative, showing an interest comparable to the interest generated by the beginnings of internet. FLOSS can enhance system interoperability and make it easier to introduce new applications. It can also have the potential to develop applications specifically for SMEs, which can be cost-saving for them, moreover its use and updating generate costs which are easily controlled by an SME.

When analysing the reasons why enterprises implement FLOSS solutions and applications, the tendencies are similar all throughout Europe. The main reasons seem to be related stability, security and cost, as shown in the research by Wichmann [7]. It must be said that no differentiation here is made for larger and smaller enterprises.

Even though research and experiences shows there are advantages to the use of FLOSS applications and solution, take up by SMEs is very slow. They face generic barriers to adoption including trust and transaction security and IPR concerns, and challenges in areas of management skills, technological capabilities, productivity and competitiveness.

implement FLOSS solutions and

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| <p><i>Exhibit 3: Main FLOSS selection criteria:</i></p> <ol style="list-style-type: none"> <li>1. <i>Higher stability, better access protection and higher performance</i></li> <li>2. <i>Low or zero license fees</i></li> <li>3. <i>Installation and administration cost savings</i></li> <li>4. <i>Open and modifiable source code</i></li> </ol> |
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*Table 2: Open Source deficiencies as seen through the eyes of company managers [8]*

<p><i>Informal support:</i> FLOSS is not owned and sold by a single supplier, there aren't the handy manuals, installation guides and support helplines that come with proprietary software. The issue is where to get support. There are a number of third party support companies as well as the distribution vendors. However if your attitude to IT is .But the question for many CEOs still is "Who do I sue when things go wrong?".</p>
<p><i>Velocity of change:</i> The fact that the open source community is constantly tweaking its software is a concern, CEOs do not want to update every day their software.</p>
<p><i>No roadmap:</i> Many open source projects suffer from an informality that causes CEOs anxiety. Most CEOs and IT executives want a clear roadmap for products so that they can better plan for their future</p>
<p><i>Functional gaps :</i> The current market for Linux is dominated by low-end edge server applications, there is still a perceived lack in mainframe, data centers and ERP applications</p>

<i>Licensing caveats:</i> Confusion about the various open source licensing schemes adds an element of uncertainty and risk
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<i>Independent Software Vendors endorsements:</i> Endorsements from independent software vendors (ISVs) aren't especially credible for CEOs, but those from peers in other enterprises carry substantial weight (and they usually do not know many peers that have used FLOSS)
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One of the reasons for which the majority of the SMEs are not considering the implementation, despite the clear benefits it can produce, is the lack of specific knowledge about FLOSS. SME senior managers or managing directors usually have worked their way up in the business, but are no specialists in ICT, and rely for their decisions on the vendors of solutions. The market is currently dominated by proprietary software vendors, thus reducing the access to professional knowledge about FLOSS.

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Another consequence of the lack of knowledge of FLOSS (at higher management levels) reduces its consideration at the decision-making stage, ruling it out in many cases and not considering it as one of the alternative solutions. Recent research by Open Forum Europe, jointly funded with the DTI, highlights the need for credible, comparative business models for FLOSS. Both users and non-users point out that the primary challenge facing the market is in the perceived availability of support and lack of business information on which to base decisions.

### *3.1 Increasing FLOSS take up in SMEs*

The strategy to promote the take up of FLOSS by SMEs in Extremadura, takes as reference point that the low take up of FLOSS by SMEs is mainly related to the lack of knowledge on its possibilities and how to use and implement it, and is based on two mayor lines of activity:

1. Awareness creation and promotion
2. Training and support

These are conducted mainly through two specific projects, LinEX/Empresa, a regional initiative, and Stratos<sup>2</sup>, a European funded project. LinEX Empresa” combines the development of a specific FLOSS solution for the SMEs in the region, with a technological support service. The objective of the effort is support the migration towards FLOSS. The users are companies, public administration and other types of organizations of the region, that are interested in implementing FLOSS and need information and support in the related decision-making processes. The LinEX empresa application is based on the LinEX distribution and offers an accounting and invoice management programme in FLOSS, specially developed for small and micro enterprises.

During the realisation of the LinEX Empresa project, it became clear that, on the one hand, other European countries were facing similar challenges, and on the other, that the training action, which mainly focussed on the use of the software and the technology, needed to be reinforced. This lead to the Stratos<sup>2</sup> (SME training methodology for technologies based on free open source software) project, which addresses the challenges and problems faced by the SMEs through the development of a training plan that will provide European SME managers with the competences necessary for the assessment and evaluation of the suitability of FLOSS applications and solutions for their organisations, and their posterior implementation, including issues such as the full involvement of their human capital in the whole process (vital to the success of the operation).

## **4. Where we are now**

The first phase of the LinEX Empresa project has finalised, with an overwhelming success of the LinEX Empresa application, as demonstrated by the number of downloads in table 3.

Table 3: Downloads of LinEX Empresa application

Application	Downloads in 1 year
LinEx-FactorLinEx: application for invoice management	13.567
Linex-Contabilidad: application for basic accounting	8.006
Sources LinEx-FactorLinEx	1.724
Sources Linex-Contabilidad	1.357

The support platform, which contains information and knowledge about FLOSS and how to migrate, has been accessed over 2 million times over the period of one year,

The main lessons learned from the LinEX Empresa project can be summarised as follows:

- Importance of access to cases close to the own reality and preferably in the same geographical area thus helping to overcome one of the deficiencies concerning independent vendor endorsement mentioned in table 2,
- Importance of easy accessible and localised support for those SMEs that migrate, through specialised and independent consultants and FLOSS companies backed or recognised by a larger organisation, e.g in Extremadura the fact that a company is supported by the business incubator of Fundecyt increases their perceived reliability,
- Migration to FLOSS by SMEs, more than a technological question, is a business question, addressing them should be done from this point of view and by experts in business, not in technology, which tends to confirm statements from people such as Andy Mulholland, , chief technology officer for Cap Gemini Ernst & Young. He argues that it is a question of attitude. "The arguments for and against open-source software often get very trivialized. It's not a technology issue; it's a business issue to do with externalization".
- Need for FLOSS training more focussed on the business aspects of migration and support.

The experience in Extremadura shows the validity of the guidelines of the IDA report on Open Source Migration Guidelines [9] (even if these were written for governmental institutions), and the need to follow these steps in a well planned way.

*Exhibit 3: Open Source Migration Guidelines by IDA*

- *Before starting have a clear understanding of the reasons to migrate;*
- *Ensure that there is active support for the change from it staff and users;*
- *Make sure that there is a champion for change . The higher up in the organisation the better;*
- *Build up expertise and relationships with the FLOSS movement;*
- *Start with non critical systems;*
- *Ensure that each step in the migration is manageable.*

The lack of knowledge, skills and competencies of SME managers to follow all of these steps and migrate their organisation to FLOSS is being covered by the STRATOS2 initiative.

First an inventory of the current FLOSS related training in each of the countries was realised, followed by a training needs analysis, with representatives of SMEs. The scope of the analysis were SMEs, according to the definition of the EU, not belonging to the ICT sector and preferable with low ICT

experience. The questionnaires (semi-closed), aimed at owners/managers and/or IT decision-makers, addressed three mayor blocks:

1. ICT education and training of the respondent;
2. Introduction of ICT in the organisation; and
3. Knowledge and use of FLOSS.

A total of 140 questionnaires were recollect. Preliminary results [10] indicate that the lack of ICT skills and business skills are widespread impediments to effective uptake both during the decision making process, as well as once adoption decisions are made. They also show that the awareness among SME managers on FLOSS varies per region, with relatively high levels of awareness in Extremadura, and the Netherlands, which can be explained by importance of FLOSS for the Information Society Policy in Extremadura, and the coverage FLOSS is getting in the Dutch press. The results from the training needs analysis confirm the research findings and experience in other projects. Specific training (and support) is needed at three levels:

1. Decision-making process: it is necessary to provide the SME managers with knowledge and skills to be able to consider FLOSS solutions, and evaluate and assess their impact and value compared to proprietary software.
2. Implementation process: to provide them with the skills to plan and execute the implementation of FLOSS within their organisations, taking into account both the technological, as well as the organisational and people related aspects.
3. Development process: to give them the skills and competencies to lead the development and/or adaptation of FLOSS solutions for their organisations, including those that will allow them to select the most appropriate company (in the case of acquisition), that will allow them to interact with the developer's community (in case of adaptation of a solution), or even to lead their own development.

## 5. Conclusions

Using FLOSS offers various advantages, not only to large enterprises and public administration, but also to SMEs, these are related to the ability to reduce costs and development time and to avoid being dependent on a single software provider. For these reasons there is an expectation that more and more organisations, both public and private, will start using it. But the growth will develop at a slow and steady pace.

Users are beginning to view many software applications as commodity products with little differentiation between vendor offerings. FLOSS provides organizations with another compelling choice that offers the flexibility, quality and reliability necessary to implement many functional applications to run a business. CEOs will become more receptive to open source over time, and enterprise initiation, support, and participation in open source software development will increase, especially to meet niche customization requirements.

FLOSS penetration is clearly above average in Public Administration, and has high levels of acceptance among larger corporations, SMEs, and specially the smaller enterprises, lack behind, both in awareness about FLOSS as well as in their adoption levels. The barriers faced are not only of a technological nature, but are more business related and are a consequence of the lack of knowledge and specific, customised, support for these types of organisations. Although it is said that SMEs are quicker in their take up of innovative solutions, these seems not to be the result for FLOSS, as preliminary results from the STRATOS<sup>2</sup> project show. It is clear that the FLOSS community as a whole needs to pay special attention to needs of the SMEs and address the barriers as perceived by the SME managers, not addressing the underlying technological issues. In Extremadura, both the LinEX empresa, as well as the STRATOS<sup>2</sup> project pretend to address these issues mentioned.

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